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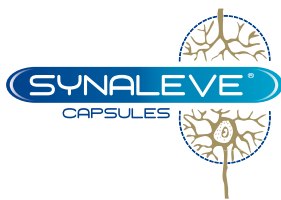


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Beyond boundaries: competence and collaboration in modern luminal endoscopy

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Endoscopy has undergone a remarkable transformation. What began primarily as a means of visualising the gastrointestinal tract has evolved into a sophisticated therapeutic discipline capable of managing conditions that previously required open or minimally invasive surgery. This evolution challenges the traditional boundaries between medical and surgical practice. The articles in this issue illustrate the changing landscape particularly well, encompassing adoption of new technology, training and the organisation of endoscopy services, quality assurance, and advanced diagnostic and therapeutic techniques.

Historically, much of the development of gastrointestinal endoscopy occurred within surgery. Surgeons were among the early adopters of flexible endoscopy and rapidly recognised its potential not only for diagnosis but also as an extension of operative management. The development of endoscopic sphincterotomy and endoscopic retrograde cholangiopancreatography (ERCP), the treatment of postoperative complications, management of strictures, and therapeutic intervention following bariatric surgery all demonstrate that endoscopy could become an alternative to, or complement, conventional surgery. In many centres, therefore, endoscopy developed naturally within a shared surgical environment.^{1,2}

The distinction between surgical and medical endoscopy is increasingly difficult to sustain. The expanding capabilities of therapeutic endoscopy have created a field that sits between traditional disciplines. The patient with a bile duct injury may require surgery, ERCP or both. The patient with a complication following bariatric surgery may require endoscopic, radiological and surgical intervention at different stages. A patient with oesophageal cancer may require endoscopic palliation as part of a broader multidisciplinary treatment strategy. The most appropriate approach is determined by the patient's anatomy, disease and clinical circumstances rather than by the professional background of the individual holding the endoscope.

This is particularly apparent in the management of bile duct injuries. ERCP has become an important component of the management of selected injuries and leaks, often avoiding or reducing the need for further surgery.³ Similarly,

endoscopic therapy has changed the management of benign oesophageal strictures, while stenting provides an important option for selected patients with oesophageal malignancy.⁴ These developments do not represent the replacement of surgery by endoscopy. Rather, they demonstrate how the two disciplines have become complementary.

The same principle applies to complications following metabolic and bariatric surgery. Altered anatomy can make these patients technically challenging, but therapeutic endoscopy has increasingly provided minimally invasive solutions to problems that previously required reoperation. The development of these techniques requires an understanding of both surgical anatomy and endoscopic intervention. It is precisely at this interface that collaboration between surgeons and endoscopists becomes particularly valuable.⁵

Not all progress in endoscopy, however, has been driven by increasingly complex intervention. High-quality endoscopy depends on fundamentals. Appropriate bowel preparation, completion of colonoscopy, competence assessment and the organisation of an effective endoscopy service remain essential. A technically sophisticated procedure is of limited value if the examination is incomplete, inadequately documented or performed by an operator who has not demonstrated competence.⁶

The question of competence is likely to become increasingly important. As endoscopic procedures become more specialised, training based simply on the number of procedures performed is unlikely to be sufficient. Competence requires appropriate knowledge, technical ability, judgement, recognition and management of complications, and the ability to work effectively within a multidisciplinary team, requirements that apply irrespective of whether the practitioner is trained primarily in surgery or medicine.^{6,7}

Technological innovation continues to blur the boundaries between endoscopy and surgery, creating new opportunities to diagnose and treat gastrointestinal disease using complementary approaches. High-resolution manometry has transformed the assessment of oesophageal motility disorders and is central to the modern evaluation

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of achalasia.⁸ Capsule endoscopy has expanded the ability to investigate areas of the gastrointestinal tract that are difficult to reach with conventional endoscopes.⁹ Single-use duodenoscopes represent a technological advance that addresses important issues surrounding infection control, reprocessing and availability of specialised equipment.¹⁰ These innovations demonstrate that the future of endoscopy will not simply involve doing established procedures better; it will also involve reconsidering how gastrointestinal disease is investigated and treated.

The organisation of endoscopy services is consequently becoming as important as the individual procedure. Modern endoscopy requires trained personnel, appropriate equipment and reliable systems for sedation, anaesthesia and reprocessing. Quality assurance, complication management and access to surgical, radiological and pathological expertise are equally important.⁶ In a shared medical–surgical facility, these components can be brought together to create an environment in which complex patients can move between disciplines without barriers created by specialty boundaries.

Perhaps the most important lesson from the evolution of luminal endoscopy is that competence matters more than ownership. The traditional question of whether a procedure belongs to surgery or medicine matters less than whether it is appropriate for the patient, whether the operator has demonstrated the necessary competence, whether the service can support it safely, and whether appropriate surgical, radiological and medical expertise is available when needed.^{6,7} The history of therapeutic endoscopy is closely intertwined with surgical innovation, but the field has now matured beyond its historical origins.

Gastroenterologists, surgeons, interventional endoscopists, anaesthetists, radiologists, nurses and other members of the multidisciplinary team all contribute to contemporary endoscopic practice. Endoscopy services should therefore have the patient as their focus, with treatment tailored to the patient's anatomy, physiology and disease rather than to the skill set or management approach of a single specialty. The articles in this issue reflect this ongoing evolution. From the fundamentals of bowel preparation and colonoscopy competence to ERCP for bile duct injury, the management of oesophageal strictures and cancer, complications of bariatric surgery, capsule endoscopy, high-resolution manometry and single-use duodenoscopes, they demonstrate a discipline that has moved well beyond simple visualisation and increasingly requires integrated care. The future of luminal endoscopy should therefore not be defined by specialty ownership. It should be defined by competence, collaboration, innovation and patient-centred care. The shared medical–surgical endoscopy environment provides an ideal setting for this evolution. Rather than asking where endoscopy belongs, we should ask how the different disciplines can work together to ensure that patients receive the right procedure, competently performed by the right person, in the right environment, and with the appropriate expertise available when things do not go according to plan.

That is perhaps the real story of modern luminal endoscopy: not the movement of a discipline from one specialty to another, but its emergence as a genuinely collaborative, patient-centred component of gastrointestinal care.

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REFERENCES

1. Morgenthal CB, Richards WO, Dunkin BJ, et al; SAGES Flexible Endoscopy Committee. The role of the surgeon in the evolution of flexible endoscopy. *Surg Endosc*. 2007;21(6):838-53. <https://doi.org/10.1007/s00464-006-9109-4>.
2. Pauli EM, Ponsky JL. A modern history of the surgeon-endoscopist. *Techniques in gastrointestinal endoscopy*. 2013;15(4):166-72. <https://doi.org/10.1016/j.tgie.2013.08.002>.
3. De'Angelis N, Catena F, Memeo R et al. 2020 World Society of Emergency Surgery updated guidelines for the detection and management of bile duct injury during cholecystectomy. *World J Emerg Surg*. 2021;16:30. <https://doi.org/10.1186/s13017-021-00369-w>.
4. Spaander MCW, van der Bogt RD, Baron TH, et al. Oesophageal stenting for benign and malignant disease: ESGE Guideline - Update 2021. *Endoscopy*. 2021;53:751-62. <https://doi.org/10.1055/a-1475-0063>.
5. Gala K, Brunaldi V, Abu Dayyeh BK. Endoscopic management of surgical complications of bariatric surgery. *Gastroenterol Clin North Am*. 2023;52(4):719-31. <https://doi.org/10.1016/j.gtc.2023.08.004>.
6. Valori R, Cortas G, de Lange T, et al. Performance measures for endoscopy services: A European Society of Gastrointestinal Endoscopy quality improvement initiative. *Endoscopy*. 2018;50:1186-204. <https://doi.org/10.1055/a-0755-7515>.
7. Domagk D, Oppong KW, Aabakken L, et al. Performance measures for ERCP and endoscopic ultrasound: A European Society of Gastrointestinal Endoscopy quality improvement initiative. *Endoscopy*. 2018;50:1116-27. <https://doi.org/10.1055/a-0749-8767>.
8. Gyawali CP, Carlson DA, Chen JW, et al. ACG Clinical Guidelines: Clinical use of oesophageal physiologic testing. *Am J Gastroenterol*. 2020;115(9):1412-28. <https://doi.org/10.14309/ajg.0000000000000734>.
9. Pennazio M, Rondonotti E, Despott EJ, et al. Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: ESGE Guideline - Update 2022. *Endoscopy*. 2023;55(1):58-95. <https://doi.org/10.1055/a-1973-3796>.
10. Trindade AJ, Copland A, Bhatt A, et al. Single-use duodenoscopes and duodenoscopes with disposable end caps. *Gastrointest Endosc*. 2021;93(5):997-1005. <https://doi.org/10.1016/j.gie.2020.12.033>.

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The colonoscopy paradigm: expectation without demonstrated competence in South African surgical training

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Colonoscopy occupies an uneasy position in South African surgical practice. General surgeons are expected to perform the procedure, yet most complete their endoscopy training without formal assessment of competence for independent practice.¹ This gap between expectation and preparation is critical and reveals a deeper misalignment between training, competence and accountability.

The problem lies partly in the mismatch between service needs and training capacity. Colonoscopy is central to general surgical practice, particularly in the private sector, where most procedures are performed by surgeons rather than gastroenterologists.² Given limited subspecialist capacity, expecting general surgeons to perform colonoscopy is pragmatic. Yet that expectation assumes competence, an assumption that warrants scrutiny.

Acquiring colonoscopy competence requires time and effort. Skill develops through practice, structured supervision and meaningful feedback. A caecal intubation rate (CIR) of at least 90%, confirmed by photo documentation, is widely accepted as a minimum standard of technical competence.³ Although trainees progress at different rates, achieving this level of proficiency typically requires 200–300 procedures, even within well-resourced, closely supervised programmes.^{4,5} Fewer than half reach this threshold by 200 colonoscopies, and colorectal fellows require similar volumes to gastroenterology trainees.^{4,5}

Against this background, the South African experience is markedly different. Surgical trainees historically have completed training after performing on average as few as 14 colonoscopies.⁶ Even allowing for improvement, the gap between required and available experience remains substantial. Colonoscopy is not a “basic skill” acquired through limited exposure; the procedure demands technical proficiency, lesion recognition, therapeutic capability and complication management, competencies that must be developed, not assumed.⁴

Why is adequate experience so difficult to obtain? Public sector tertiary hospitals, where most training occurs, face constraints in infrastructure, personnel and competing clinical priorities, leaving endoscopy services unable to meet demand.⁷ Meanwhile, the private sector performs

substantially more colonoscopies relative to the population served but remains largely disconnected from formal training.² Within tertiary centres, the training needs of subspecialty fellows further limit procedural opportunities for general surgical registrars.

The consequences extend beyond specialist training. Many South African surgeons acquire colonoscopy skills after specialist qualification through informal mentorship or self-directed learning. While some achieve a high level of competence, this pathway is unsatisfactory and inherently unpredictable, exposing patients to vagaries of a steep learning curve, and risks entrenching suboptimal practice while leaving practitioners increasingly vulnerable to medico-legal scrutiny. These limitations reinforce the need for structured training and an objective assessment of competence.

Limited exposure makes structured training and assessment even more important. Rather than relying on procedural numbers alone, training should combine clearly defined objectives, supervised experience and progressive assessment of competence, specific measurable, achievable, relevant, time-bound (SMART) objectives can translate competence into measurable targets, while direct observation of procedural skills (DOPS) provides structured teaching, feedback and assessment. Formative DOPS can guide progression during training, with summative assessment determining readiness for independent practice. In a low-volume environment, every procedure must carry educational weight.^{4,5}

The current regulatory framework does not consistently support this approach. CMSA requirements for medical and surgical gastroenterology subspecialty training include documented endoscopic experience, supervision and assessment, with physician trainees required to complete at least 100 colonoscopies.⁸ No comparable framework of procedural exposure, objective competency assessment or colonoscopy key performance indicators applies to general surgical training. This discrepancy raises a fundamental question: how can competence be expected when it is neither consistently taught nor objectively assessed?



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Expanding training opportunities remains problematic. Existing South African initiatives within academic centres, professional bodies and emerging simulation programmes reflect genuine engagement but lack coordination and scale. Intensive, concentrated training has been shown to improve colonoscopy skills but is resource-intensive and therefore challenging to implement where services, infrastructure and staffing are already stretched.⁹ More feasible approaches include protected endoscopy rotations, simulation-supported preparation and public-private training partnerships. Crucially, increased exposure must be paired with structured assessment to ensure that experience translates into competence.

Key performance indicators (KPIs)³ are central to quality assurance in colonoscopy and should form an integral part of competency assessment and ongoing professional practice. Internationally, adenoma detection rate (ADR) is regarded as the most important quality indicator because higher detection rates are consistently associated with a lower risk of post-colonoscopy colorectal cancer. Routine measurement of ADR, however, requires reliable linkage to pathology databases and sufficient procedural volumes, limiting widespread implementation in many South African settings. In contrast, CIR, supported by mandatory photographic documentation of the appendiceal orifice, represents a pragmatic, objective and immediately measurable KPI that could be implemented nationally. While photographic confirmation of complete examination cannot substitute for high-quality mucosal inspection or ADR measurement, it provides a practical foundation for quality assurance, with ADR remaining the preferred benchmark where the necessary data infrastructure exists.

Recent South African debate has focused on the mismatch between expectations of colonoscopy competence and the capacity to provide adequate training and assessment. Thomson questioned whether colonoscopy should become an entrustable professional activity when training capacity is insufficient to achieve competence, and recommended a national assessment of training capacity and procedural volume before considering implementation.¹⁰ Nel et al.¹⁰ acknowledged these constraints but argued that colonoscopy should remain part of formative assessment, supported by simulation, expanded training opportunities and structured mentorship after qualification. The debate exposes the central dilemma: general surgeons will continue to perform colonoscopy, yet the current system neither provides sufficient training nor consistently demonstrates competence for independent practice.

A parallel debate has emerged around post-colonoscopy colorectal cancer (PCCRC), defined as colorectal cancer diagnosed following a colonoscopy in which no cancer was detected. Although some PCCRCs reflect biological factors, including rapidly developing interval cancers, many are attributable to lesions missed or incompletely resected at the index colonoscopy, making PCCRC the ultimate outcome measure and a key indicator of colonoscopy quality. Fourie et al.¹¹ highlighted concerns that PCCRC may reflect missed cancers at the original colonoscopy and deficiencies in colonoscopy performance, whereas the SAGES response emphasised the multifactorial nature of PCCRC and the importance of structured competency-based training and continuous quality monitoring.¹² These perspectives are complementary rather than contradictory. While PCCRC

should not be viewed solely as a measure of individual performance, meaningful reductions in its incidence will only be achieved through systematic investment in high-quality training, objective competency assessment, and continuous monitoring of procedural KPIs. Monitoring CIR, ADR, bowel preparation quality, withdrawal time, and appropriate surveillance will drive improvements in colonoscopy quality and minimise missed lesions.

Systemic reform, however, remains essential. Training, assessment and practice must align around defined standards. This requires national evaluation of training capacity, incorporation of explicit competency metrics into regulatory frameworks and greater integration between public and private sectors. Simulation and structured post-certification mentorship may further bridge the gap.

Colonoscopy training in South Africa has reached a point where incremental adjustments are no longer sufficient. A profession cannot continue to expect competence in a procedure it does not consistently teach, assess or verify. Training must move towards structured competency assessment, while mandatory photographic documentation of caecal completion offers an immediately implementable measure of accountability in practice.

The way forward for colonoscopy in South Africa is clear. The profession already knows what is required: defined competency standards, structured assessment, objective documentation and measurable quality indicators. The remaining challenge is implementation. Competence in colonoscopy should no longer be assumed because of specialty, experience or procedural numbers. Competence should be demonstrated, measured and maintained.

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REFERENCES

1. Nel D, Burch V, Beley K, et al. Procedures most frequently performed by South African-trained general surgeons: Implications for training and assessment. *S Afr J Surg.* 2024;62(3):242-8. <https://doi.org/10.36303/SAJS.00190>.
2. Katsidzira L, Thomson SR. Colonoscopy practice in South Africa: The way forward. *S Afr Med J.* 2020;110(12):1144-5. <https://doi.org/10.7196/SAMJ.2020.v110i12.15270>.
3. Rex DK, Anderson JC, Butterly LF, et al. Quality indicators for colonoscopy. *Am J Gastroenterol.* 2024;119:1754-80. <https://doi.org/10.14309/ajg.0000000000002972>.
4. Ward ST, Mohammed MA, Walt R, et al. An analysis of the learning curve to achieve competency at colonoscopy using the JETS database. *Gut.* 2014;63(11):1746-54. <https://doi.org/10.1136/gutjnl-2013-305973>.
5. Sedlack RE, Sedlack AR, Kelley SR, League JB. Defining the learning curves of colorectal surgical trainees in colonoscopy using the Assessment of Competency in Endoscopy tool. *Gastrointest Endosc.* 2022;96(2):301-7. <https://doi.org/10.1016/j.gie.2022.02.019>.
6. Kruger D, Veller MG. Exposure to key surgical procedures during specialist general surgical training in South Africa. *S Afr J Surg.* 2014;52(4):96-100. <https://doi.org/10.7196/sajs.2162>.

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REFERENCES: 1. MEZAVANT[®] professional information, May 2025. 2. Tenjarla S, Romasanta V, Zejdner E, Villa R, Moro L. Release of 5-Aminosalicylate From an MMX Mesalazine Tablet During Transit Through a Simulated Gastrointestinal Tract System. *Adv Ther* 2007;24(4):826-840. 3. Tenjarla S, Abinusawa A. In-Vitro Characterization of 5-Aminosalicylic Acid Release from MMX Mesalazine Tablets and Determination of Tablet Coating Thickness. *Adv Ther* 2011;28(1):62-72. 4. Turner D, Ricciuto A, Lewis A, D'Amico F, Dhaliwal J, Griffiths AM, et al. STRIDE-II: An Update on the Selecting Therapeutic Targets in Inflammatory Bowel Disease (STRIDE) Initiative of the International Organization for the Study of IBD (IOIBD): Determining Therapeutic Goals for Treat-to-Target strategies in IBD. *Gastroenterol* 2021;160:1570-1583. 5. Kamm MA, Sandborn WJ, Gassull M, Schreiber S, Jackowski L, Butler T, et al. Once-Daily, High-Concentration MMX Mesalazine in Active Ulcerative Colitis. *Gastroenterol* 2007;132:66-75. 6. Willian MK, D'Haens G, Yarlas A, Joshi AV. Changes in health-related quality of life and work-related outcomes for patients with mild-to-moderate ulcerative colitis receiving short-term and long-term treatment with multimatix mesalazine: a prospective, open-label study. *J Patient Rep Outcomes* 2018;2:22. <https://doi.org/10.1186/s41687-018-0046-5>. 7. Kamm MA, Lichtenstein GR, Sandborn WJ, Schreiber S, Lees K, Barrett K et al. Randomised trial of once- or twice-daily MMX mesalazine for maintenance of remission in ulcerative colitis. *Gut* 2008;57:893-902. 8. Hu MY, Peppercorn MA. MMX mesalazine: a novel high-dose, once-daily 5-aminosalicylate formulation for the treatment of ulcerative colitis. *Expert Opin Pharmacother* 2008;9(6):1049-1058.

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Combined endoscopic and radiologic intervention for major bile duct injuries

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Keywords: bile duct injuries, intervention, endoscopic stent, percutaneous transhepatic biliary stent

Serious complications continue to accompany laparoscopic cholecystectomy despite widespread emphasis on the principles of safe cholecystectomy.¹ The Achilles heel remains failure to achieve adequate visualisation of biliary anatomy, resulting in major bile duct injury (BDI), one of the most devastating complications of abdominal surgery.² Despite focus on the critical view of safety technique and the introduction of robotic-assisted cholecystectomy, this complication has not disappeared.³ Two recent large population-based analyses of Medicare patients found significantly higher rates of major BDI after robotic-assisted compared with conventional laparoscopic cholecystectomy, with the increased risk persisting across low-, intermediate- and high-risk patients.^{4,5} These findings reinforce that technological sophistication alone cannot compensate for errors in anatomical identification and safe operative technique.

Traditionally, repair of major BDIs has been the domain of hepatobiliary surgeons, with Roux-en-Y hepaticojejunostomy regarded as the gold standard because of excellent long-term results.^{6,7} During the past two decades, however, advances in therapeutic endoscopy and interventional radiology have, when combined, created an alternative minimally invasive strategy for selected patients with major BDIs, extending treatment beyond simple biliary leaks to complex injuries with loss of ductal continuity.

In this issue of the *South African Journal of Surgery*, Bhana and colleagues⁸ report the outcomes of 14 consecutive patients with major BDIs managed definitively by endoscopic techniques, including a combined endoscopic and radiologic approach (CERA) using the “Lasso” method⁹ with a snare-assisted endoscopic-radiological rendezvous technique when complete transection and loss of ductal continuity had occurred. Seven patients underwent conventional endoscopic stenting, while seven required CERA. Technical and clinical success was achieved in all patients, procedure-related complications were mild, and no biliary strictures developed during a median follow-up of 22 months. This series builds on the authors’ earlier two-patient report¹⁰ and on three other published cohorts: Fiocca et al.¹¹ (22 patients), Donatelli et al.¹² (60 patients) and Schreuder et al.¹³ from the Academic Medical Centre, Amsterdam (47 patients). Although this cohort is relatively small, these results represent a substantial single-centre experience of

definitive combined endoscopic and radiological stenting of complex bile duct injuries.

The importance of this study lies less in the technical success of the procedures than in the challenge it poses to established treatment algorithms. By adopting the McMahon definition of MBDI, the authors focus specifically on severe injuries, including complete transections and extensive circumferential defects, rather than on minor bile leaks for which endoscopic therapy is already well established.¹⁴ The question addressed is therefore not whether endoscopy can manage bile leaks, but whether CERA can provide definitive treatment for injuries traditionally considered to require operative biliary reconstruction.⁸⁻¹²

The principal innovation is the structured application of CERA. When guidewire access cannot be achieved from either the endoscopic or percutaneous route alone, the rendezvous technique establishes biliary continuity by combining both approaches. This permits re-establishing ductal continuity using covered self-expanding metal stents to bridge complete transections and even tissue loss, expanding the range of injuries potentially amenable to minimally invasive treatment. The study demonstrates that anatomical discontinuity should no longer automatically exclude consideration for endoscopic therapy in appropriately selected patients when managed by experienced multidisciplinary teams.

The clinical implications are particularly relevant for patients who present late with bile leakage, sepsis and inflammation, circumstances in which immediate reconstructive surgery carries substantially increased operative risk and is best deferred until the sepsis has been treated successfully and bile leak has effectively been controlled by external drainage.¹⁵ Applying CERA, internalisation of biliary drainage offers recognised physiological advantages over prolonged external drainage, including preservation of bile salts, improved nutritional recovery, avoidance of electrolyte losses and earlier discharge from hospital. At the same time, however, these benefits must be balanced against the need for repeated endoscopic interventions and prolonged stent surveillance, particularly in patients with complete transections who required longer treatment than those with partial injuries.

The study also reinforces the importance of multidisciplinary management. Successful treatment depends

not only on advanced endoscopic expertise, but also on careful radiological imaging, close collaboration between hepatobiliary surgeons, interventional radiologists and therapeutic endoscopists, and meticulous patient selection. Ultimately, these resources are available only in highly specialised centres and should temper enthusiasm for widespread adoption of CERA before adequate expertise exists.

Several limitations deserve emphasis. The study is retrospective, includes only 14 highly selected patients, originates from a single expert centre and lacks a contemporaneous surgical comparison group. Follow-up, although encouraging, remains relatively short for an intervention intended to replace hepaticojejunostomy, where excellent durability extending over decades has been well documented. Consequently, these findings should be regarded as proof of concept rather than definitive evidence of superiority.

Nevertheless, this study represents an important contribution to the evolving management of MBDIs. Rather than replacing surgery, CERA broadens the therapeutic options available to multidisciplinary HPB teams and demonstrates that, in selected patients, definitive minimally invasive treatment is achievable even after complete bile duct transection. Larger prospective multicentre studies as in the Donatelli analysis¹² with long-term follow-up, standardised outcome measures and direct comparison with surgical reconstruction will determine whether this promising approach will modify future treatment algorithms and provide a realistic and durable alternative to surgical reconstruction in patients who have major bile duct injuries with ductal discontinuity and tissue loss.

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REFERENCES

1. Krige JE, Jonas E, Hofmeyr S. Instilling a culture of safety for laparoscopic cholecystectomy. *S Afr J Surg.* 2016;54(3):2-5. PMID: 28240459.
2. Hofmeyr S, Krige JE, Bornman PC, Beningfield SJ. A cost analysis of operative repair of major laparoscopic bile duct injuries. *S Afr Med J.* 2015;105(6):454-7. <https://doi.org/10.7196/SAMJ.9038>.
3. Lindemann J, Jonas E, Kotze U, Krige JE. An analysis of early postoperative complications following biliary reconstruction of major bile duct injuries using the Modified Accordion and Anatomic, Timing of and Mechanism classifications. *Surg Open Sci.* 2019;1(1):2-6. <https://doi.org/10.1016/j.sopen.2019.01.001>.
4. Kalata S, Thumma JR, Norton EC, Dimick JB, Sheetz KH. Comparative safety of robotic-assisted vs laparoscopic cholecystectomy. *JAMA Surg.* 2023;158(11):1123-31. <https://doi.org/10.1001/jamasurg.2023.4389>.
5. Mullens CL, Sheskey S, Thumma JR, et al. Patient complexity and bile duct injury after robotic-assisted vs laparoscopic cholecystectomy. *JAMA Netw Open.* 2025;8(3):e251705. <https://doi.org/10.1001/jamanetworkopen.2025.1705>.
6. Lindemann J, Jonas E, Kotze U, Krige JE. Evolution of bile duct repair in a low and middle-income country (LMIC): A comparison of diagnosis, referral, management and outcomes in repair of bile duct injury after laparoscopic cholecystectomy from 1991 to 2004 and 2005-2017. *HPB (Oxford).* 2020;22(3):391-7. <https://doi.org/10.1016/j.hpb.2019.07.009>.
7. Lindemann J, Krige JE, Kotze U, Jonas E. Factors leading to loss of patency after biliary reconstruction of major laparoscopic cholecystectomy bile duct injuries: An observational study with long-term outcomes. *HPB (Oxford).* 2020;22(11):1613-21. <https://doi.org/10.1016/j.hpb.2020.02.010>.
8. Bhana M, Creamer D, Kloppers C, et al. Beyond the scope: Endoscopic approach for the definitive management of major bile duct injuries. *S Afr J Surg.* 2026;64(3):XXX
9. Ödemiş B, Shorbagi A, Köksal AŞ, et al. The “Lasso” technique: Snare-assisted endoscopic-radiological rendezvous technique for the management of complete transection of the main bile duct. *Gastrointest Endosc.* 2013;78(3):554-6. <https://doi.org/10.1016/j.gie.2013.04.002>.
10. Lindemann J, Kloppers C, Burmeister S, Bernon M, Jonas E. Mind the gap! Extraluminal percutaneous-endoscopic rendezvous with a self-expanding metal stent for restoring continuity in major bile duct injury: A case series. *Int J Surg Case Rep.* 2019;60:340-4. <https://doi.org/10.1016/j.ijscr.2019.06.059>.
11. Fiocca F, Salvatori FM, Fanelli F, et al. Complete transection of the main bile duct: Minimally invasive treatment with an endoscopic-radiologic rendezvous. *Gastrointest Endosc.* 2011;74(6):1393-8. <https://doi.org/10.1016/j.gie.2011.07.045>.
12. Donatelli G, Cereatti F, Dhumane P, et al. Long-term outcomes of combined endoscopic-radiological approach for the management of complete transection of the biliary tract. *J Gastrointest Surg.* 2022;26(9):1873-80. <https://doi.org/10.1007/s11605-022-05365-2>.
13. Schreuder AM, Booij KAC, de Reuver PR, et al. Percutaneous-endoscopic rendezvous procedure for the management of bile duct injuries after cholecystectomy: Short- and long-term outcomes. *Endoscopy.* 2018;50(6):577-87. <https://doi.org/10.1055/s-0043-123935>.
14. Chinnery GE, Krige JE, Bornman PC, et al. Endoscopic management of bile leaks after laparoscopic cholecystectomy. *S Afr J Surg.* 2013;51(4):116-21.
15. Krige JE, Bornman PC, Kahn D. Bile leaks and sepsis: Drain now, fix later. *Arch Surg.* 2010;145(8):763. <https://doi.org/10.1001/archsurg.2010.154>.

Oesophageal cancer in South Africa: time for a coordinated national response

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Introduction

Oesophageal cancer in South Africa presents a striking health-system paradox: the populations carrying the greatest burden of disease are often those with the least access to the resources required for its diagnosis, palliation, and definitive treatment. The reasons for this paradox are socioeconomic and geographical.

Oesophageal cancer ranks as the 12th most common cancer in males and the 10th most common cancer in females in South Africa.¹ The socioeconomic circumstances affecting oesophageal cancer in South Africa are rooted in the fact that South Africa has one of the most unequal health systems in the world, due to a two-tiered system consisting of a public sector that treats 84% of the population and a private sector that treats 16%. Oesophageal cancer adds to the burden on the public health system, which is significantly under-resourced, particularly in areas such as the Eastern Cape.²⁻⁵

The geographical peculiarity associated with oesophageal cancer globally persists in South Africa, which falls within the African oesophageal cancer corridor extending along the eastern coast of Africa from Ethiopia to South Africa.⁶ Within South Africa, the burden is uneven, with the Eastern Cape reporting the highest oesophageal cancer incidence and age-standardised mortality rate.⁷⁻¹⁰ Squamous cell carcinoma is the predominant histological subtype, accounting for 86% of histologically confirmed cases, compared with 11% for adenocarcinoma and 3% for unspecified cases.⁷

Why this disease occurs with such striking frequency in particular populations and geographical areas, however, remains incompletely understood. Oesophageal squamous cell carcinoma (OSCC) is a multifactorial disease, and tobacco and alcohol exposure, nutritional and dietary factors, environmental exposures and socioeconomic circumstances have all been implicated. Studies from African populations have identified associations with several potentially modifiable exposures, including tobacco, alcohol, combined tobacco and alcohol exposure, dietary factors, poor oral

health and consumption of very hot foods or beverages. However, the available evidence is heterogeneous, and no single exposure adequately explains either the geographical distribution or the magnitude of the oesophageal cancer burden across Africa.¹¹

The possibility of an underlying genetic contribution is an increasingly important area of investigation. Earlier studies in African populations suggested population-specific genetic associations, although the available evidence was limited by relatively small study populations and a lack of replication.¹² More recently, a genome-wide association study involving African populations identified both shared and potentially African-specific susceptibility loci for OSCC, including variants involving *FAM120A*, *PLCE1*, *CHEK2* and a potential African-specific locus within *MYO1B*.¹³ These findings raise the possibility that the unusual geographical distribution of OSCC in Africa reflects complex interactions between inherited susceptibility and environmental, nutritional and behavioural exposures.

The African Esophageal Cancer Consortium (AfrECC) provides an important collaborative platform through which these questions can be investigated. Established to coordinate research into the environmental, lifestyle, genetic and molecular determinants of oesophageal cancer across Africa, AfrECC also aims to identify opportunities for primary prevention, improve early detection and strengthen clinical and research capacity.¹⁴ For South Africa, participation in this research agenda offers an opportunity to investigate the country's unusually high disease burden using larger, geographically diverse populations and harmonised clinical, epidemiological and biological data. The eventual integration of genomic information with detailed information on geography, nutrition, lifestyle and environmental exposures may help identify populations at increased risk and, in time, inform targeted prevention or early-detection strategies. At present, however, these approaches remain investigational and should not be used to

determine an individual's access to diagnostic investigation or treatment.

The prevention agenda should therefore focus pragmatically on reducing established modifiable risks while continuing to investigate those whose contribution remains uncertain. Tobacco and harmful alcohol exposure should remain important targets for public-health intervention, alongside broader measures addressing nutrition, food security and potentially relevant dietary and environmental exposures. Given the current limitations in the evidence, there is insufficient justification for population-wide endoscopic screening for oesophageal cancer in South Africa. Scarce endoscopic resources are likely to have greater immediate impact if directed towards symptomatic patients. Prevention, therefore, should complement rather than compete with efforts to improve early recognition and access to diagnosis.

Despite the apparently high incidence, accurate and reliable data on the disease in South Africa are lacking.¹⁵ A self-perpetuating problem therefore exists whereby lack of resources and knowledge of the disease result in inadequate care, which in turn makes collection and maintenance of reliable data difficult, thereby stunting meaningful clinical research on oesophageal cancer. The result is a vicious cycle of late presentation, delayed diagnosis, suboptimal care, and a lack of data to inform contextually relevant clinical practice guidelines for managing this healthcare crisis more effectively. The ultimate victims of this cycle are the patients, their families, and communities most affected by the disease.

These problems can and should be addressed concurrently. Breaking this cycle requires a multi-pronged approach that addresses multiple problems simultaneously. It is therefore up to clinicians, clinical researchers, community leaders, and policymakers to combine forces to tackle oesophageal cancer in South Africa.

Recognising oesophageal cancer earlier

The fact that oesophageal cancer presents late is well known, but it may be a comparatively bigger problem in South Africa as evidenced by the advanced dysphagia grade, poor performance status and level of malnutrition of patients presenting with oesophageal cancer to institutions in South Africa.¹⁶ The reasons are not only that patients fail to recognise dysphagia as an alarm symptom, but also that healthcare workers don't refer patients complaining of dysphagia for endoscopy timeously.¹⁷ Apart from the obvious effect on prognosis, late presentation results in a patient who is unable to tolerate any form of radical treatment, a fact well known to clinicians faced with these patients.

The key to addressing this problem is to convince the public and primary healthcare personnel that dysphagia is an alarm system requiring prompt referral for endoscopy. This could be done with well-coordinated public health education initiatives emphasising the dangers of dysphagia, especially when accompanied by weight loss. Specific education programmes and in-service training should also be aimed at healthcare workers, especially those at the primary healthcare level. These include traditional healers, local clinics, and district hospitals. Patients with unexplained dysphagia should have timely referral to a facility where endoscopy should be performed, particularly in areas with a high burden of oesophageal cancer. The fact that dysphagia is

an alarm symptom cannot be overemphasised, and a simple public-health message to high-incidence areas should be: "Dysphagia = Endoscopy".

Reducing diagnostic delays

The consequences of late presentation of patients with oesophageal cancer in South Africa are exacerbated by delayed diagnosis. Unfortunately, too many patients report that when they present to primary healthcare facilities complaining of dysphagia, they are not immediately referred for endoscopy, but rather given treatment and told to return if symptoms persist.^{17,18} This may reflect gaps in healthcare-worker knowledge, who may not be aware that dysphagia is an alarm symptom, but also illustrates the broader structural barriers to timely diagnosis. Even when patients are referred, a lack of endoscopic and/or pathological resources, especially in high-incidence areas, further delays care.⁵ In addition, the healthcare system's referral pattern in South Africa often makes it difficult for healthcare workers to ensure timely patient referrals to appropriate facilities, especially in rural areas. The fact that many healthcare facilities are understaffed and/or under-resourced doesn't help.^{19,20} Added to this is the problem of unacceptably long waiting times for endoscopy and pathology services central to the diagnosis of cancer in South Africa.^{21,22}

Healthcare facilities in high-incidence areas should be adequately equipped with appropriate endoscopy and pathology capacity to ensure timely diagnosis of oesophageal cancer. While district and other primary healthcare facilities should be able to refer patients with dysphagia appropriately, regional and tertiary facilities should ideally have the capacity to perform endoscopic intervention to manage dysphagia. These interventions should include the ability to safely dilate patients at a minimum and, ideally, to insert self-expanding metal stents. This responsibility should fall on policymakers with the capacity to allocate resources appropriately.

Providing appropriate patient care

Once the diagnosis of oesophageal cancer is made, international guidelines advise staging investigations, some of which are harmonised for resource-constrained environments, like the South African public health sector.²³ But even these harmonised guidelines may prove challenging to adhere to locally due to resource constraints and healthcare inequality.²⁴ For example, international guidelines recommend staging all patients diagnosed with oesophageal cancer, but whether this is possible, or even appropriate in South Africa is not clear.²³ The purpose of staging is to inform treatment decisions. In patients with very poor performance status or an extremely limited life expectancy, extensive staging may not change management and may unnecessarily delay symptom-directed treatment. These patients may not be strong enough to tolerate radical treatments. They may be better served by providing them with proper palliative care to improve their quality of life and allow them to live out their remaining time with dignity and surrounded by loved ones. The challenge lies in identifying patients who would benefit from staging investigations and differentiating them from those best served by upfront palliative care. The prognostic score for oesophageal cancer is a validated scoring system developed for use in resource-limited settings to help clinicians make that decision.^{25,26} The

score could potentially be incorporated into a risk-stratified staging pathway, with prospective evaluation of its impact on resource utilisation and clinical outcomes. This approach may be more feasible than trying to increase radiology capacity in an already strained healthcare system.

Curative management presents a different problem. The proportion of patients receiving curative-intent treatment is much lower in South Africa compared to other parts of the world.^{16,27} For patients requiring curative treatment, access is limited by several factors, including surgical theatre time and the availability of radiotherapy. In many centres, for example, access to oncological treatment like radiotherapy is severely limited, while oesophageal cancer falls low on the list of priorities for radiotherapy.²⁸ Patients at these centres are often treated with upfront surgery, provided they are medically fit and without prohibitive comorbidities. This, in itself, comes with a significant delay, but may be less severe than the delay in radiotherapy.²⁹ Adjuvant chemotherapy or radiotherapy, or both, are then planned depending on the pathological stage. But many of these patients do not receive radiotherapy because of long waiting times, resulting in most patients receiving “surgery alone” as their treatment, despite the overwhelming evidence that multi-modal treatment is superior to surgery alone.³⁰ Whether survival in South African patients with oesophageal cancer treated with curative intent is comparable to that reported elsewhere remains unknown because reliable national survival data are unavailable.

Attempts to improve both curative and palliative care for oesophageal cancer in South Africa are further hampered by a lack of survival data. No national survival estimate for oesophageal cancer exists in South Africa, because survival requires something none of the current data systems is yet resourced to do – link a registered diagnosis to a certified death for the same individual. Record linkage between cancer registration and civil registration is well established internationally and would deliver national survival estimates from data that South Africa already collects.

Improving the cure rate of oesophageal cancer in South Africa requires a multi-pronged approach, including directing efforts towards earlier patient diagnosis and centralising the curative management of this disease. While the multi-modal curative management of oesophageal cancer is complex and fraught with potential complications in the best of circumstances, centralisation has been shown to improve outcomes.³¹ This would once again require input and coordination from policymakers and clinicians.

Building a national database

Addressing the clinical problems associated with oesophageal cancer in South Africa is made harder by the lack of reliable data on the disease. A scoping review published in 2022 found that, at the time, clinical research on oesophageal cancer in South Africa comprised only 81 articles, the majority of which were single-institution retrospective reviews, while randomised controlled trials on the curative management of oesophageal cancer accounted for only 2% of publications. Of greater concern was that the majority of publications were from before the year 2000, indicating a decrease in publications over time.¹⁵

One of the most significant data deficiencies is knowledge of the disease burden of oesophageal cancer in South Africa. Between 2014 and 2023, the National Cancer Registry

recorded 17 011 new cases of oesophageal cancer in South Africa, and between 2014 and 2022, Statistics South Africa certified 22 747 deaths from it.^{7,9} These figures are not directly comparable because the two systems have different ascertainment methods and periods of observation. Nevertheless, the discrepancy highlights the substantial limitations of relying on either system alone to describe the national burden of oesophageal cancer.

While the currently available data on incidence and mortality are valuable, there are several shortcomings:

1. Cancer registration records the reporting laboratory rather than the patient's district of residence, and the largest reporters are national private pathology networks. Provincial incidence, therefore, cannot be derived, and everything we currently know about the disease's national geography comes from death certificates.
2. While oesophageal cancer can be recorded as a cause of death, it is often not, and the cause may be labelled as “oesophagus – not specified”, thereby omitting valuable data like tumour histology and location.
3. Provincial population data by age, sex, and population group are not published, so provincial rates must be reconstructed rather than measured directly.

A potential solution is an integrated national oesophageal cancer database which includes the current pathology-based data which would record the pathology data, a population-based database maintained by public health personnel that would record demographic and geographical data, and a clinical database maintained by clinicians that would record data like patient conditions, cancer stage and management, and patient-reported outcomes, like the effect of current treatment modalities on quality of life. These databases should be linked, which would provide all the information needed to truly understand the impact of oesophageal cancer in South Africa. Achieving this will require sustained collaboration among these role players, together with appropriate governance, funding, and data-sharing mechanisms.

Conclusion

The problem of oesophageal cancer in South Africa requires a coordinated national response spanning prevention and risk reduction, earlier recognition, timely diagnosis, appropriate curative or palliative treatment, and research. These priorities are interdependent: reducing risk and understanding the disease's aetiology may inform future prevention, while earlier diagnosis and better care will generate the clinical data needed to guide resource allocation and improve outcomes.

Better data by themselves will not improve patient outcomes. Better patient care will. But without reliable data, South Africa will remain unable to determine where the burden is greatest, whether access to care is improving, or whether interventions are making a meaningful difference. The opportunity now is to move from recognising the problem to building a coordinated national response in which prevention, early recognition, equitable access to care and research inform one another.

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REFERENCES

1. National Cancer Registry. National Cancer Registry 2024 [Internet]. Cape Town: Cancer Association of South Africa; 2026. Available from: <https://www.cansa.org.za/files/2026/04/National-Cancer-Registry-2024>.
2. Francis D, Webster E. Poverty and inequality in South Africa: Critical reflections. *Dev South Afr*. 2019;36(6):788-802. <https://doi.org/10.1080/0376835X.2019.1666703>.
3. Van Rensburg HCJ. South Africa's protracted struggle for equal distribution and equitable access - still not there. *Hum Resour Health*. 2014;12:26. <https://doi.org/10.1186/1478-4491-12-26>.
4. Mntungwana S, Khosa NV, Buso AE, Sithole N. Barriers to chronic disease healthcare access in rural Eastern Cape Province, South Africa. *Int J Environ Res Public Health*. 2025;22(12):1881. <https://doi.org/10.3390/ijerph22121881>.
5. Willie MM, Maqbool M. Access to public health services in South Africa's rural Eastern Cape Province. *SSRN Electron J*. 2023;4:110-7. <https://doi.org/10.2139/ssrn.4405870>.
6. Schaafsma T, Wakefield J, Hanisch R, et al. Africa's oesophageal cancer corridor: Geographic variations in incidence correlate with certain micronutrient deficiencies. *PLoS One*. 2015;10(10). <https://doi.org/10.1371/journal.pone.0140107>.
7. National Cancer Registry. National Cancer Registry [Internet]. Johannesburg: National Institute for Communicable Diseases, National Health Laboratory Service. Available from: <https://www.nicd.ac.za/centres/national-cancer-registry/>.
8. Ramaliba TM, Muchengeti MM, Sithole N, et al. Incidence patterns and temporal trends of breast, prostate, oesophageal and cervical cancer in rural Eastern Cape Province, South Africa 1998-2021. *Cancer Epidemiol*. 2026;103:103151. <https://doi.org/10.1016/j.canep.2026.103151>.
9. Statistics South Africa. Mortality and causes of death in South Africa [Internet]. Pretoria: Statistics South Africa. Available from: <https://isibalowe.statssa.gov.za/pages/surveys/pss/hvs/cod/2021/cod2021.php>.
10. Made F, Wilson K, Jina R, et al. Distribution of cancer mortality rates by province in South Africa. *Cancer Epidemiol*. 2017;51:56-61. <https://doi.org/10.1016/j.canep.2017.10.007>.
11. Simba H, Kuivaniemi H, Abnet CC, Tromp G, Sewram V. Environmental and lifestyle risk factors for oesophageal squamous cell carcinoma in Africa: A systematic review and meta-analysis. *BMC Public Health*. 2023;23:1782. <https://doi.org/10.1186/s12889-023-16629-0>.
12. Simba H, Kuivaniemi H, Lutje V, Tromp G, Sewram V. Systematic review of genetic factors in the aetiology of oesophageal squamous cell carcinoma in African populations. *Front Genet*. 2019;10:642. <https://doi.org/10.3389/fgene.2019.00642>.
13. Chen WC, Brandenburg JT, Choudhury A, et al. Genome-wide association study of oesophageal squamous cell cancer identifies shared and distinct risk variants in African and Chinese populations. *Am J Hum Genet*. 2023;110(10):1690-703. <https://doi.org/10.1016/j.ajhg.2023.08.007>.
14. Van Loon K, Mwachiro MM, Abnet CC, et al. The African Esophageal Cancer Consortium: A call to action. *JCO Glob Oncol*. 2018;4:1-9. <https://doi.org/10.1200/JGO.17.00163>.
15. Ferndale L, Aldous C. Oesophageal cancer in South Africa: A scoping review. *S Afr J Oncol*. 2022;6. <https://doi.org/10.4102/sajo.v6i0.217>.
16. Ferndale L, Sartorius B, Aldous C, Thomson SR. Oesophageal cancer in Area 2 of KwaZulu-Natal: Predictors of late presentation. *S Afr J Surg*. 2019;57(2):3-9. <https://doi.org/10.17159/2078-5151/2019/v57n2a2948>.
17. Govender M, Ferndale L, Clark DL. Oesophageal cancer in South Africa: The long timeline from onset of symptoms to definitive management. *S Afr J Oncol*. 2017;1. <https://doi.org/10.4102/sajo.v1i0.6>.
18. Nocawe GS, Tshifhumulo R, Sharpley N, Ndebia EJ. Experiences of people living with diagnosis of oesophageal cancer: Case of Eastern Cape municipalities, South Africa: A phenomenological study. *East Afr J Humanit Soc Sci*. 2026;5(1):215-28. <https://doi.org/10.58721/eajhss.v5i1.1712>.
19. Nkomo PN. Is the referral system appropriate for public healthcare in South Africa? An ethical analysis. Stellenbosch : Stellenbosch University; 2025. Available from: <https://scholar.sun.ac.za/handle/10019.1/132541>.
20. Ngoie KD, Jenkins L, Schoevers J. Evaluating referrals between rural district hospitals and a regional hospital in South Africa. *Afr J Prim Health Care Fam Med*. 2025;17(1):e11. <https://doi.org/10.4102/phcfm.v17i1.4956>.
21. Watermeyer G, Van Wyk MEC, Goldberg PA. An audit of provincial gastroenterology services in the Western Cape. *S Afr J Surg*. 2008;46(3):68-72. PMID: 18807301.
22. Dalwai E, Buccimazza I. System delays in breast cancer. *S Afr J Surg*. 2015;53(2):40-42. <https://doi.org/10.7196/sajsnew.7741>.
23. Anderson BO. NCCN Harmonised Guidelines for Sub-Saharan Africa: A collaborative methodology for translating resource-adapted guidelines into actionable in-country cancer control plans. *JCO Glob Oncol*. 2020;6:1419-21. <https://doi.org/10.1200/GO.20.00436>.
24. Nel D, Omar M, Chinnery G, Jonas E. Disparity in oesophageal cancer management in South Africa: A comparison between two tertiary centres with special focus on the palliation of dysphagia. *S Afr J Surg*. 2019;57(2):10-5. <https://doi.org/10.17159/2078-5151/2019/v57n2a2842>.
25. Ferndale L, Ayeni OA, Chen WC, Aldous C, Thomson SR. Development and internal validation of the survival time risk score in patients treated for oesophageal cancer with palliative intent in South Africa. *S Afr J Surg*. 2023;61(1):66-74. <https://doi.org/10.36303/SAJS.3955>.
26. Ferndale L, Bhadree S, Chen WC. External validation of a prognostic score for oesophageal cancer (PSOC) for patients treated with palliative intent in a resource-limited setting. *S Afr Med J*. 2026;116(6). <https://doi.org/10.7196/SAMJ.2026.v116i6.4209>.
27. Mahlawat N, Patiyal N, Vias P, Sood A, Bhagra S. A retrospective analysis of the burden and treatment patterns of oesophageal cancer over one year in a tertiary healthcare institution in the Western Himalayan region. *Int J Basic Clin Pharmacol*. 2025;14(4):513-8. <https://doi.org/10.18203/2319-2003.ijbcp20251835>.
28. Ramashia PN, Nkosi PB, Mbonane TP. Barriers to radiotherapy access in sub-Saharan Africa for patients with cancer: A systematic review. *Int J Environ Res Public Health*. 2024;21(12):1597. <https://doi.org/10.3390/ijerph21121597>.
29. Milligan L, Roodt L, Malherbe F, Cairncross L. Breast cancer surgical services in South Africa: Availability and barriers to guideline-concordant care. *S Afr Med J*. 2026;116(3). <https://doi.org/10.7196/SAMJ.2025.v116i3.3154>.
30. Jin HL, Zhu H, Ling TS, Zhang HJ, Shi RH. Neoadjuvant chemoradiotherapy for resectable oesophageal carcinoma: A meta-analysis. *World J Gastroenterol*. 2009;15(47):5983-91. <https://doi.org/10.3748/wjg.15.5983>.
31. Aiolfi A, Bona D, De Bernardi S, et al. Impact of centralizing oesophageal cancer surgery at high-volume centres on long-term survival: Individual patient data meta-analysis. *Ann Surg Oncol*. 2025;32(10):7891-900. <https://doi.org/10.1245/s10434-025-17823-7>.

Colonoscopy quality indicators in a South African district hospital: a baseline assessment using international quality standards

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Background: Validated colonoscopy key performance indicators (KPIs) are widely used to assess and improve colonoscopy quality, but South Africa has no nationally endorsed framework for routine quality measurement. This study evaluated colonoscopy quality indicators in a South African district hospital using internationally recognised standards and established a baseline for future quality improvement.

Methods: A retrospective quality assessment was performed at the gastrointestinal endoscopy unit of Victoria Hospital Wynberg, Cape Town. All lower gastrointestinal endoscopic procedures performed between June 2018 and April 2022 were reviewed. After exclusion of procedures in which complete colonoscopy was not intended or was not technically feasible, 610 examinations constituted the eligible colonoscopy quality-assessment cohort. Caecal intubation rate (CIR), adenoma detection rate (ADR), polyp detection rate (PDR) and bowel preparation quality using the Boston Bowel Preparation Scale (BBPS) were assessed against internationally recommended standards.

Results: A total of 777 lower gastrointestinal endoscopic procedures were identified, of which 767 were available for analysis. Among 610 eligible colonoscopies, CIR was 89.0% (543/610), ADR 24.9% (152/610), and PDR 27.4% (167/610). Adequate bowel preparation (BBPS ≥ 6) was achieved in 65.1% (397/610). ADR and PDR were significantly higher in males than females (32.3% vs 19.4%, $p = 0.005$ and 35.0% vs 21.7%, $p = 0.006$, respectively). Colorectal cancer was detected in 83/744 procedures (11.2%).

Conclusion: Colonoscopy quality assessment using internationally recognised indicators is feasible in a South African district hospital. CIR and ADR closely approached international benchmarks, whereas adequate bowel preparation was substantially below the recommended standard. Despite this major deficiency in bowel preparation, ADR remained close to the international benchmark, identifying optimisation of bowel preparation as the principal opportunity for further quality improvement.

Keywords: colonoscopy, quality indicators, adenoma detection rate, caecal intubation rate, Boston Bowel Preparation Scale, South Africa

Introduction

Colorectal cancer (CRC) is an important cause of cancer-related morbidity and mortality worldwide, with an estimated incidence of 12.7 cases per 100 000 population in South Africa (SA).¹ Colonoscopy remains the gold standard for the diagnosis of colorectal neoplasia and other colonic disorders because it permits direct mucosal visualisation, tissue sampling and therapeutic intervention.² The effectiveness of colonoscopy, however, depends not only on access to the procedure but also on the quality with which it is performed.

Over the past two decades, international gastroenterology societies have recognised that variation in colonoscopy performance influences diagnostic accuracy, adenoma detection and ultimately patient outcomes. Consequently, evidence-based key performance indicators (KPIs),

including adenoma detection rate (ADR), caecal intubation rate (CIR), bowel preparation quality and withdrawal time, have been developed to standardise performance, benchmark endoscopy services, and drive continuous quality improvement.^{3,4} Routine measurement of these KPIs is now a cornerstone of quality assurance in endoscopy units worldwide.

South Africa, however, has no nationally endorsed colonoscopy quality standards and therefore relies largely on recommendations developed in the United Kingdom and the United States. In the public sector, colonoscopy is performed predominantly for the investigation of symptoms, including iron-deficiency anaemia, rectal bleeding and chronic diarrhoea, as well as surveillance of known colorectal disease, because there is no population-based colorectal cancer screening programme. As endoscopy

services continue to expand beyond tertiary referral centres, ensuring consistent measurement of recognised quality indicators across all levels of care has become increasingly important. Adequate bowel preparation is fundamental to high-quality colonoscopy because poor preparation is associated with incomplete examinations, missed lesions and repeat procedures. Among the validated scoring systems available, the Boston Bowel Preparation Scale (BBPS) provides an objective and reproducible assessment of bowel cleanliness after washing and suctioning and facilitates comparison between endoscopy units.^{5,6} A BBPS of equal to or greater than 6 (and specifically a score of at least 2 in each individual segment) is considered adequate preparation for optimal polyp detection.

Three South African studies from academic referral centres have reported colonoscopy KPIs.⁷⁻⁹ However, no published study has evaluated whether comparable quality standards can be achieved within a district-level hospital endoscopy service. Demonstrating the feasibility of structured KPI measurement in this setting is important for assessing the quality of care delivered beyond tertiary referral centres and for informing the development of quality assurance programmes across the South African public health sector.

The aim of this study was to assess colonoscopy KPIs at Victoria Hospital Wynberg (VHW), a district-level hospital in Cape Town, using internationally recognised quality standards. We also describe the clinical profile and indications of patients undergoing lower gastrointestinal endoscopy and establish a baseline assessment of colonoscopy quality against which future quality improvement initiatives can be measured.

Methods

Study design and setting

This retrospective quality assessment included all lower gastrointestinal endoscopic procedures performed at the gastrointestinal endoscopy unit of Victoria Hospital Wynberg (VHW), Cape Town, between 22 June 2018 and 21 April 2022. During the study period, colonoscopy services were provided by two experienced endoscopists. Data collection concluded when additional trainee endoscopists joined the unit, thereby maintaining a consistent operator cohort for assessment.

The study population comprised all procedures recorded in the unit's endoscopy database. Procedures undertaken

for limited perioperative or therapeutic purposes, in which a complete colonoscopic examination was not intended, were excluded from the colonoscopy KPI analysis. The remaining procedures constituted the colonoscopy quality assessment cohort. Individual KPIs were analysed using the denominator appropriate to the procedure and quality indicator being assessed.

Endoscopy database and data collection

All procedures were identified from a prospectively maintained electronic endoscopy reporting database developed using FileMaker Pro (now Claris Pro; Claris International Inc., Santa Clara, California, USA). The database forms part of the routine clinical record and is completed contemporaneously by the endoscopists immediately following each procedure using structured reporting fields supplemented by free-text documentation and integrated endoscopic images.

All eligible lower gastrointestinal endoscopic procedures performed during the study period were extracted for analysis. Data were entered into a purpose-designed, pre-piloted Microsoft Excel database protected by password authentication and encryption. Access was restricted to members of the research team, and the principal investigator was responsible for maintaining data integrity and quality.

Data collected included patient demographics, indications, procedural findings and colonoscopy KPIs. Indications were categorised as investigation of symptoms, surveillance following previous colorectal neoplasia or polypectomy, screening of high-risk individuals, and other indications. Histopathology results were obtained from the National Health Laboratory Service electronic database. Conscious sedation using intravenous midazolam (2.5 mg) and fentanyl (50 µg) was administered in most patients.

Study outcomes and quality indicator definitions

The primary outcome was assessment of colonoscopy quality using internationally recognised KPIs based on recommendations from the British Society of Gastroenterology and the US Multi-Society Task Force on Colorectal Cancer.^{3,10} The KPIs assessed were CIR, ADR, polyp detection rate (PDR), and bowel preparation quality using the BBPS. Definitions and benchmark values are summarised in Table I.

Table I: Definitions, benchmark values and BBPS scoring for colonoscopy quality indicators

Quality indicator	Definition	Benchmark/ scoring
CIR	Proportion of colonoscopies in which the caecum was successfully intubated, confirmed photographically by visualisation of the appendiceal orifice or terminal ileum.	≥ 90%
ADR	Proportion of colonoscopies in which at least one histologically confirmed adenoma was identified.	≥ 25%*
PDR	Proportion of colonoscopies in which at least one colorectal polyp was detected.	Surrogate marker for ADR
Bowel preparation quality (BBPS)	Assessed using the BBPS.	Total BBPS ≥ 6
BBPS scoring		
Score	Description	Interpretation
0	Unprepared colon segment; mucosa not visualised because of solid stool that cannot be cleared	Inadequate
1	Portions of mucosa visualised, but other areas obscured by residual stool, staining or opaque liquid	Inadequate
2	Minor residual staining, small stool fragments or opaque liquid remain, but the mucosa is well visualised	Adequate
3	Entire mucosa well visualised after washing and suctioning, with no residual stool or staining	Excellent

Caecal intubation was considered successful when the caecum was reached and confirmed by endoscopic visualisation and photographic documentation of the appendiceal orifice and/or terminal ileum. CIR was calculated among examinations in which caecal intubation was intended and technically feasible. Withdrawal time was not routinely recorded during the study period and was therefore not included as a KPI.

ADR was defined as the proportion of colonoscopies in which at least one histologically confirmed adenoma was identified. PDR was defined as the proportion of colonoscopies in which at least one colorectal polyp was detected and was analysed as a supplementary measure of lesion detection. Bowel preparation quality was assessed using the BBPS, with the colon divided into right, transverse and left segments, each scored from 0 to 3 after washing and suctioning. A total BBPS score of ≥ 6 , with no individual segment scoring < 2 , was considered adequate preparation.

Secondary outcomes included patient demographics, indications for lower gastrointestinal endoscopy, reasons for procedures not eligible for CIR and colorectal cancer detection.

KPI analysis

Of the procedures identified in the database, 10 were excluded because of missing data points or duplicate entries, leaving 767 procedures available for analysis of the lower gastrointestinal endoscopy cohort. A further 23 procedures involving limited perioperative or therapeutic interventions, in which a complete colonoscopic examination was not intended, were excluded from the colonoscopy quality assessment. A further 134 procedures were not eligible for the principal colonoscopy KPI analysis because caecal intubation was not intended or was technically impossible. The resulting 610 examinations constituted the eligible colonoscopy KPI cohort. CIR, ADR and PDR were assessed within this cohort. BBPS was assessed where a valid score was recorded.

Statistical analysis

Continuous variables are presented as means with standard deviations (SD) or medians with interquartile ranges (IQR), as appropriate. Categorical variables are summarised as frequencies and percentages.

Comparisons between categorical variables were performed using the χ^2 test or Fisher's exact test where appropriate. Continuous variables were compared using

t-test or the Wilcoxon rank-sum test according to data distribution.

Statistical analyses were performed using R version 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria). Statistical significance was defined as a two-sided p -value < 0.05 .

Study population

Between June 2018 and April 2022, 777 lower gastrointestinal endoscopic procedures were identified. After excluding 10 procedures with incomplete demographic data or duplicate entries, 767 procedures were available for analysis of the lower gastrointestinal endoscopy cohort. Twenty-three limited perioperative or therapeutic procedures in which a complete colonoscopic examination was not intended were excluded from the colonoscopy quality assessment, leaving 744 procedures for the broader colorectal cancer detection cohort. A further 134 procedures were not eligible for the principal colonoscopy KPI analysis because caecal intubation was not intended or was technically impossible. The resulting 610 eligible examinations constituted the principal KPI cohort (Figure 1).

Patient characteristics

The median patient age was 61 years (IQR 49–71), and 43.7% of patients were male. The lower gastrointestinal endoscopy service was used predominantly for investigation of symptoms (89.7%), with surveillance examinations accounting for 6.9% and screening examinations for only 0.4% of procedures. The commonest indications were rectal bleeding, change in bowel habit, anaemia and abdominal pain (Table II).

Colonoscopy quality indicators

Among the 610 eligible colonoscopies, the overall CIR was 89.0% (543/610), PDR was 27.4% (167/610), and ADR was 24.9% (152/610). Colorectal cancer was identified in 11.2% (83/744) of the broader colonoscopy cohort.

Bowel preparation and sex differences

Adequate bowel preparation, defined as a BBPS score ≥ 6 , was achieved in 397 of the 610 eligible colonoscopies (65.1%). PDR and ADR were significantly higher in males than females (35.0% vs 21.7%, $p = 0.006$ and 32.3% vs 19.4%, $p = 0.005$, respectively). There was no significant sex difference in CIR (91.2% vs 87.4%, $p = 0.726$), adequate

Table II: Baseline patient characteristics and indications for colonoscopy

	Male (<i>n</i> = 335, 43.7%)		Female (<i>n</i> = 432, 56.3%)		Total (<i>n</i> = 767, 100%)		<i>p</i> -value
Demographics							
	median	IQR	median	IQR	median	IQR	
Age in years	60.0	48.0–70.0	62.0	52.0–71.0	61.0	51.0–70.0	0.150
Indications for colonoscopy							
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
For symptoms	289	86.3	399	92.4	688	89.7	0.008
Surveillance	29	8.7	24	5.6	53	6.9	0.125
Screening	0	0	3	0.7	3	0.4	0.261
Other*	17	5.1	6	1.4	23	3.0	0.006

IQR – Interquartile range

*Other defined as cases in which colonoscopy was not performed due to investigation of symptoms, surveillance, or screening.

Table III: Colonoscopy quality indicators by sex

Quality indicator	Male		Female		Total		p-value
	Ratio	%	Ratio	%	Ratio	%	
CDR	43/318	13.5	40/426	9.4	83/744	11.2	0.114
PDR	91/260	35	76/350	21.7	167/610	27.3	0.006
ADR	84/260	32.3	68/350	19.4	152/610	24.9	0.005
CIR	237/260	88.8	306/350	89.2	543/610	89.0	0.726
BBPS Score ≥ 6	157/260	60.3	241/350	68.8	397/610	65.1	0.317

CIR – caecal intubation rate, PDR – polyp detection rate, ADR – adenoma detection rate, CDR – colorectal cancer detection rate, BBPS – Boston Bowel Preparation Score

Table IV: Comparison of colonoscopy quality indicators at Victoria Hospital with internationally recommended benchmark standards

Quality indicator	Victoria Hospital	International benchmark	Interpretation
CIR	89.0%	$\geq 90\%$	Approached benchmark
ADR	24.9%	$\geq 25\%$	Slightly below benchmark
PDR	27.4%	None	Comparable with previous South African studies
Adequate BBPS	65.1%	$> 85\text{--}90\%$	Substantially below recommended standard

CIR –caecal intubation rate, PDR – polyp detection rate, ADR – adenoma detection rate, BBPS – Boston Bowel Preparation Score

BBPS (60.4% vs 68.9%, $p = 0.317$), or CDR (13.5% vs 9.4%, $p = 0.114$) (Table III).

Comparison with international benchmarks

Observed colonoscopy quality indicators were compared with internationally recommended performance standards (Table IV). The CIR of 89.0% closely approached the recommended minimum benchmark of 90%, while the ADR of 24.9% was marginally below the benchmark of 25% derived largely from average-risk screening populations. Adequate bowel preparation was achieved in only 65.1% of eligible colonoscopies, substantially below the recommended target of $> 85\text{--}90\%$. The PDR was 27.4%; no universal international benchmark was applied to PDR.

Discussion

This study represents the first comprehensive assessment of colonoscopy quality indicators in a South African district hospital using internationally recognised quality standards. Overall performance approached accepted international benchmarks, with a CIR of 89.0% and an ADR of 24.9%. In contrast, only 65.1% of eligible examinations achieved adequate bowel preparation according to the BBPS. Although not all benchmark values were achieved, the study identifies bowel preparation as the principal modifiable quality deficit and establishes an objective baseline against which future quality improvement can be measured.

Colonoscopy is a highly operator-dependent procedure and unlike many surgical interventions, procedural quality cannot be verified retrospectively once the examination has been completed.⁷ Consequently, validated quality indicators have become the cornerstone of modern colonoscopy quality assurance. Routine measurement of KPIs allows endoscopy units to benchmark performance against accepted standards, identify deficiencies, implement targeted quality improvement interventions and monitor the effect of service changes over time.

South Africa currently has no nationally endorsed framework for routine measurement of colonoscopy quality indicators. Training pathways remain heterogeneous, quality metrics are inconsistently documented, and regular audit is uncommon outside selected academic centres.¹¹

Consequently, objective data describing colonoscopy quality in district hospitals are scarce. The present study therefore provides important baseline information from a secondary-level public hospital and demonstrates that structured quality monitoring is feasible outside tertiary referral centres.

Colonoscopy quality indicators

The CIR is widely regarded as one of the fundamental indicators of technical competence in colonoscopy, reflecting the completeness of examination and the opportunity to detect proximal colonic pathology.^{3,10,12} The CIR of 89.0% in the present study was marginally below the internationally recommended benchmark of 90%, but compares favourably with previous South African reports, which have ranged from 80% at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) to 97% at Wits Donald Gordon Medical Centre (WDGMC).⁷⁻⁹ Differences in patient populations, procedural complexity and trainee involvement may account for some of this variation. Nevertheless, the findings demonstrate that internationally accepted completion rates are achievable within a district hospital setting.

ADR is widely regarded as the most important quality indicator for colonoscopy because of its established inverse relationship with interval colorectal cancer.^{13,14} In the present study, the ADR was 24.9%, closely approaching the internationally recommended benchmark of 25% and exceeding rates reported in previous South African series from Wits Donald Gordon Medical Centre and Groote Schuur Hospital.⁷⁻⁹ Interpretation of the 25% benchmark requires some caution, however, as it was derived largely from average-risk screening populations, whereas 89.7% of patients in the present study underwent colonoscopy for investigation of symptoms and fewer than 1% underwent screening.

A significant sex difference in adenoma detection was observed, with an ADR of 32.3% in males compared with 19.4% in females ($p = 0.005$). PDR showed a similar pattern, at 35.0% in males and 21.7% in females ($p = 0.006$). This male predominance in adenoma detection is consistent with both international and South African observations. Kruger and Thomson have also demonstrated variation in adenoma detection according to demographic characteristics

within the South African population, highlighting the potential limitations of applying a single international ADR benchmark across populations with differing adenoma prevalence.⁸ The sex difference observed in the present study is therefore likely to reflect, at least in part, differences in underlying adenoma prevalence rather than endoscopist performance alone.

Importantly, the higher ADR in males was observed despite no significant sex difference in CIR or adequate bowel preparation, suggesting that the difference in adenoma detection was unlikely to be explained simply by differences in examination completion or bowel cleansing.

Bowel preparation was the principal quality deficit identified in this study. Only 65.1% of eligible colonoscopies achieved an adequate BBPS (≥ 6 , with no individual segment < 2), substantially below the recommended target of 85–90%. This finding is important because the ADR of 24.9% nevertheless approached the international benchmark despite the poor bowel-preparation performance. The relatively high ADR may reflect the predominantly symptomatic case mix, the underlying prevalence of adenomas in this population and consistent performance by two experienced endoscopists. Nevertheless, the marked deficiency in bowel preparation represents the clearest modifiable opportunity for further improvement in lesion detection and examination quality.

Since the conclusion of this study, the VHW unit has incorporated the recording of withdrawal time of all colonoscopies, as well as adopted a lower volume bowel preparation polyethylene glycol (PEG) agent with improved patient tolerance. A multilingual information leaflet has also been designed to improve split bowel preparation adherence. A follow-up audit after implementation of these changes is planned.

Conclusion

This study demonstrates that measurement of internationally recognised colonoscopy KPIs is feasible in a South African district hospital. Overall performance approached accepted international benchmarks, with a CIR of 89.0%, an ADR of 23.0%, and objective assessment of bowel preparation using the BBPS. These findings establish an important baseline assessment of colonoscopy quality against which future quality improvement initiatives can be measured. The study also identified bowel preparation as the principal modifiable determinant of quality. Despite suboptimal bowel cleansing, adenoma detection remained close to international standards, suggesting that optimisation of bowel preparation may provide the greatest opportunity for further improvement in colonoscopy performance.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval for the study was obtained from the Human Research Ethics Committee of the University of Cape Town (HREC Ref: 101/2023). The prospective endoscopy database used for data collection had previously received

ethical approval from the same committee (HREC Ref: 617/2018).

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REFERENCES

- Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2021;71(3):209-49. <https://doi.org/10.3322/caac.21660>.
- Shaukat A, Kahi CJ, Burke CA, Rabeneck L, Sauer BG, Rex DK. ACG Clinical Guidelines: Colorectal cancer screening 2021. *Am J Gastroenterol.* 2021;116(3):458-79. <https://doi.org/10.14309/ajg.0000000000001122>.
- Rex DK, Johnson DA, Anderson JC, et al. American College of Gastroenterology guidelines for colorectal cancer screening 2009 [corrected]. *Am J Gastroenterol.* 2009;104(3):739-50. <https://doi.org/10.1038/ajg.2009.104>.
- Williams JE, Holub JL, Faigel DO. Polypectomy rate is a valid quality measure for colonoscopy: Results from a national endoscopy database. *Gastrointest Endosc.* 2012;75(3):576-82. <https://doi.org/10.1016/j.gie.2011.12.012>.
- Kastenberg D, Bertiger G, Brogadir S. Bowel preparation quality scales for colonoscopy. *World J Gastroenterol.* 2018;24(26):2833-43. <https://doi.org/10.3748/wjg.v24.i26.2833>.
- Lai EJ, Calderwood AH, Doros G, Fix OK, Jacobson BC. The Boston bowel preparation scale: A valid and reliable instrument for colonoscopy-oriented research. *Gastrointest Endosc.* 2009;69(3 Pt 2):620-5. <https://doi.org/10.1016/j.gie.2008.05.057>.
- Bouter C, Barrow P, Bizos D, et al. The 'ins and outs' of colonoscopy at Wits Donald Gordon Medical Centre, South Africa: A practice audit of the outpatient endoscopy unit. *S Afr Med J.* 2020;110(12):1186-90. <https://doi.org/10.7196/SAMJ.2020.v110i12.14419>.
- Kruger J, Katsidzira L, Setshedi M, Thomson SR. Prevalence and characteristics of incidental colorectal polyps in patients undergoing colonoscopy at a South African tertiary institution. *S Afr Med J.* 2020;110(12):1191-4. <https://doi.org/10.7196/SAMJ.2020.v110i12.14582>.
- Mahomed AD, Cremona E, Fourie C, et al. A clinical audit of colonoscopy in a gastroenterology unit at a tertiary teaching hospital in South Africa: Original. *South African Gastroenterology Review.* 2012;10(3):9-15.
- Rees CJ, Thomas Gibson S, Rutter MD, et al. UK key performance indicators and quality assurance standards for colonoscopy. *Gut.* 2016;65(12):1923-9. <https://doi.org/10.1136/gutjnl-2016-312044>.
- Katsidzira L, Thomson S. Colonoscopy practice in South Africa: The way forward. *S Afr Med J.* 2020;110(12):1144-5. <https://doi.org/10.7196/SAMJ.2020.v110i12.15270>.
- Arditi C, Peytremann-Bridevaux I, Burnand B, et al. Appropriateness of colonoscopy in Europe (EPAGE II). Screening for colorectal cancer. *Endoscopy.* 2009;41(3):200-8. <https://doi.org/10.1055/s-0028-1119626>.
- Corley DA, Jensen CD, Marks AR, et al. Adenoma detection rate and risk of colorectal cancer and death. *N Engl J Med.* 2014;370(14):1298-306. <https://doi.org/10.1056/NEJMoa1309086>.
- Kaminski MF, Regula J, Kraszewska E, et al. Quality indicators for colonoscopy and the risk of interval cancer. *N Engl J Med.* 2010;362(19):1795-803. <https://doi.org/10.1056/NEJMoa0907667>.

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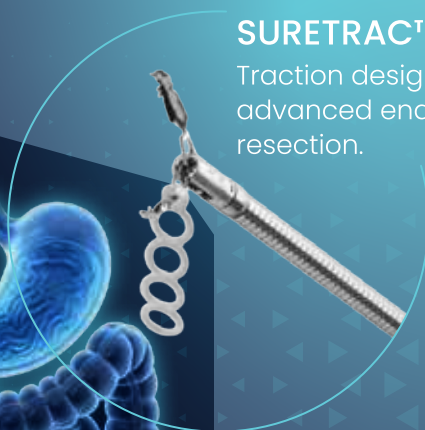
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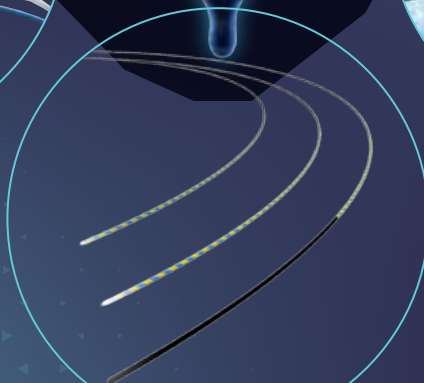
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Beyond the scope: endoscopic approach for the definitive management of major bile duct injuries

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Background: Traditionally major bile duct injuries (MBDIs) have been managed with surgery. Endoscopic treatment for MBDIs has more recently been performed with comparable results and lower morbidity rates, but data regarding longer term outcomes is lacking.

Methods: This is a retrospective review analysing the short- and long-term outcomes of endoscopic management in consecutive patients with MBDIs.

Results: Fourteen patients were included with a median age of 40 years (range 26–55 years), of whom 11 (79%) were female. Laparoscopic cholecystectomy (LC) ($n = 12$, 86%) was the most common cause of injury while penetrating trauma accounted for ($n = 2$, 14%). The most common presenting symptoms were pain ($n = 9$) and bile leaks ($n = 9$). Strasberg E2 (8,56%) was the most common injury. Seven patients (50%) had endoscopic stenting while the remainder underwent the combined endoscopic and radiologic approach (CERA). Successful endoscopic management was achieved in all patients. Complications included cholangitis and pancreatitis, which were mild. In the patients still alive, none developed stenosis during a median follow-up of 22 months.

Conclusions: The definitive endoscopic management of patients with MBDIs represents a major advance in the management of these injuries. Endoscopic management is a safe and durable intervention for patients with MBDIs, with outcomes comparable to those ascribed to a surgical reconstruction. A broader view of management in these patients should be considered at a multidisciplinary team and considered for inclusion in treatment algorithms of MBDIs.

Keywords: bile duct injury, Strasberg classification, endoscopic retrograde cholangiopancreatography, combined endoscopic and radiologic approach, modified rendezvous

Introduction

One hundred and forty-one years ago, the first cholecystectomy was carried out by Langenbuch.¹ Iatrogenic bile duct injuries (BDIs) at cholecystectomy remain a devastating complication. In the open cholecystectomy era, the incidence of BDIs was reported to be around 0.1%. Post-introduction of laparoscopic cholecystectomy (LC), the incidence has risen to 0.8%.^{2,3} The injuries range in severity from a simple cystic duct stump leak to a complete transection of a major bile duct.

The original description of major bile duct injuries (MBDIs) by McMahon encompassed a transection of the common hepatic duct (CHD) or common bile duct (CBD), partial injury involving > 25% of the circumference of the ducts and includes a postoperative stricture not otherwise specified.⁴ Traditionally, MBDIs have been managed with surgery, hepaticojejunostomy being widely accepted as the operation of choice due to favourable long-term outcomes.⁵ However, this procedure is associated with significant morbidity and mortality. Endoscopic management has been used as an alternate, usually in injuries with incomplete transection of the bile duct where ductal continuity allows for guidewire cannulation. More recently endoscopic treatment for MBDIs has been expanded to those with

complete transection and tissue loss, with comparable results and lower morbidity rates.⁶⁻⁸ However, outcome data of this endoscopic management of MBDIs are lacking. The aim of this study was to analyse the short- and long-term outcomes of endoscopic management in patients with MBDIs treated at our centre.

Methods

This is a retrospective cohort study. An HREC approved Bile Duct Injury Registry (HREC R032/2014) was used to identify patients between 1 January 2015 and 31 December 2024. Inclusion criteria were patients aged 18 years and older with MBDIs, as defined by McMahon, who were definitively managed endoscopically. Exclusion criteria were any patients requiring surgery for the management of MBDIs, and blunt abdominal trauma as a mechanism of injury. Injuries were classified according to the Strasberg-Bismuth Classification of BDIs (Figure 1).

The primary aim was to assess the short- and long-term outcomes of MBDIs managed endoscopically at Groote Schuur Hospital, Cape Town, South Africa. The secondary aim is to assess procedural complications of endoscopic management of MBDIs.

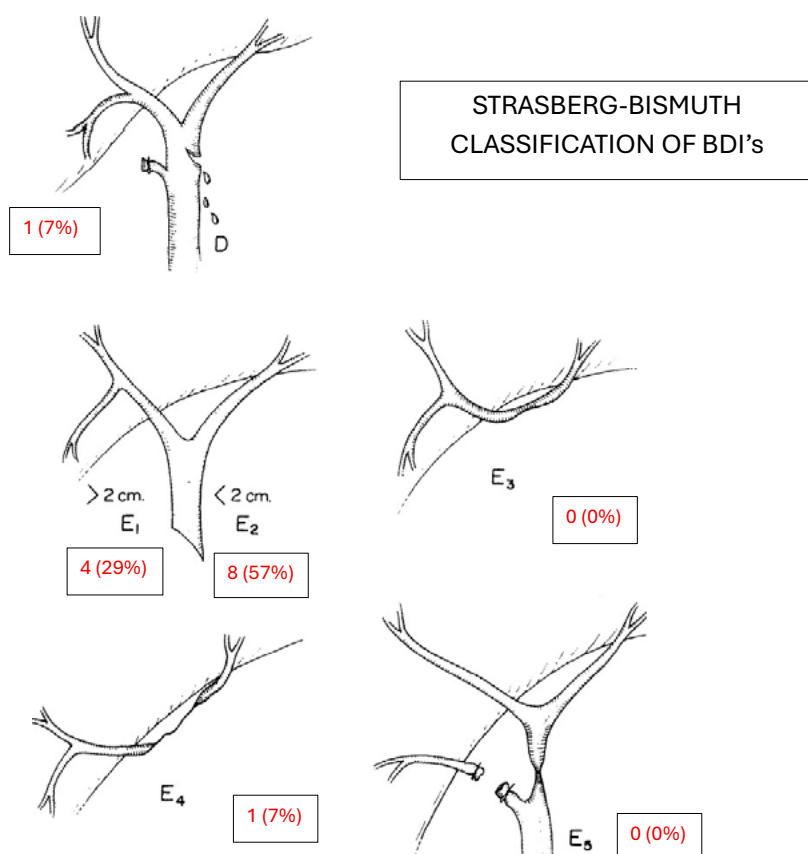


Figure 1: Strasberg-Bismuth Classification of Bile Duct Injuries with their injury distribution; Type D – Lateral injury to extrahepatic bile duct, Type E – Circumferential injury to major bile duct, Type E1/E2 – Transection > 2 cm or < 2 cm from hilum, Type E3 – Hilar injury but confluence intact, Type E4 – Confluence disrupted with separated right and left duct, Type E5 – Combined common hepatic duct and aberrant right duct injury



Figure 2a: Cholangiogram with proximal cutoff of biliary system (red arrow)



Figure 2b: Defect demonstrated with PTC (red arrow) placed via Rendezvous bridging the gap

Treatment protocol

The protocol at our tertiary centre HPB Unit regarding imaging of MBDIs is that cross-sectional imaging was obtained. Contrast-enhanced computerised tomography (CE-CT), magnetic resonance imaging (MRI), or both, is used to assess for vascular injury, intra-abdominal collections. Biliary anatomy was delineated by magnetic resonance cholangio-pancreatography (MRCP). A sinogram through a surgical or percutaneously placed drain was a helpful adjunct in delineating biliary anatomy when present in selected patients. Our routine management of BDIs

included control of sepsis by administering of appropriate antibiotics and early percutaneous drainage of intra-abdominal collections. Based on imaging, mapping of the injury is performed, and a preliminary treatment plan is devised. In general, patients were considered for definitive endoscopic management when anatomy was considered favourable, regardless of ductal continuity or tissue loss, which included a 1 cm or more CHD stump for landing of the proximal end of a self-expandable metal stent (SEMS). However, we also included patients who underwent initial internalisation of the bile leak as a bridge to surgery, but where definitive endoscopic treatment was ultimately pursued after discussion with the patient. All interventions, both percutaneous and endoscopic, were performed under conscious sedation or general anaesthesia.

In those patients who were deemed suitable for definitive endoscopic management, a percutaneous transhepatic cholangiogram (PTC) was performed if dilated intrahepatic ducts (IHDs) were noted, as the first procedure (Figure 2a). In patients where there was contrast extravasation into the subhepatic space from the proximal system, an attempt was made to pass a guidewire into the distal bile duct. If this was successful, an external internal catheter was placed with the distal tip secured in the duodenum (Figure 2b). If this was not successful, the PTC drain was secured in the subhepatic space to allow drainage of both the proximal bile ducts and subhepatic collections. In patients where the proximal bile duct was occluded by a ligaclip, clips were dislodged at the first or subsequent PTCs before internalisation was attempted. If, however, a non-dilated biliary system was noted, an endoscopic retrograde cholangiography (ERC) was performed as the first procedure (Figure 3a). Once the proximal bile ducts were successfully cannulated with a guidewire, a stent (Figure 3b) was placed.

In patients with discontinuity of the bile duct, with or without substance loss where the defect could not be traversed with a guidewire either percutaneously or trans-papillary, a rendezvous procedure was performed. As a first step, a stone

extraction basket was deployed via PTC or ERC in the extraductal subhepatic space. A guidewire was then placed from the opposite site of access, which was then snared by the basket and exteriorised. An appropriate stent was then placed, ensuring biliary continuity and bridging the defect. This method is referred to as the combined endoscopic and radiologic approach (CERA). Fully covered 10 mm SEMS were used in all patients of sufficient length to cover the defect and allow for the distal end of the stent to lie in the duodenum.



Figure 3a: Cholangiogram demonstrating proximal cutoff with metal clips at the site of occlusion (red arrow)



Figure 3b: Cholangiogram done after ERCP where a distal stent (red arrow) was placed to allow for drainage of a bile collection and CERA used via PTC to bridge the defect

Patients underwent stent exchange every 3 months for a total stent duration of at least 9 months. After stent removal, patients were followed up clinically, and with liver function tests (LFTs). Technical success was defined as biliary tract continuity successfully established with at least one stent bridging the defect or stricture and long-term clinical success defined as an asymptomatic patient with normalisation of LFTs or improving LFTs upon stent removal and follow-up. No imaging was done for follow-up in patients that were asymptomatic – LFT trends were noted and symptoms monitored. These patients should have no indication for repeat endoscopic, percutaneous or surgical intervention.

Results

A summary of the patient's demographics and outcomes can be found in Table I.

Demographics and procedure

Fourteen patients were included in this study with a median age of 40 years (range 26–55 years), of whom 11 (79%) were female. The median BMI was 36 (range 21–63). The most common cause of injury was a misadventure during LC ($n = 12$, 86%) with penetrating trauma ($n = 2$, 14%) accounting for the remainder. Four (33%) of the LC injuries were converted to an open procedure.

Presentation and description of injury

The median duration of time from injury to diagnosis was 11 days (range 3–30 days).

The most common presenting symptoms were pain ($n = 9$) and bile leaks ($n = 9$). Obstructive jaundice was present in four (29%) patients. The mean total bilirubin on presentation was 62 ug/dl, the mean ALP was 195 and GGT 339 (units). Eleven (78%) patients were evaluated for an associated vascular injury with imaging, of whom an injury was detected in two (18%). Percutaneous drainage of collections was performed in two patients (15%). A Strasberg E2 injury was found in eight patients (57%) (Figure 1). In seven (50%) patients endoscopic stenting was performed while the remainder underwent CERA. In one patient, where an unreconstructible hilar injury was found at emergency laparotomy, multiple 8 mm SEMs were used (Figure 4).

Table I: Detailed patient profile

Age, y/sex	Primary Operation	Converted to OC	Delay to diagnosis (D)	Classification of BDI, Strasberg	Vascular Injury	Time from injury to endoscopic management (D)	Type of Endoscopic management	Length of stenting (M)	Follow-up period (M)	Outcome (success/failure)
47 M	TL	N/A	5	E2	Y	5	CERA	5	24	Success
52 M	LC	N	9	E2	N	9	ES	48	48	Success
29 F	LC	N	7	E2	N	7	CERA	11	13	Success
35 F	LC	Y	30	E2	N	30	ES	5	50	Success
52 F	LC	Y	5	E4	N	5	CERA	10	1	Under treatment
31 F	LC	N	7	E1	N	7	CERA	12	1	Success
30 F	LC	N	8	E2	N	8	CERA	6	6	Under treatment
55 F	LC	N	3	E1	N	3	ES	6	12	Success
33 F	LC	N	28	E2	N	28	ES	19	12	Success
42 F	LC	N	26	E2	N	26	ES	16	12	Success
44 F	LC	Y	6	D	N	6	ES	8	18	Success
45 F	LC	Y	6	E1	Y	6	CERA	12	48	Success
26 M	TL	N/A	3	E1	N	3	ES	1	1	Success
48 F	LC	N	17	E2	N	17	CERA	12	1	Success

TL – trauma laparotomy, LC – laparoscopic cholecystectomy, Y – yes, N – no, D – day, M – month, N/A – not applicable, CERA – combined endoscopic and radiologic approach, ES – endoscopic stenting



Figure 4: Intraoperative finding of multiple plastic clips in hilum (white arrow)

Management

A detailed summary of the treatment per patient is shown in supplementary Table I. Occluding ligaclips were found in six cholecystectomy patients (58%), all of which were successfully dislodged. The mean number of procedures per patient was three, with a median stent duration of 12 months (range 5–48 months).

Complications

Cholangitis occurred in two patients (15%), both requiring stent repositioning. One patient had a mild post-ERCP pancreatitis.

Follow-up

The median duration of follow-up was 22 months (range 1–50 months; range for alive), with a clinical and technical success rate of 100%. One trauma patient died 30 days post-initial injury, from complications of injuries sustained by trauma unrelated to the BDI. No patients developed strictures during follow-up.

Discussion

In our study of 14 patients with MBDIs, successful endoscopic management was achieved in all patients. Complications included cholangitis and pancreatitis, which were mild. In the patients still alive, none developed stenosis during a median follow-up of 22 months.

The major cause of a MBDI remains a LC as is demonstrated in this cohort.⁹ A third of patients who had a LC were also converted to an open procedure. These patients presented with only postoperative detection of the MBDI, highlighting that conversion is not always a safer procedure and alternative bail-out options should be considered when encountering a difficult LC. In line with previous studies, the majority of these patients were female, and below the age of 50 years.¹⁰

Surgical repair is still practised as the management of choice for MBDIs, with recognised, favourable long term outcomes.¹¹ Morbidity rates, however, are a concern and the timing of the surgery can be complex. This is compounded

by the fact that intraoperative recognition of BDI is infrequent, and the majority of our patients presented with symptoms more than a week after the initial surgery, making an early surgical repair challenging due to the ongoing bile leak and sepsis. Endoscopic management in these cases may be a more attractive and feasible option, even if only a bridge to surgery.

Other causes of MBDI, for example, trauma related injuries, are rare, occurring in about 1% of patients with penetrating trauma.¹² Percutaneous and endoscopic intervention for traumatic BDI has been well described in the management of these patients, mostly to address minor MBDIs with postoperative bile leaks.^{13,14} Definitive endoscopic management for MBDIs caused by trauma has not been well reported on, with the majority of patients undergoing surgery for associated injuries.^{14,15}

Occluding ligaclips are often a cause of obstruction as demonstrated in patient 9 of this cohort (Figure 3a). They are radio opaque (titanium) and easily visible on imaging. Attempts at removing them have a high chance of success and should be pursued when possible. Hem-o-lock clips, however, cannot be removed endoscopically and as seen in a patient in this cohort (Figure 4) will require surgical removal.

As expected, patients managed with CERA had on average a higher number of procedures needed to complete treatment versus those undergoing endoscopic stenting alone, reflecting the complexity of the procedure. However, once the initial stent is placed, the complexity of the follow-up stent exchange procedures drops, and they go on to have the general average of stent exchanges six monthly. In our study, patients required longer stenting times for complete transections (15.2 months) ($n = 7$), compared to partial transections, (11.5 months) ($n = 5$).

The favourable results of our and previously published cohort studies warrants revisiting interventional non-operative treatment as a treatment modality that should be considered for inclusion in treatment algorithms of MBDIs, including those with tissue loss. It has many advantages over external drainage, and internalisation of biliary drainage is particularly important in patients requiring prolonged prehabilitation prior to definitive surgery. Firstly, fluid losses and electrolyte imbalances are prevented, and nutritional recovery is enhanced due to the luminal presence of bile. Secondly, they can be managed at home instead of a protracted hospital admission.

Post-procedure, cholangitis was the commonest complication noted and was usually due to incomplete drainage due to stent positioning – this was successfully corrected by stent exchange. It emphasises close patient review and follow-up to mitigate this and should also be a consideration when choosing endoscopic management for patients who may not have good access to healthcare and follow-up. There were no mortalities in our study for procedure- or complication-related events.

The limitations remain that CERA is an advanced procedure requiring significant expertise and experience and may not be possible at many centres of care where patients with MBDIs present to. It also has a relatively small cohort, retrospective methodology, and single-centre setting, which may restrict the broader applicability of the findings.

Conclusion

In our experience, endoscopic management is a safe and durable intervention for patients with MBDIs, comparable to outcomes ascribed to a surgical reconstruction, even when tissue loss is present. A broader view of management in patients with MBDIs should be considered and the results of this cohort emphasise the importance of a multidisciplinary team, including experienced surgical gastroenterologists and interventional radiologists, for consideration of both diagnosis and method of intervention.

Conflict of interest

The authors declare no conflict of interest.

Funding source

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Ethical approval

Ethical approval was obtained from the University of Cape Town Human Research Ethics Committee (HREC 414/2018).

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REFERENCES

1. Traverso LW. Carl Langenbuch and the first cholecystectomy. *Am J Surg.* 1976;132(1):81-2. [https://doi.org/10.1016/0002-9610\(76\)90295-6](https://doi.org/10.1016/0002-9610(76)90295-6).
2. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. *J Am Coll Surg.* 1995;180(1):101-25. PMID: 8000648.
3. Barone JE, Lincer RM. Correction: A prospective analysis of 1518 laparoscopic cholecystectomies. *N Engl J Med.* 1991;325(21):1517-8. <https://doi.org/10.1056/NEJM199111213252117>.
4. McMahon AJ, Fullarton G, Baxter JN, O'Dwyer PJ. Bile duct injury and bile leakage in laparoscopic cholecystectomy. *Br J Surg.* 1995;82(3):307-13. <https://doi.org/10.1002/bjs.1800820308>.
5. de'Angelis N, Catena F, Memeo R, et al. 2020 WSES guidelines for the detection and management of bile duct injury during cholecystectomy. *World J Emerg Surg.* 2021 Jun 10;16(1):30. <https://doi.org/10.1186/s13017-021-00369-w>.
6. Donatelli G, Vergeau BM, Derhy S, et al. Combined endoscopic and radiologic approach for complex bile duct injuries (with video). *Gastrointest Endosc.* 2014;79(5):855-64. <https://doi.org/10.1016/j.gie.2013.12.034>.
7. Fiocca F, Salvatori FM, Fanelli F, et al. Complete transection of the main bile duct: Minimally invasive treatment with an endoscopic-radiologic rendezvous. *Gastrointest Endosc.* 2011;74(6):1393-8. <https://doi.org/10.1016/j.gie.2011.07.045>.
8. Schreuder AM, Booijs KA, de Reuver P, et al. Percutaneous-endoscopic rendezvous procedure for the management of bile duct injuries after cholecystectomy: Short- and long-term outcomes. *Endoscopy.* 2018;50(6). <https://doi.org/10.1055/s-0043-123935>.
9. Fatima J, Barton JG, Grotz TE, et al. Is there a role for endoscopic therapy as a definitive treatment for post-laparoscopic bile duct injuries? *J Am Coll Surg.* 2010;211(4):495-502. <https://doi.org/10.1016/j.jamcollsurg.2010.06.013>.
10. Booijs KA, de Reuver PR, van Dieren S, et al. Long-term impact of bile duct injury on morbidity, mortality, quality of life, and work related limitations. *Ann Surg.* 2018;268(1):143-150. <https://doi.org/10.1097/SLA.0000000000002258>.
11. Marichez A, Adam JP, Laurent C, Chiche L. Hepaticojejunostomy for bile duct injury: State of the art. *Langenbecks Arch Surg.* 2023;408(1):107. <https://doi.org/10.1007/s00423-023-02818-3>.
12. Molinari M. Traumatic bile duct injuries. In: Actual problems of emergency abdominal surgery. Garbuzenko DV, editor. IntechOpen: Rijeka; 2016. <https://doi.org/10.5772/64535>.
13. Yuan KC, Wong YC, Fu CY, et al. Screening and management of major bile leak after blunt liver trauma: A retrospective single centre study. *Scand J Trauma Resusc Emerg Med.* 2014;22:26. <https://doi.org/10.1186/1757-7241-22-26>.
14. Bridges A, Wilcox CM, Varadarajulu S. Endoscopic management of traumatic bile leaks. *Gastrointest Endosc.* 2007;65(7):1081-5. <https://doi.org/10.1016/j.gie.2006.11.038>.
15. Richey JS, Manning BM, Jones WB. Outcomes of endoscopic stenting for traumatic biliary and pancreatic fistulae. *Am Surg.* 2016;82(7):588-93. <https://doi.org/10.1177/000313481608200723>.

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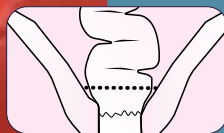
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Single-use duodenoscope for ERCP: a prospective feasibility study

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Background: Single-use duodenoscopes were developed to eliminate the risk of duodenoscope-related cross-contamination associated with reusable instruments. Although their technical performance has been evaluated in high-income countries, evidence from low-middle-income settings remains limited. This study evaluated the feasibility, technical performance, safety, and operator satisfaction of a single-use duodenoscope for endoscopic retrograde cholangiopancreatography (ERCP) in a South African tertiary academic hospital.

Methods: This prospective, single-arm feasibility study included 15 patients with obstructive jaundice who underwent ERCP using a single-use duodenoscope (SUD). Data collected included patient demographics, ASA grade, procedural characteristics, cannulation attempts and times, completion and crossover rates, complications, and operator satisfaction. Patients were followed for 30 days for serious adverse events.

Results: All 15 procedures (100%) were completed using the SUD, with no crossover to a reusable duodenoscope (RD). Mean cannulation time was 4.9 ± 2.0 minutes and mean procedure time 14.7 ± 4.7 minutes. The mean number of cannulation attempts was 1.47 ± 0.52 . Operator satisfaction was high, with a median score of 9/10 for handling, positioning, and image quality. All 15 procedures (100%) were completed using the single-use duodenoscope, with no crossover to a reusable duodenoscope. Mean cannulation time was 4.9 ± 2.0 minutes, mean procedure time was 14.7 ± 4.7 minutes, and the mean number of cannulation attempts was 1.47 ± 0.52 . Operator-reported scores were favourable, with median scores of 9/10 for handling, scope positioning, image visualisation and overall satisfaction. Four patients (26.7%) developed post-ERCP complications: mild pancreatitis ($n = 2$), moderate pancreatitis ($n = 1$), and mild bleeding ($n = 1$). Only the patient with moderate pancreatitis required prolonged hospitalisation and subsequent nutritional support. No perforations or deaths occurred, and the median hospital stay was 2 days.

Conclusion: The feasibility study of a single-use duodenoscope for ERCP in our setting achieved complete procedural success with high operator satisfaction. The small sample size precludes meaningful conclusions regarding complication rates. Larger studies are needed to establish its role in practice.

Keywords: endoscopic retrograde cholangiopancreatography, ERCP, single-use duodenoscope, obstructive jaundice, feasibility, South Africa

Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is an established therapeutic intervention for a wide range of pancreaticobiliary disorders, including biliary obstruction due to stones, strictures and malignancy. Access to ERCP, however, remains limited in many low- to middle-income countries (LMICs), including South Africa, where shortages of trained endoscopists, inadequate infrastructure, equipment failure and limited access to fluoroscopy can delay treatment, particularly outside tertiary academic centres.¹⁻³

Reusable duodenoscopes (RDs) remain the standard platform for ERCP but require meticulous cleaning and high-level disinfection between procedures. Despite adherence to recommended reprocessing protocols, duodenoscope-associated transmission of multidrug-resistant organisms continues to be reported. The complex design of the duodenoscope, particularly the elevator mechanism and internal channels, may make effective decontamination challenging and contribute to persistent contamination.²⁻¹⁰ These concerns have driven the development of

duodenoscopes incorporating disposable components and fully single-use duodenoscopes (SUDs), which eliminate the need for reprocessing between patients and may reduce the risk of device-related cross-contamination.¹¹⁻¹³

Several prospective studies have demonstrated high technical success and favourable procedural performance with SUDs, including studies evaluating their use across operators with different levels of experience and procedures of varying complexity.¹⁴⁻¹⁸ However, much of the published evidence has originated from high-income healthcare systems, and experience with SUDs in LMICs remains limited. In particular, the practical value of a single-use device may extend beyond infection prevention. In settings where reprocessing facilities are limited or unreliable, ERCP volumes are low, or equipment and trained support staff are intermittently unavailable, a SUD may provide an alternative means of maintaining or extending ERCP services. Its portability may also facilitate selected outreach procedures where appropriate infrastructure is available but access to a functioning reprocessing service is limited.

The principal limitation to wider adoption of SUDs is their higher per-procedure acquisition cost. Economic analyses suggest that RDs may remain more economical in high-volume centres, whereas the balance may shift in lower-volume institutions or settings with limited reprocessing capacity.^{19,20} These considerations favour a selective rather than universal approach to the use of SUDs, with potential application in specific clinical or service-delivery circumstances rather than routine replacement of RDs.

To our knowledge, no published South African clinical study has evaluated a SUD for ERCP. Furthermore, although previous studies have evaluated SUDs, the clinical experience with the Ambu® aScope™ Duodeno remains relatively limited.¹⁴⁻¹⁸ We therefore conducted a prospective feasibility study to evaluate the technical performance of a single-use duodenoscope during therapeutic ERCP at a South African tertiary academic hospital, with particular attention to successful procedure completion, procedural complexity and operator experience.

Methodology

Study design

This prospective, single-arm feasibility study evaluated the use of a SUD for therapeutic ERCP. Patient management followed the unit's standard clinical protocol. Data were collected prospectively during ERCP and immediately thereafter, with patients followed for 30 days after discharge to identify delayed complications and other clinical outcomes.

The study was designed as an exploratory feasibility study rather than a comparative or safety study. Twenty patients were initially planned for enrolment; however, only 15 SUDs were available and therefore 15 patients were included. The sample size was determined by device availability and was not intended to provide statistical power for comparison of complication rates or clinical outcomes.

Study setting and device

The study was conducted in the Endoscopy Unit of Dr George Mukhari Academic Hospital (DGMH), a tertiary academic institution affiliated with Sefako Makgatho Health Sciences University. The unit provides ERCP services to the northern Tshwane community and receives referrals from Limpopo, North West and Mpumalanga provinces.

The device evaluated was the Ambu® aScope™ Duodeno SUD (Figure 1) used with the Ambu® aBox™ Duodeno imaging system. The devices were donated to the hospital and were not part of the institution's routine equipment stock. The manufacturer had no involvement in study design, patient selection, data collection, analysis, interpretation of the findings, manuscript preparation or the decision to publish.

Patient selection

Consecutive adults aged ≥ 18 years with obstructive jaundice due to distal common bile duct stones or malignancy who required ERCP were eligible for inclusion. Written informed consent was obtained from all participants. Patients with pregnancy, altered anatomy or other conditions precluding conventional ERCP, participation in another conflicting study, or clinical circumstances making ERCP inappropriate were excluded.

Patients were recruited using purposive sampling during the study period, with enrolment limited by the availability of SUDs.

ERCP procedure

All ERCP procedures were performed by a single experienced endoscopist with more than 2 000 lifetime ERCP procedures. The use of a single operator was deliberate to minimise operator-related variability and allow the technical performance of the device to be assessed under relatively consistent procedural conditions. This approach also limits the generalisability of the findings to other operators and centres.

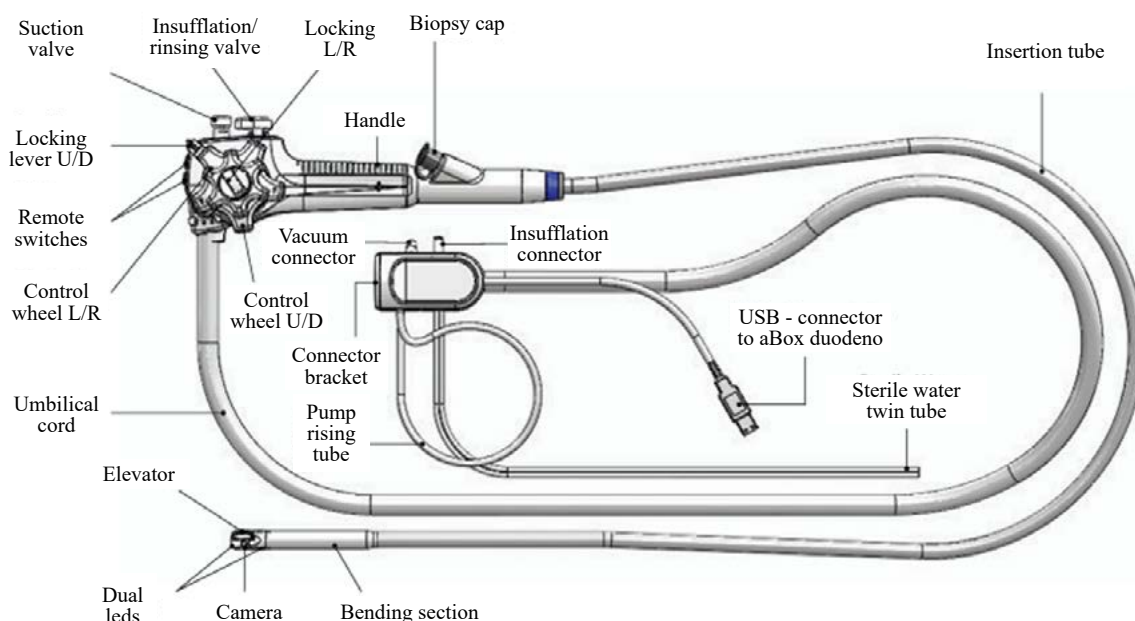


Figure 1: Ambu® aScope™ Duodeno by Ambu used in our study²¹

Procedures were performed in the dedicated endoscopy suite using standard institutional ERCP protocols. Patients were positioned according to procedural requirements, with the prone position used whenever appropriate. Anaesthesia or sedation was administered according to routine institutional practice. Prophylactic nonsteroidal anti-inflammatory medication was administered according to availability at the time of the procedure.

Selective biliary cannulation was performed using standard guidewire-assisted techniques. Needle-knife-assisted access was undertaken when required for difficult cannulation. Therapeutic interventions were performed according to the underlying indication and included biliary sphincterotomy, stone extraction, biliary stent placement and other interventions as clinically indicated.

Procedural complexity was classified according to the American Society for Gastrointestinal Endoscopy (ASGE) ERCP complexity grading system.²² The specific therapeutic intervention performed, ASGE complexity grade, cannulation technique, number of cannulation attempts, cannulation time and total procedure time were recorded prospectively.

Technical feasibility and device performance

The primary outcome was technical feasibility of the SUD for therapeutic ERCP. A technically successful procedure required successful deep cannulation of the intended bile duct, completion of the planned therapeutic intervention, absence of device-related technical failure and completion of the procedure without crossover to a RD.

Device-related technical problems, including loss of image, impaired elevator function, difficulty with accessory passage, inadequate scope positioning or other malfunction requiring device exchange, were recorded prospectively. Any requirement to replace the SUD with a RD was recorded as crossover and considered technical failure.

Operator evaluation

Because this was a feasibility study of a novel endoscopic platform, operator experience was included as a secondary outcome. Immediately after each procedure, the operating endoscopist completed a structured assessment using a 10-point scale. The assessment recorded scores for scope handling, scope positioning, image visualisation and overall satisfaction.

The assessment tool was developed by the principal investigator and was not a validated comparative instrument. Its purpose was to provide a consistent assessment of

the operator's experience with the device and to permit descriptive comparison with previously published studies using similar assessments.

Outcome definitions and follow-up

Post-ERCP complications were recorded prospectively and classified according to accepted ERCP adverse-event definitions. Post-ERCP pancreatitis was diagnosed when patients developed new or worsening abdominal pain accompanied by a post-procedure amylase level of at least three times the upper limit of normal and requiring unplanned hospital admission or prolongation of the planned hospital stay. Pancreatitis severity was classified according to duration of hospitalisation and clinical course.

Bleeding, perforation and other post-procedural complications were recorded and graded according to their clinical severity. Hospitalisation, level of postoperative care, additional treatment and mortality were recorded during the index admission.

All patients were followed for 30 days after ERCP. Follow-up was undertaken through clinical review and assessment of hospital records to identify delayed complications, readmission, additional interventions and mortality.

Data collection and descriptive and comparative analysis

Data were collected prospectively by the principal investigator and verified by the research supervisor and/or endoscopist. Variables included demographic characteristics, ASA physical status, referral source, inpatient or outpatient status, cause of biliary obstruction, cholangitis, relevant comorbidities, therapeutic procedures, ASGE complexity grade, cannulation attempts and time, total procedure time, device-related technical problems, crossover, operator assessment, hospitalisation, complications and 30-day outcomes.

Continuous variables were summarised using means and standard deviations or medians and ranges, as appropriate, while categorical variables were presented as frequencies and percentages. Given the small sample size and exploratory nature of the study, analyses were primarily descriptive and no formal statistical comparisons were undertaken.

For contextual comparison, findings from the present study were compared descriptively with selected prospective studies evaluating SUDs for ERCP.¹⁴⁻¹⁸ Studies were selected because they reported prospective clinical experience and included measures of procedural completion or technical success and/or operator assessment. Published data were not

Table 1: Comparison of selected prospective studies evaluating SUDs for ERCP

Study	Patients <i>n</i>	Technical success	Operator assessment	Principal study characteristic
Bang et al. ¹⁴	98	95.8%	Lower ratings for image quality, image stability, ease of passage and air–water function than RD	Randomised comparison with RD
Muthusamy et al. ¹⁵	60	96.7%	Median overall satisfaction 9/10	Multicentre clinical evaluation
Slivka et al. ¹⁶	200	96.3%	Median overall satisfaction 8/10	Operators with varying experience and procedures of variable complexity
Bruno et al. ¹⁷	552	97.5%	Overall operator satisfaction 8/10	Large international prospective study
Bhenswala et al. ¹⁸	52	90.4%	Operator assessment reported; no directly comparable overall satisfaction score	Single-centre preliminary clinical evaluation
Present study	15	100%	Median overall satisfaction 9/10	First prospective South African clinical evaluation

subjected to statistical comparison because of differences in study design, patient populations, procedural complexity and outcome definitions. The comparative data are presented in Table I.

Results

Patient characteristics

Fifteen patients underwent ERCP using the SUD. The mean age was 51.2 years (range 26–73), with 10 (66.7%) women and 5 (33.3%) men. Ten patients (66.7%) were inpatients. Referrals originated from the study institution in 4 patients (26.7%), other academic centres in 4 (26.7%), and non-academic centres in 7 (46.7%). Six patients (40.0%) were ASA I, eight (53.3%) ASA II and one (6.7%) ASA III.

Benign biliary obstruction accounted for 9 cases (60.0%) and malignant obstruction for 6 (40.0%). Ascending cholangitis was present in 11 patients (73.3%), comprising mild disease in 4 (36.4%), moderate disease in 5 (45.5%) and severe disease in 2 (18.2%). Eleven patients (73.3%) had at least one medical comorbidity, with hypertension being the most common.

Therapeutic procedures and procedural complexity

All 15 ERCPs were completed successfully using the SUD, with no crossover to a RD. Eleven procedures (73.3%) were classified as ASGE Grade 1–2 and four (26.7%) as Grade 3; no Grade 4 procedures were undertaken. The median procedure time was 15 minutes (range 7–23), and the median cannulation time was 5 minutes (range 2–9), with a mean of 1.47 ± 0.52 cannulation attempts. Guidewire-assisted cannulation was performed in 11/15 (73.3%) procedures and needle-knife-assisted cannulation in 4/15 (26.7%).

Therapeutic interventions are shown in Table II. Stone extraction was successfully completed in all nine procedures in which it was attempted, while plastic and metal biliary stent placement were successfully completed in all four and six procedures, respectively. Some patients underwent more than one therapeutic intervention during the same ERCP.

Technical performance

Successful completion of the intended ERCP was achieved in all 15 patients (100%), with no device-related crossover to a RD. There were no reported device failures preventing

completion of the planned procedure. Procedures included both lower- and higher-complexity ERCPs, with successful completion across all ASGE grades represented in the study.

Operator evaluation

Table III shows the operator-reported evaluation scores that were favourable across all four assessed domains. Median scores were 9/10 for handling, scope positioning, image visualisation and overall satisfaction. Image visualisation received the highest mean score (9.4 ± 0.5), while handling had the lowest (8.7 ± 0.9).

Eleven patients (73.3%) experienced no post-procedural complications. Four patients (26.7%) developed complications: three cases of post-ERCP pancreatitis (20.0%) and one episode of mild bleeding (6.7%). The pancreatitis cases were classified as mild in two patients and moderate in one. All three patients who developed pancreatitis had undergone ASGE Grade 3 procedures.

The median post-procedural hospital stay was 2 days (range 0–7). One patient with moderate pancreatitis required nutritional support and was classified as Clavien–Dindo Grade II. No perforations or deaths occurred during the index admission or 30-day follow-up. All patients completed 30-day follow-up.

Discussion

This prospective study demonstrates the technical feasibility of using a SUD for therapeutic ERCP in a South African tertiary academic hospital. All 15 procedures were completed without crossover to a RD, including ASGE Grade 1–3 procedures and therapeutic interventions involving stone extraction and biliary stent placement. Operator-reported assessments were favourable across all domains evaluated. These findings are consistent with previous international prospective studies and provide prospective clinical experience with a SUD for ERCP in a South African tertiary hospital.

The 100% procedural completion rate and favourable operator assessments in the present study are broadly consistent with previous prospective evaluations of SUDs (Table III).^{14–18} Direct comparison is nevertheless limited by differences in device type, patient selection, procedural complexity, operator experience and definitions of technical success. Most procedures in our cohort were ASGE Grade 2,

Table II: Therapeutic procedures performed using the SUD according to ASGE complexity grade

Therapeutic procedure*	ASGE Grade 1-2 (successful/attempted)	ASGE Grade 3-4 (successful/attempted)
Benign disease		
Stone extraction	6/6	3/3
Plastic stent insertion	3/3	1/1
Malignant disease		
Metal stent insertion	5/5	1/1

* Patients may have undergone more than one therapeutic intervention during the same procedure

Table III: Operator evaluation of the SUD post-ERCP outcomes

Domain	Mean (SD)	Median (IQR)	Min– Max
Handling	8.7 (0.9)	9 (8–9)	7–10
Scope positioning	8.9 (0.7)	9 (8–9)	8–10
Image visualisation	9.4 (0.5)	9 (9–10)	9–10
Overall satisfaction	9.0 (0.7)	9 (8.3–9.3)	8–10

with none classified as Grade 4; successful stone extraction and plastic and metal stent placement therefore provide more meaningful evidence of therapeutic feasibility than procedure time or cannulation attempts. Operator satisfaction scores were favourable (median 9/10 across all domains), although these findings should be interpreted with caution because the assessment was non-validated and performed by a single experienced operator. Bang et al.¹⁴ identified lower ratings for specific device characteristics, including image quality and stability, highlighting the importance of not interpreting operator satisfaction as evidence of equivalence or superiority over RDs.

The therapeutic procedures undertaken provide additional evidence of device capability. Stone extraction was successful in all nine procedures in which it was attempted, while all attempted plastic and metal stent insertions were completed successfully. The device was therefore successfully used for several common therapeutic ERCP interventions across ASGE Grade 1–3 procedures. However, no Grade 4 procedures were undertaken, and the small number of procedures prevents conclusions regarding performance in more complex therapeutic interventions.

The safety findings in this small cohort provide limited information on complication rates. Four patients experienced post-ERCP complications: three cases of pancreatitis and one mild bleeding episode; only the patient with moderate pancreatitis required prolonged treatment and nutritional support. The observed PEP rate of 20% exceeds the ESGE quality benchmark of < 10%,²³ but represents only three patients. All three cases followed ASGE Grade 3 procedures, and inconsistent NSAID prophylaxis may have contributed.^{24,25} Variation in PEP rates according to patient selection and procedural risk further limits comparison with published studies.^{26,27} No perforations or deaths occurred, but the study was not designed to assess safety.

The potential value of SUD in South Africa may therefore lie in selective rather than universal use. Their principal practical advantage is elimination of the need for reprocessing between procedures, which may be particularly relevant where reprocessing facilities are inadequate or unreliable.^{3-5,10,14} Selective use may also be considered for patients with highly transmissible infections, including those with multidrug-resistant tuberculosis, where minimising potential contamination of reusable equipment may be advantageous. Their portability may further facilitate selected outreach services where appropriate fluoroscopy, anaesthetic support and post-procedural care are available. These potential applications require appropriate infrastructure and should not be interpreted as justification for ERCP outside suitably equipped clinical environments.

Limitations

The sample size was small and determined by device availability, limiting the precision of the findings, particularly complication estimates. The single-centre design and performance of all procedures by one highly experienced ERCP endoscopist limit generalisability. There was no RD comparator, and microbiological surveillance was not performed; consequently, the study cannot assess comparative performance, contamination or infection transmission. Cost is an important consideration in the adoption of SUDs that was not evaluated in this study.^{19,20}

Conclusion

This prospective study demonstrates the technical feasibility of a SUD for therapeutic ERCP in a South African tertiary hospital, with successful completion of all procedures undertaken and favourable operator assessment. The small sample size precludes meaningful conclusions regarding complication rates. The cost effectiveness in resource-limited settings therefore requires further assessment. Larger studies are needed to establish its role in practice in the South African setting.

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding was received for this study.

Ethical approval

Ethical clearance was obtained from the Sefako Makgatho Health Sciences University Ethics Committee with the following ethics number (SMUREC/M/283/2024:PG). Informed written consent was obtained from all patients for being included in the study.

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REFERENCES

1. Tun M, Gvilia T, van As AB. An audit on the preliminary results of endoscopic retrograde cholangiopancreatography performed in the Limpopo Academic Complex, Polokwane, South Africa. *S Afr Med J*. 2022;112(11b):895-8. <https://doi.org/10.7196/SAMJ.2022.v112i11b.16821>.
2. Mulder CJ, Puri A, Reddy DN. Food for thought, a perspective of future GI training in SA: A review. *S Afr Gastroenterol Rev*. 2009;7(2):69. <https://doi.org/10.4314/sagr.v7i2.51339>.
3. Loots E, Clarke DL, Newton K, Mulder CJ. Endoscopy services in KwaZulu-Natal Province, South Africa, are insufficient for the burden of disease: Is patient care compromised? *S Afr Med J*. 2017;107(11):1022-25. <https://doi.org/10.7196/SAMJ.2017.v107i11.12484>.
4. Epstein L, Hunter JC, Arwady MA, et al. New Delhi metallo-beta-lactamase producing carbapenem-resistant *Escherichia coli* associated with exposure to duodenoscopes. *JAMA*. 2014;312:1447-55. <https://doi.org/10.1001/jama.2014.12720>.
5. Rauwers AW, Voor in't Holt AF, Buijs JG, et al. High prevalence rate of digestive tract bacteria in duodenoscopes: A nationwide study. *Gut*. 2018;67(9):1637-45. <https://doi.org/10.1136/gutjnl-2017-315082>.
6. Rahman MR, Perisetti A, Coman R, et al. Duodenoscope-associated infections: Update on an emerging problem. *Dig Dis Sci*. 2019;64(6):1409-18. <https://doi.org/10.1007/s10620-018-5431-7>.
7. Chhaya R, Bhatwadekar K. Microbial bio-film an unpredictable trouble on medical devices. *Int J Basic Appl Med Sci*. 2015;5:83-93.

Full list of references available on request

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Why some peptic oesophageal strictures persist: risk factors of recalcitrancy from a South African cohort

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Background: Peptic strictures (PSs) result from excessive oesophageal acid reflux and are a common benign cause of dysphagia. A scarcity of local data is available as regards identifying risk factors associated with recalcitrancy.

Methods: Single-centre retrospective audit of PS undergoing endoscopic management between 1 March 2018 and 1 March 2022, aiming to identify recalcitrancy risk factors.

Results: Of 69 patients, 37 were male, (53.4%) and 27 (39.1%) were diagnosed with recalcitrant strictures. Most strictures were distal (53, 76.8%) with an associated hiatus hernia in 52 (75.4%). While comorbidities were not associated with recalcitrancy, younger age was a risk factor with recalcitrant stricture group median age of 51 (IQR 38.5–61.0 years) versus non-recalcitrant group median age of 62.5 (IQR 48.5–70.8 years; $p = 0.044$). Although HIV status did not affect recalcitrancy risk, taking oral antiretrovirals (ARVs) was significantly associated with recalcitrancy ($p = 0.032$; OR 4.55 [95% CI 1.06–19.51]).

Presenting degree of dysphagia ($p < 0.001$; OR 16 [95% CI 3.34–76.65]), requiring > 3 dilatations ($p < 0.001$) and smaller index residual oesophageal lumen ($p < 0.001$) were all significantly associated with recalcitrancy. Fourteen patients were temporarily stented (having a total of 24 stents placed). Thirteen patients had post-endoscopic complications with most of these complications occurring amongst the recalcitrant group ($n = 11$). There was a 2.3% immediate endoscopy intervention complication rate (total 265 oesophageal dilatations) and there were two mortalities in the cohort (one from suspected aspiration pneumonia and one from a suspected missed oesophageal perforation).

Conclusion: Peptic stricture recalcitrancy is common in our setting and an association with taking antiretroviral medication was a novel finding in this study.

Keywords: benign oesophageal stricture, recalcitrant stricture, risk factors for recalcitrancy

Introduction

Peptic oesophageal stricturing is defined as a narrowing of the oesophageal lumen due to uncontrolled gastro-oesophageal reflux disease (GORD) resulting in chronic inflammation.¹ Fibrous tissue deposition and collagen lead to scarring and stricture formation.²⁻⁴ Peptic strictures (PSs) remain the most common benign oesophageal strictures but have been declining in incidence over the past 20 years due to increasing use of proton pump inhibitors (PPI).^{1,2} Refractory or recurrent PSs, which have been previously specifically defined, remain a significant management challenge.^{2,5-8} Approximately 90% of benign oesophageal strictures are dilated successfully after 3–5 dilatations without needing further intervention.⁸⁻¹⁰ The remaining 10% are refractory or recurrent strictures, requiring a longer course of treatment, increasing the risk of iatrogenic complications, nutritional deficits and economic burden to the healthcare system.²

Predictors of recurrence of benign oesophageal strictures include symptom persistence (dysphagia and heartburn) despite management, a narrow index diameter of the stricture (diameter of less than 9 mm), female sex, aetiology of the stricture and achieving maximum stricture diameter of 13–15 mm during the first 3 endoscopic dilatation

interventions.^{2,9,11,12} Dysphagia to solids only occurs when there is a substantial oesophageal luminal compromise with a residual lumen of 18 mm usually remaining asymptomatic.¹³

The mainstay investigation for oesophageal strictures remains upper gastrointestinal endoscopy that allows defining the characteristics of the stricture, therapeutic interventions and excluding concurrent pathology.^{4,5,8,12,14} Endoscopy should be augmented with fluoroscopy to better define the anatomy of complex strictures. Formal contrast swallow examination, manometric studies for exclusion of coexisting motility disorders and, occasionally, cross-sectional imaging may be required when investigating recalcitrant strictures.

While management is multimodal, adequate continued acid suppressive therapy with PPI is essential, with endoscopic intervention required to achieve and maintain oesophageal luminal patency.^{1-3,9,11,13,15-17} Serial bougienage or balloon dilatations are equally effective.^{2,11,13,15,16} Intralesional steroid injections in conjunction with dilatation and incisional therapy or stricturoplasty are additional options employed on an individualised basis in patients with recalcitrant strictures.¹ The temporary placement of

fully covered self-expanding metal stents (SEMS) may occasionally be required.^{1,2,15}

There remains a paucity of international data on benign oesophageal strictures in general and their risk factors for recalcitrance with a complete absence of data in the South African context. This study aims to audit local peptic oesophageal strictures and attempts to identify factors associated with stricture recalcitrance. Early identification will facilitate counselling these patients regarding likelihood of prolonged invasive treatment modalities. In addition, this data will assist the unit with financial planning as treatment duration of the recalcitrant strictures is longer and has financial implications that need to be factored in during budget allocation.

Methods

Patient population

This is a single-centre retrospective study of all adult patients (> 18 years) with peptic strictures presenting to the Upper Gastrointestinal Surgery Unit at Groote Schuur Hospital between 1 March 2018 and 1 March 2022 (study approved by the University of Cape Town Human Research Ethics Committee, REF251/2021). Patients eligible for inclusion into the study were identified from a prospectively maintained registry of all endoscopy procedures performed by the Upper Gastrointestinal Surgery service at Groote Schuur Hospital (registry approved by the University of Cape Town Human Research Ethics Committee, REF

031/2015). All adult patients presenting to the unit with dysphagia due to benign PS were included in the study. Patients younger than 18 years or those with malignant and benign oesophageal strictures other than PS were excluded. Patients with missing data, including demographics, stricture aetiology or management were excluded. The unit routinely takes biopsies of all oesophageal strictures and all patients included had histological confirmation excluding malignancy. Once stricture recalcitrancy was confirmed, repeat biopsies were routinely taken to exclude missed pathology.

Definitions

A recalcitrant stricture was defined as either refractory or recurrent. Refractory strictures fail to achieve an oesophageal diameter of more than 14 mm after 5 sessions of endoscopic dilatations with 2-week intervals.^{2,5-8} A recurrent stricture is where there is an inability to maintain an oesophageal luminal diameter of more than 14 mm for more than 4 weeks after achieving an initial diameter of 14 mm.^{2,8} Dysphagia was graded using a system previously described by Earlam et al.¹⁸ (grade 0: normal swallowing, grade 1 occasional difficulty to swallow solid food, grade 2 occasional difficulty swallowing minced solids, grade 3: unable to swallow minced foods, grade 4: unable to swallow pureed or liquidised foods and grade 5: unable to swallow liquids or saliva). Although not well defined in the literature, we further defined significant dysphagia as equal to or more than grade 4 dysphagia, as most patients struggle to maintain adequate nutrition while

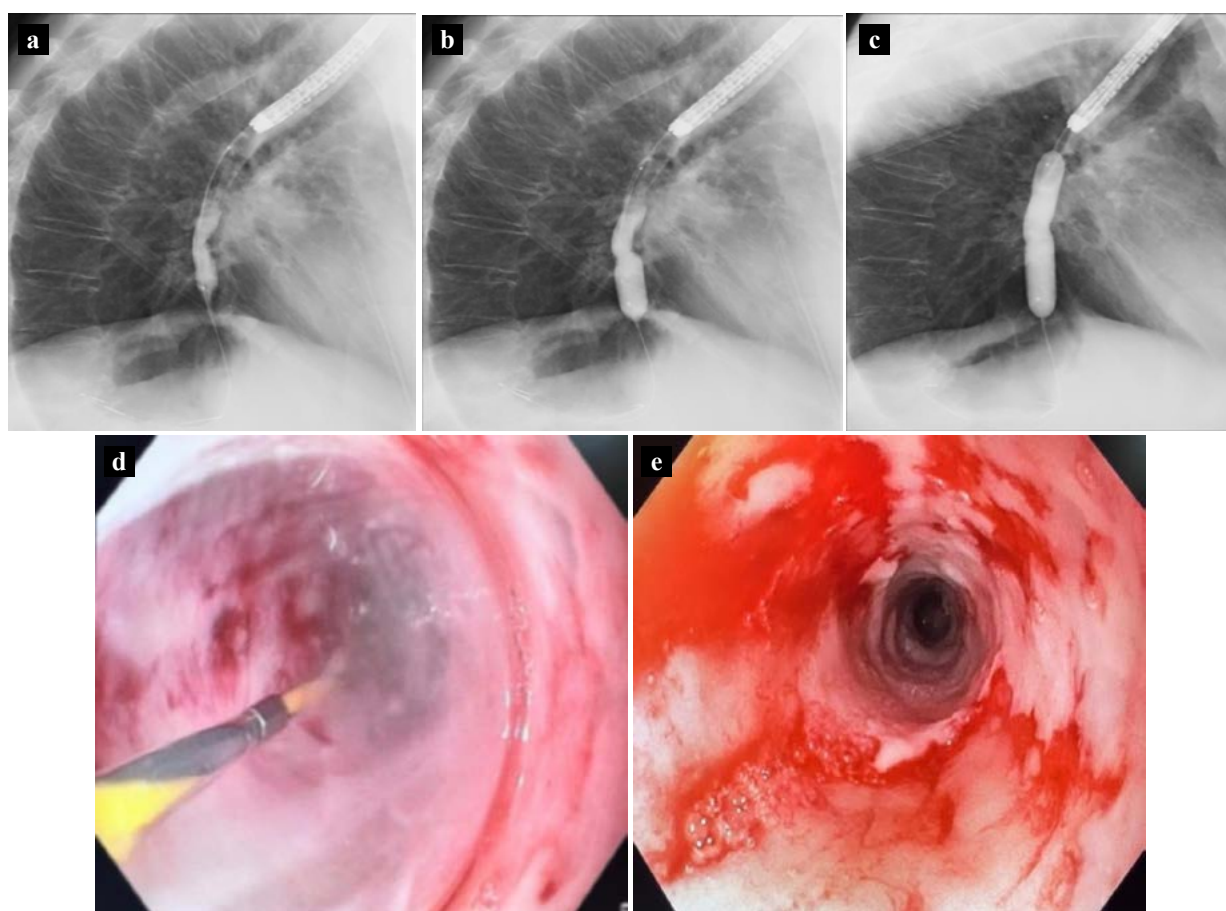


Figure 1: a. Beginning of dilatation with stricture positioned mid balloon; b. Balloon partially inflated; c. Balloon fully inflated; d. Endoscopic view of distal benign peptic stricture pneumatic balloon dilatation; e. Endoscopic view post-balloon dilatation

only tolerating fluids. The first bougie dilator that was used to dilate the stricture was used as the index diameter of the stricture. In patients where a bougie dilator was not used at the initial endoscopy, an estimate of the luminal diameter was made by the endoscopist prior to intervention. Although index diameter severity has not been previously categorised, the authors decided on defining the index diameter as being mild, moderate, severe or extremely severe (mild: more than 11 mm; moderate: 9–11 mm; severe: 6–8 mm; extremely severe: less than 6 mm) – these ranges were decided upon by the authors of this study and have not been used previously. The oesophagus was divided into proximal, mid and distal oesophagus (proximal: less than 20 cm from incisors; mid: 20–30 cm from incisors, and distal: more than 30 cm from incisors).

Endoscopic dilatation technique

With patients in the left lateral position, an endoscopic dilatation is performed using a standard gastroscope. This is performed simultaneously with fluoroscopy and pharyngeal xylocaine spray plus intravenous conscious sedation with individualised combinations of midazolam, fentanyl or propofol. Nasal prong oxygen and non-invasive blood pressure, pulse and oxygen saturation monitoring are standard. Endoscopic balloon dilatation (EBD), bougienage, incisional therapy, intralesional steroid injection and temporary stenting are available as dilatation treatment modalities in our unit. The choice of which therapy is used is left up to the discretion of the endoscopist. For PS management, EBD and serial bougienage are the most frequently employed options. The gastroscope is first passed to confirm the presence of the stricture, determine stricture position and if traversable, and to confirm presence or absence of a hiatus hernia. If the gastroscope passes the stricture before any dilatation, the residual index diameter of the stricture is presumed to be ≥ 11 mm. The starting size and type of dilator utilised is at the discretion of the attending endoscopist.

Bougienage is performed over a standard hydrophilic soft-tipped 0.035" guidewire with serial Savary Gillard dilators and gradual incremental size increases (at the endoscopists discretion), with each dilatation performed under fluoroscopic guidance. EBD is performed using over-the-wire, through the-scope (TTS) balloons with a mixture of 50% water to 50% radio-opaque contrast for balloon insufflation using a hydrostatic device with pressures according to manufacturer specifications correlating to specific diameters. TTS balloons are insufflated during continuous fluoroscopy, ideally with the stricture "waist" positioned mid-balloon. Duration of insufflation is 120 seconds. Figure 1 demonstrates EBD under fluoroscopic guidance and endoscopic view of the stricture dilatation. Bougienage is favoured where possible due to cost. On completion of any dilatation, a review of the dilated area is routinely performed by repeat gastroscopy. If any concern for a full-thickness tear exists, contrast is injected into the oesophageal lumen under fluoroscopy to evaluate for any extravasation.

Temporary fully covered self-expanding metal stents (SEMS) are occasionally placed in specific circumstances for PS, either as an immediate management of iatrogenic stricture perforations or when the performance status or nutritional state of the patient precludes safe dilatation. These stents are then removed within 4–6 weeks with

the patient subsequently joining a scheduled dilatation programme. Dilatation intervals are usually between 2–4 weeks, with shorter intervals scheduled for severe or extremely severely narrow strictures. Restrictions as regards transport availability from rural areas are factored in. All patients diagnosed with PS are routinely placed on chronic twice daily PPI and asked to modify their risk behaviours. Patients are followed-up until complete stricture resolution with no dysphagia or are lost to follow-up.

Assessment of outcomes

The following data categories were collected: patient demographics, comorbidities, chronic medication, patient reported smoking and substance use, GORD symptoms, prior or present H2 receptor antagonist or PPI use and the degree of dysphagia on initial presentation. Endoscopy findings were recorded with emphasis on position of stricture, residual lumen, dilatation technique employed, maximum dilatation size achieved, immediate technical success or any procedural complications (as per the Clavien-Dindo classification).¹⁹ Subsequent dilatation frequency and interval duration were noted until clinical resolution of dysphagia, achievement of endoscopic success or until the end of the study period.

Statistical analysis

Data analysis was done using Microsoft Excel and IBM SPSS Statistics (version 29.0.0.0). Patient demographics, PS details and management were described using simple descriptive statistics, with mean $\pm$ standard deviation for parametric data and median with interquartile range for non-parametric data. Univariate analyses were performed to assess for any factors associated with stricture recalcitrance using chi-square test for univariate categorical data and Kruskal-Wallis test to allow for comparison of multiple groups with non-parametric data. Single factors (not multiple groups) found to be significant were further analysed using odd's ratio. A p -value of < 0.05 was considered statistically significant. The factors that were evaluated for association with recalcitrance included the patients age, gender, comorbidities, including medication use (specifically ARV use) recreational substance use, initial degree of dysphagia, stricture position, presence of a hiatus hernia, number of dilatations and index stricture diameter.

Results

A total of 69 patients (32 female; 37 male) with peptic strictures met the inclusion criteria. The median age was 56 years. Recalcitrant strictures were diagnosed in 27 (39.1%) while 42 (60.9%) patients had non-recalcitrant strictures. Common comorbidities included hypertension, type II diabetes mellitus, dyslipidaemia, chronic obstructive airway disease and human immunodeficiency virus (HIV) infection. Seven patients (25.9%) with recalcitrant strictures were on antiretroviral (ARV) therapy. Smoking was the most common recreational substance used, followed by alcohol. In the recalcitrant group of patients, 48% ($n = 13$) presented with significant dysphagia at their primary endoscopic dilatation, while in the non-recalcitrant group only 23.8% ($n = 10$) had significant dysphagia.

The majority ($n = 53$; 76.8%) presented with distal oesophageal strictures; 14 had mid-oesophageal strictures and two patients had proximal strictures. A hiatus hernia

Table I: Association between potential risk factors and recalcitrant peptic strictures

		Not recalcitrant			Recalcitrant		p-value	Odd's ratio
Age – median (IQR) years		62.5 (48.5–70.8)			51.0 (38.5–61.0)		0.044*	
		Total	n	%	n	%		
Gender	Female	32	21	65.6	11	34.4	0.455	
	Male	37	21	56.8	16	43.2		
Comorbidities	None	22	12	54.5	10	45.5	0.465	
	Yes	47	30	63.8	17	36.2		
Hypertension	No	50	27	54.0	23	46.0	0.06	
	Yes	19	15	78.9	4	21.1		
Diabetes	No	63	38	60.3	25	39.7	0.762	
	Yes	6	4	66.7	2	33.3		
Hypercholesterolemia	No	65	40	61.5	25	38.5	0.649	
	Yes	4	2	50.0	2	50.0		
COAD	No	65	40	61.5	25	38.5	0.649	
	Yes	4	2	50.0	2	50.0		
HIV	No	57	37	64.9	20	35.1	0.137	
	Yes	12	5	41.7	7	58.3		
ARVs	No	59	39	66.1	20	33.9	0.032*	4.55 (95% CI 1.06–19.51)[‡]
	Yes	10	3	30.0	7	70.0		
Substances	No	52	32	61.5	20	38.5	0.843	
	Yes	17	10	58.8	7	41.2		
Smoking	No	55	34	61.8	21	38.2	0.751	
	Yes	14	8	57.1	6	42.9		
Recreational drug use	No	68	41	60.3	27	39.7	0.423	
	Yes	1	1	100.0	0	0.0		
Alcohol	No	65	40	61.5	25	38.5	0.649	
	Yes	4	2	50.0	2	50.0		
Initial dysphagia degree	Grade 0–2	26	24	92.3	2	7.7	< 0.001*	16 (95% CI 3.34–76.65)[‡]
	Grade 3–4	42	18	42.9	24	57.1		
Stricture position	Proximal < 20cm	2	1	50.0	1	50.0	0.497	
	Mid 20–30 cm	14	10	71.4	4	28.6		
	Distal >30cm	53	31	58.5	22	41.5		
Hiatus hernia	No	14	10	71.4	4	28.6	0.354	
	Yes	52	30	57.7	22	42.3		
Dilatations n	0 Dilatations	25	23	92.0	2	8.0	< 0.001*	
	1–2 Dilatations	20	15	75.0	5	25.0		
	3–5 Dilatations	12	4	33.3	8	66.7		
	> 5 Dilatations	12	0	0.0	12	100.0		
Index stricture diameter	< 6 mm	3	1	33.3	2	66.7	< 0.001*	
	6–8 mm	21	8	38.1	13	61.9		
	9–11 mm	13	6	46.2	7	53.8		
	>11 mm	32	27	84.4	5	15.6		

IQR – interquartile range, HIV – human immunodeficiency virus, COAD – chronic obstructive airway disease, LDL – lower than detectable limit, ARVs – antiretrovirals;
 *p-value < 0.05, [‡] Odds ratio > 1.0

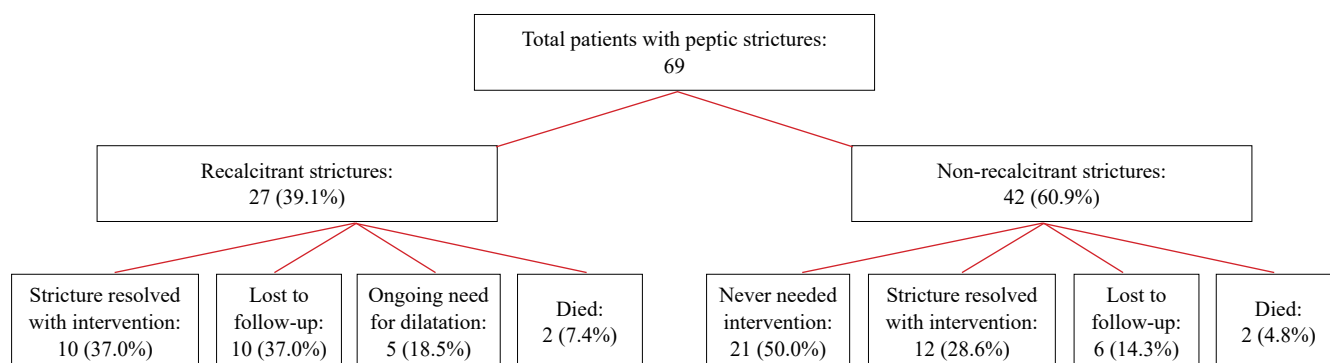


Figure 2: Flow diagram of patient outcomes

Table II: Complications post-endoscopic intervention

Type of stricture	Presence of complications		Clavien-Dindo classification ¹	
	Yes	No	Grading	Complications <i>n</i>
Recalcitrant	11	16	I	5
			II	1
			III(a)	3
			III(b)	0
			IV(a)	0
			IV	0
Non-recalcitrant	2	40	V	2
			I	0
			II	0
			III(a)	2
			III(b)	0
			IV(a)	0
			IV(b)	0
			V	0

¹Classification of surgical complications according to Dindo et al.¹⁹

was diagnosed endoscopically in 52 patients (75.4%). In 22 patients, while the PS was noted, the residual oesophageal lumen was wide enough to easily allow scope passage and as such no dilatation was required. The remaining 47 all required one or more dilatations (Table I), with patients requiring more than 3 dilatations later all meeting the definition for recalcitrancy (either refractory or recurrent). A total of 265 dilatations were performed in this cohort. Forty patients had only bougie dilatations, 4 patients had both EBD and bougie dilatation. None of the patients were managed with EBD only. Although available in the unit, none of the patients included in this study were managed with either incisional therapy or intralesional steroid injections.

Fourteen patients required temporary oesophageal stenting prior to entering the dilatation programme. The decision for temporary stenting with a fully covered SEMS was made if the patient was subjectively deemed to be very frail, severely malnourished or had a pin-point residual oesophageal diameter considered by the endoscopist to be high risk for perforation during dilatation. In total 24 temporary stents were placed in these 14 patients with some patients having

multiple stents replaced over time. The majority ($n = 11$, 79%) of stented patients were from the recalcitrant stricture group. Two patients (14%) were managed by stenting only. Eight patients continued with the dilatation programme after stent removal; four patients were lost to follow-up after primary stent placement. Two (14%) patients were dilated with both bougie and EBD following final stent removal, while the remainder by only bougie dilatation ($n = 10$; 71%). Six (42%) strictures initially stented subsequently resolved during the study period, while a further 2 (14%) patients were lost to follow-up after having progressed to endoscopic dilatations. Two stented (14%) patients died during the study period (one of severe malnutrition, the second patient of metastatic cervical cancer).

Table I shows the associations between potential risk factors and recalcitrant peptic strictures. Risk factors for recalcitrant peptic strictures included age (median age 62 vs 51, $p = 0.04$), initial degree of dysphagia ($n = 24$ vs 18, OR 16 [95% CI 3.34–76.65], p -value < 0.001), number of dilatations ($p = 0.001$), index stricture diameter and ARV usage ($p = 0.032$; OR 4.55 [95% CI 1.06–19.51]). The patients who had these potential risk factors were likely to receive aggressive treatment strategies over a prolonged period of time, compared to those who did not have these potential risk factors. HIV status and smoking were not associated with recalcitrant strictures. Gender, comorbidities, presence of a hiatus hernia and stricture position were also not associated with recalcitrant peptic strictures. Outcomes of the 69 patients are presented in Figure 2.

Table II demonstrates endoscopic intervention-related complications during the study period. A total of 13 patients had complications. There were four immediate complications that occurred during endoscopy, two partial-thickness tears managed endoscopically, a gastric perforation requiring an over the scope-clip closure of a small gastric defect and one sedation-related hypoxia necessitating a short period of bag-mask-valve ventilation and sedation-reversal. Two procedure-related deaths occurred in the dilatation cohort: one from a suspected aspiration pneumonia five days after last dilatation and one death from a suspected missed oesophageal perforation. This equates to a 2.3% immediate endoscopic intervention complication rate for 265 interventions performed for this cohort. Eleven delayed stent-related complications occurred: nine early stent migrations and two failed removals of stents due to mucosal ingrowth after delayed patient return.

Discussion

This study showed a higher recalcitrancy PS rate of 39%, compared to the approximate 10% shown in the international literature.⁸⁻¹⁰ The reasons for this are likely multi-factorial but may be difficult to identify from this dataset. Previously identified risk factors for refractory or recurrent strictures are numerous with narrow index diameter, higher dysphagia grade and number of oesophageal dilatations shown to be associated in our study, which correlates with prior studies.^{2,9,11,12} In addition, a younger age was also associated with recalcitrancy in this study.

While 68% of the cohort were taking chronic medications for various comorbidities, the use of ARV medication, and not being HIV positive in itself demonstrated an association with recalcitrant strictures. This is a novel finding and the underlying aetiology or association is not clear. We postulate that the ARVs perhaps cause a pill oesophagitis. The exact ARV drugs taken by the patients could not be ascertained in the dataset and certain of the ARVs may have a higher association with recalcitrancy than others, but this could not be elucidated from this data. The most common mechanism of pill induced oesophageal mucosal injury is due to local acid or hyperosmolar mucosal burn resulting from pills being retained in the oesophagus.²⁰ Medication that has previously been described to cause pill oesophagitis by this mechanism, includes ascorbic acid, ferrous sulphate, potassium containing tablets and antibiotics such as doxycycline, tetracyclines and clindamycin. Nonsteroidal anti-inflammatory drugs, aspirin, bisphosphonates and chemotherapy agents such as paclitaxel have also been described to cause local mucosal burn.²⁰ Patients with PSs are always encouraged to crush their tablets and advised to ingest the crushed tablet with copious amounts of fluid to help prevent pill oesophagitis.

The corner stone in management of PSs remains usage of PPIs and endoscopic dilatation with either a bougie dilator or EBD, with no differences in safety and efficacy between the 2 types of dilation techniques.^{1-3,9,11,13,15-17,21,22} Previous literature has demonstrated an 80–90% clinical success rate amongst patients who are managed with these modalities. Our local success rates for the endoscopic treatment of PS are considerably lower at 60.8%. The minority of patients that remain symptomatic despite these treatment modalities require prolonged periods of dilatation due to chronic inflammation and fibrosis that cannot be easily mediated with expansile, transient radial and longitudinal forces applied during dilatation.¹⁰ These patients require early identification and risk stratification, with counselling regarding possible treatment duration and potential intervention complications.

Endoscopic dilatation with intralesional steroid injection using triamcinolone acetate is an alternative combination therapy for recalcitrant benign PSs.^{21,22} It is thought to inhibit inflammatory response, reducing collagen synthesis, fibrosis and chronic scarring.²² Steroid injection has been shown to reduce the number of required dilatations and increase the dysphagia free period.²² Triamcinolone acetate is unfortunately not available in South African state practice and our unit has had little success with alternative forms of available injectable steroids. Mitomycin C is an antineoplastic agent that has been used as an alternative or to supplement intralesional steroid injections, with positive outcomes reported predominantly in paediatric benign oesophageal strictures, but no definitive evidence presently exists for the use of Mitomycin C in adult patients.^{21,22}

Incisional therapy is a further alternative treatment option recommended for short, simple strictures.^{21,22} A maximum of

3 sessions of incisional therapy are recommended, after which alternatives should be considered if strictures persist.²² Short, fibrotic strictures as often seen with anastomotic strictures, lend themselves well to incisional therapy. However, in our prior experience the active inflammation usually present in PSs, does not readily avail itself to incisional therapy. While daily self-dilatation is reported as a successful alternative in refractory strictures, our institution only has one full set of bougie dilators and thus cannot accommodate sending patients home with these.²³ For these reasons, none of the above adjunctive therapies were used in this cohort.

Oesophageal stenting is a safe alternative modality for the management of benign PSs, usually recommended towards the end of the algorithm for the treatment of persistent strictures. Using SEMS is thought to increase the overall dilatation period of the stricture when compared to other dilatation alternatives; there is, however, no data to support this.^{21,22} SEMS are thought to reduce the rate of restricturing, by remodelling of the stricture while the stent is in place maintaining luminal patency.²² The stent is kept in place for 6–8 weeks but should not exceed 12 weeks to reduce the risk of mucosal ingrowth related to a hyperplastic tissue reaction.²² In our unit, oesophageal stenting was used as an alternative or in conjunction with bougie and sometimes balloon dilatation. When the index diameter of the stricture was deemed too narrow to allow for safe dilatation in a patient severely malnourished or frail (decided by the treating endoscopist), primary stenting was offered to avoid potential complications of stricture dilatation by bougie or EBD. Stenting was also offered as treatment progression following failed endoscopic dilatation in recalcitrant strictures. There was a 42% stricture resolution rate amongst the patients who were managed with oesophageal stents in this study thus making stenting a safe alternative bridging tool when other modalities of dilatation are not safe to perform. The literature demonstrates 35–45% clinical resolution rate amongst stented patients.²² Evidence shows that use of stenting reduces the number of dilatations and increases the dysphagia free periods.²² Care must be taken, though, when stenting distal benign strictures, as these tend to migrate in our experience and are often associated with worsening volume reflux when crossing the lower oesophageal sphincter.

The strength of this study is that there is no local data published previously regarding factors associated with recalcitrant PSs or the management thereof. Limitations are the retrospective nature of the study; it is a single institution review and that local restrictions have forced deviations from internationally recommended treatment algorithms for recalcitrant benign strictures. Furthermore, the study participant numbers are limited, making statistical inferences difficult. The retrospective nature of the data makes it difficult to understand why the recalcitrancy rate is so high. The data is captured in a prospectively-maintained endoscopy registry, but is unable to assess for ongoing risk factors, such as cigarette smoking or compliance (or lack thereof) to PPI therapy. Another major limitation is that the study offers no data on nutritional status in these patients, which anecdotally often seems very poor in these patients, but not objectively well assessed. This might be an important factor in explaining the high rate of recalcitrant strictures in this setting, and could be the focus of future research in benign oesophageal strictures. Future research could also investigate the role of surveillance upper gastrointestinal endoscopies in patients who have a combination of GORD and these risk factors and, if further studies show a similar

association between ARV use and stricture recalcitrancy, investigating specific ARV regimens might prove useful.

Conclusion

In conclusion, recalcitrant PSs continue to be an ongoing cause of morbidity locally with lower treatment success rates despite availability of most internationally recommended endoscopic treatment modalities. Younger age, presenting degree of dysphagia, requiring more than 3 dilatations, smaller index stricture diameter and use of ARVs were all significantly associated with stricture recalcitrancy. Identifying at-risk patients early will allow management modification to improve outcomes, which may include increased patient counselling on the need for prolonged treatment and realistic outcome expectations. With improved psychological preparation and patient insight, treatment adherence and follow-up may improve. In addition, this data will assist the unit with financial planning as treatment duration of the recalcitrant strictures is longer and may occasionally be associated with complications, thus these financial implications would have to be factored in during budget allocation.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

This study was approved by the University of Cape Town Human Research Ethics Committee (HREC 251/2021).

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REFERENCES

- Parasa S, Sharma P. Complications of gastro-oesophageal reflux disease. *Best Pract Res Clin Gastroenterol.* 2013;27(3):433-42. <https://doi.org/10.1016/j.bpg.2013.07.002>.
- Bansal A, Kahrilas PJ. Treatment of GERD complications (Barrett's, peptic stricture) and extra-oesophageal syndromes. *Best Pract Res Clin Gastroenterol.* 2010;24(6):961-8. <https://doi.org/10.1016/j.bpg.2010.09.007>.
- Ravich WJ. Endoscopic management of benign oesophageal strictures. *Curr Gastroenterol Rep.* 2017;19:1-8. <https://doi.org/10.1007/s11894-017-0591-8>.
- Desai M, Hamade N, Sharma P. Management of peptic strictures. *Am J Gastroenterol.* 2020;115(7):967-70. <https://doi.org/10.14309/ajg.0000000000000655>.
- Orive-Calzada A, Bernal-Martinez A, Navajas-Laboa M, et al. Efficacy of intralesional corticosteroid injection in endoscopic treatment of oesophageal strictures. *Surg Laparosc Endosc Percutan Tech.* 2012;22(6):518-22. <https://doi.org/10.1097/SLE.0b013e3182747b31>.
- Everett SM. Endoscopic management of refractory benign oesophageal strictures. *Ther Adv Gastrointest Endosc.* 2019;12:2631774519862134. <https://doi.org/10.1177/2631774519862134>.
- Kahalekar V, Gupta DT, Bhatt P, Shukla A, Bhatia S. Fully covered self-expanding metallic stent placement for benign refractory oesophageal strictures. *Indian J Gastroenterol.* 2017;36:197-201. <https://doi.org/10.1007/s12664-017-0764-2>.
- Van Boeckel PG, Siersema PD. Refractory oesophageal strictures: What to do when dilation fails. *Curr Treat Options Gastroenterol.* 2015;13(1):47-58. <https://doi.org/10.1007/s11938-014-0043-6>.
- Boregowda U, Goyal H, Mann R, et al. Endoscopic management of benign recalcitrant oesophageal strictures. *Ann Gastroenterol.* 2021;34(3):287-99.
- Rodrigues-Pinto E, Pereira P, Ribeiro A, et al. Risk factors associated with refractoriness to oesophageal dilatation for benign dysphagia. *Eur J Gastroenterol Hepatol.* 2016;28(6):684-8. <https://doi.org/10.1097/MEG.0000000000000594>.
- Van Boeckel PG, Vleggaar FP, Siersema PD. A comparison of temporary self-expanding plastic and biodegradable stents for refractory benign oesophageal strictures. *Clin Gastroenterol Hepatol.* 2011;9(8):653-9. <https://doi.org/10.1016/j.cgh.2011.04.006>.
- Vermeulen BD, de Zwart M, Sijben J, et al. Risk factors and clinical outcomes of endoscopic dilation in benign oesophageal strictures: A long-term follow-up study. *Gastrointest Endosc.* 2020;91(5):1058-66. <https://doi.org/10.1016/j.gie.2019.12.040>.
- Gkolfakis P, Siersema PD, Tziatzios G, Triantafyllou K, Papanikolaou IS. Biodegradable oesophageal stents for the treatment of refractory benign oesophageal strictures. *Ann Gastroenterol.* 2020;33(4):330-7. <https://doi.org/10.20524/aog.2020.0482>.
- Henskens N, Wauters L, Vanuysel T. Intralesional steroid injections in addition to endoscopic dilation in benign refractory oesophageal strictures: A systematic review. *Acta Gastroenterol Belg.* 2020;83(3):432-40. PMID: 33094591.
- Richardson T, Naidoo G, Rupasinghe N, Smart H, Bhattacharya S. Biodegradable stents in resistant peptic oesophageal stricture: Is it the right way to go? *Clin Med Insights Gastroenterol.* 2018;11:1179552218819492. <https://doi.org/10.1177/1179552218819492>.
- Lu Q, Lei T-T, Wang Y-L, et al. Development and validation of a model to determine risk of refractory benign oesophageal strictures. *World J Clin Cases.* 2019;7(13):1623. <https://doi.org/10.12998/wjcc.v7.i13.1623>.
- Oh YS, Kochman ML, Ahmad NA, Ginsberg GG. Clinical outcomes after self-expanding plastic stent placement for refractory benign oesophageal strictures. *Dig Dis Sci.* 2010;55:1344-8. <https://doi.org/10.1007/s10620-010-1134-4>.
- Earlam R, Cunha-Melo J. Benign oesophageal strictures: Historical and technical aspects of dilatation. *BJS.* 1981;68(12):829-36. <https://doi.org/10.1002/bjs.1800681202>.
- Dindo D, Demartines N, Clavien P-A. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg.* 2004;240(2):205-13. <https://doi.org/10.1097/01.sla.0000133083.54934.ae>.
- Tutuian R; Clinical Lead Outpatient S, Gastrointestinal Function L. Adverse effects of drugs on the oesophagus. *Best Pract Res Clin Gastroenterol.* 2010;24(2):91-7. <https://doi.org/10.1016/j.bpg.2010.02.005>.
- Fugazza A, Repici A. Endoscopic management of refractory benign oesophageal strictures. *Dysphagia.* 2021;36(3):504-16. <https://doi.org/10.1007/s00455-021-10270-y>.
- Siersema PD. How to approach a patient with refractory or recurrent benign oesophageal stricture. *Gastroenterology.* 2019;156(1):7-10. <https://doi.org/10.1053/j.gastro.2018.11.040>.
- Halland M, Prichard DO, Kahn A, Lavey CJ, Katzka DA, Alexander JA. Oesophageal self-dilation in benign refractory oesophageal strictures: Outcomes from a randomised controlled trial and a prospective observational study. *Dig Dis Sci.* 2024;69(8):2883-9. <https://doi.org/10.1007/s10620-024-08402-z>.

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References: 1. South African Medicine Price Registry. Database of Medicine Prices, 22 December 2025 [online]. [cited March 2026]. Available from: <https://www.health.gov.za/nhi-pee/>. 2. Monthly Index of Medical Specialities. February 2026;66 (No. 1):199-205. 3. Metz DC, Howden CW, Perez MC, et al. Clinical trial: dexlansoprazole MR, a proton pump inhibitor with dual delayed-release technology, effectively controls symptoms and prevents relapse in patients with healed erosive oesophagitis. *Aliment Pharmacol Ther.* 2009;29(7):742-54. doi: 10.1111/j.1365-2036.2009.03954.x. 4. Gąsiorowska A. The role of pH in symptomatic relief and effective treatment of gastroesophageal reflux disease. *Prz Gastroenterol.* 2017;12(4):244-249. doi: 10.5114/pg.2017.72097. 5. Frye JW, Peura DA. Managing gastroesophageal reflux disease - comparative efficacy and outcomes of dexlansoprazole MR. *Ther Clin Risk Manag.* 2015;11:1649-56. doi: 10.2147/TCRM.S66680. 6. Dexilant Professional Information, April 2024. 7. Sharma P, Shaheen NJ, Perez MC, et al. Clinical trials: healing of erosive oesophagitis with dexlansoprazole MR, a proton pump inhibitor with a novel dual delayed-release formulation—results from two randomized controlled studies. *Aliment Pharmacol Ther.* 2009;29(7):731-41. doi: 10.1111/j.1365-2036.2009.03933.x. 8. Fass R, Chey WD, Zakko SF, et al. Clinical trial: the effects of the proton pump inhibitor dexlansoprazole MR on daytime and nighttime heartburn in patients with non-erosive reflux disease. *Aliment Pharmacol Ther.* 2009;29(12):1261-72. doi: 10.1111/j.1365-2036.2009.04013.x.

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Diagnostic yield and appropriate use of an upper endoscopy service in a resource-constrained setting

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Background: Oesophagogastrroduodenoscopy (OGD) is an important diagnostic resource, but access remains limited in resource-constrained healthcare systems. Appropriate referral is therefore essential to maximise diagnostic yield while avoiding unnecessary use of limited endoscopic capacity. This study assessed the diagnostic yield and appropriateness of OGD referrals at a South African public-sector tertiary hospital.

Methods: A retrospective observational study was conducted of adults undergoing index diagnostic OGD at Groote Schuur Hospital between 26 March 2018 and 25 March 2022. Demographic characteristics, indications, urgency and endoscopic findings were obtained from a prospectively maintained endoscopy registry. Referral indications were assessed against predefined British Society of Gastroenterology (BSG) red-flag criteria. Endoscopic findings were categorised as normal, mild, significant or malignant, with malignancy requiring histopathological confirmation. Multivariable logistic regression was used to identify factors independently associated with confirmed malignancy and significant endoscopic findings.

Results: A total of 8 773 index diagnostic OGDs met the eligibility criteria. Among the 7 205 examinations for which appropriateness could be assessed, 80.2% met the BSG criteria. Complete endoscopic findings were available for 8 481 examinations; 18.6% were normal and 16.8% demonstrated significant non-malignant pathology. Of 406 examinations suspicious for malignancy, 323 were histologically confirmed (3.8% of the overall cohort). Older age and male sex were independently associated with malignancy. Dysphagia was the strongest indication associated with malignancy, with approximately eightfold higher odds, and was also independently associated with significant endoscopic pathology; weight loss and vomiting were additionally associated with malignancy.

Conclusion: This South African tertiary OGD service had a lower rate of normal examinations than reported internationally, while the malignancy detection rate was comparable. Dysphagia was the strongest clinical predictor of malignancy and significant endoscopic pathology. These findings provide a local baseline for OGD utilisation and support further evaluation and local validation of referral criteria.

Keywords: endoscopy, gastrointestinal, diagnostic yield, South Africa

Introduction

Oesophagogastrroduodenoscopy (OGD) is a critical diagnostic resource used in the evaluation of upper gastrointestinal symptoms and detection of malignancy. However, it remains a scarce and costly tool, particularly in resource-constrained environments such as South Africa, where equitable access to specialist services is limited.¹ Optimising the utilisation of OGD is vital to ensure timely diagnosis of serious pathology while maintaining cost-effectiveness and accessibility for a broader patient population.²

Gastric and oesophageal cancers are of particular concern. Globally, gastric cancer ranks fifth in incidence and fourth in cancer-related mortality, while oesophageal cancer is eighth in incidence and sixth in mortality.³ In South Africa, oesophageal and gastric cancers contribute substantially to the cancer burden.⁴ Early diagnosis is crucial, as it significantly improves patient outcomes; however,

symptomatology is often non-specific in the early stages, complicating the diagnostic process.⁵

International guidelines, such as those issued by the British Society of Gastroenterology (BSG), advocate for endoscopy in the presence of “red flag” symptoms, including dysphagia, unexplained weight loss, persistent vomiting, and iron-deficiency anaemia.⁶ These criteria are designed to prioritise high-risk individuals, ensuring that limited resources are directed toward those most likely to benefit. Nevertheless, these guidelines were developed in high-income settings and often assume the availability of advanced diagnostics and well-resourced healthcare systems, assumptions that may not hold in limited-resource settings, such as the public healthcare sector in South Africa.^{2,7-9}

Although South Africa is classified as an upper-middle-income country, substantial disparities exist between the public and private healthcare sectors.^{8,10,11} The public sector serves the majority of the population despite having

substantially fewer healthcare personnel and financial resources.^{7,10,12} The number of gastroenterologists is also limited, estimated at 0.12 per 100 000 population compared with 1.41 in the United Kingdom and 3.9 in the United States, and below the recommended minimum of 0.22.^{8,11} Endoscopy infrastructure is similarly constrained, with services concentrated predominantly in urban centres and some units reliant on ageing or donated equipment.⁹

These constraints contribute to the development of “closed” referral systems, where patients are triaged through specialist review before endoscopy is scheduled. While this structure supports quality control and efficiency, it may also delay access. In contrast, “open access” systems used in higher-income countries, allow direct referrals by primary physicians, potentially increasing throughput but at the risk of higher rates of inappropriate procedures.¹³

International studies have shown that rates of normal endoscopy range from 16.8–53.2%,^{13–16} with appropriateness of referral varying widely depending on the system used. While some studies from Europe and Asia report malignancy detection rates between 1.7% and 5.2%,^{14,16} no such data currently exist from South Africa. The lack of locally validated guidelines or standardised referral pathways further complicates evaluation of service efficiency and appropriateness.

This study therefore aimed to assess the diagnostic yield and appropriateness of OGD referrals at a South African public tertiary-level hospital, using BSG red-flag criteria as an international benchmark rather than as locally validated criteria.⁶ We evaluated the proportion of normal endoscopies, the rate of histologically confirmed malignancy, and the association between referral indications and significant endoscopic findings. The findings were intended to provide a local baseline against which future referral pathways and locally appropriate criteria for prioritising OGD can be evaluated in resource-constrained settings.

Methods

Study design and setting

This was a retrospective observational study of adult patients undergoing index diagnostic OGD at Groote Schuur Hospital in Cape Town, South Africa, one of two major public-sector tertiary academic hospitals serving a catchment population of approximately 4.8 million people.¹⁷ The study period extended over four years, from 26 March 2018 to 25 March 2022. The manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.¹⁸

Patient selection

All adults aged 18 years or older who underwent an index diagnostic OGD through either the surgical or medical gastroenterology services during the study period were eligible for inclusion. Repeat and surveillance examinations, therapeutic or planned interventional procedures, and records with incomplete demographic or procedural data were excluded from the analysis.

Data collection

Data were extracted from the Groote Schuur Hospital Upper Gastrointestinal Surgery Registry, a prospectively

maintained and ethically approved endoscopy registry (HREC R031/2015). This study received additional ethical approval from the University of Cape Town Human Research Ethics Committee (HREC 778/2022). No direct patient contact occurred, and all data were anonymised prior to analysis.

Collected variables included age, sex, urgency of procedure (emergent, urgent, elective), endoscopic indication, and procedural findings. Where biopsies were taken, histopathology results were obtained from the National Health Laboratory Service (NHLS) database. For patients who underwent multiple biopsies, all available reports were reviewed to confirm or exclude malignancy.

Classification of indications and findings

The appropriateness of each recorded indication for OGD was assessed retrospectively against the BSG guidance on indications for diagnostic upper gastrointestinal endoscopy.⁶ An indication was classified as appropriate when it met one or more of the specified BSG criteria, including dysphagia; unexplained upper abdominal pain with weight loss; an upper abdominal mass with or without dyspepsia; persistent vomiting with weight loss; unexplained weight loss; iron deficiency anaemia; unexplained worsening dyspepsia; unexplained and persistent recent-onset dyspepsia in patients over 55 years of age; persistent long-term reflux; or dyspepsia unresponsive to six weeks of treatment in primary care. These criteria were used as an international benchmark and were not considered to represent locally validated South African referral criteria.

Endoscopic findings were categorised as normal, mild, significant or malignant. A normal examination was defined as one in which no abnormality was identified. Mild findings comprised non-serious abnormalities, including gastritis, oesophagitis and hiatus hernia. Significant findings comprised clinically important non-malignant pathology, including ulcers, strictures and varices. Malignant findings were defined as lesions considered suspicious for malignancy at endoscopy and subsequently confirmed histologically.

The appropriateness assessment was based on the indication recorded in the registry and the predefined BSG criteria. Formal assessment of inter-rater variability was not performed.

Data analysis

Data were analysed using Microsoft Excel and IBM SPSS Statistics, version 30.0.0.0. Descriptive statistics were used to summarise demographic and clinical characteristics. Continuous variables were expressed as means with standard deviations or medians with interquartile ranges, according to the distribution of the data.

Univariate analyses were performed to identify factors associated with confirmed malignancy and with significant endoscopic findings. Pearson’s chi-square test or Fisher’s exact test was used, as appropriate. Variables demonstrating an association with the outcome at a *p*-value of < 0.10 on univariate analysis were subsequently entered into multivariable logistic regression models. The results of the logistic regression analyses were expressed as odds ratios with 95% confidence intervals and corresponding *p*-values. A two-sided *p*-value of < 0.05 was considered statistically significant.

Results

During the 48-month study period, 8 773 index OGDs met the eligibility criteria. The demographic characteristics, appropriateness of indications and urgency of procedures are summarised in Table I. The cohort had a median age of 55 years and comprised slightly more women than men. Among the 7 205 examinations for which appropriateness could be assessed, the majority met the predefined BSG red flag criteria. Elective procedures constituted the largest proportion of examinations, followed by urgent and emergent procedures.

Endoscopic findings are presented in Table II. Of the 8 481 examinations with complete recorded findings, most demonstrated mild abnormalities, while approximately one in five examinations was normal. Significant non-malignant pathology was identified in a smaller proportion of examinations. Endoscopic examination raised suspicion of malignancy in 406 patients, of which histopathological assessment confirmed malignancy in 323 patients (3.8% of the overall cohort).

Multivariable analyses of factors associated with confirmed malignancy are shown in Table III. Patients with malignancy were older and more likely to be male than those without malignancy. Among the recorded indications, dysphagia was the strongest independent predictor of malignancy. Weight loss and vomiting were also independently associated with malignancy, whereas atypical chest pain and dyspepsia were associated with a lower likelihood of malignancy after adjustment. Other recorded indications did not demonstrate an independent association with malignancy.

Factors associated with significant endoscopic findings, including malignancy, are shown in Table IV. Older age and

male sex were independently associated with significant pathology. Dysphagia and upper gastrointestinal bleeding (UGIB) were the principal indications associated with an increased likelihood of significant findings. In contrast, atypical chest pain, diarrhoea, dyspepsia and epigastric pain were independently associated with a lower likelihood of significant pathology. Weight loss, reflux, surveillance and vomiting were not independently associated with significant findings after adjustment.

Discussion

To our knowledge, this is the first study to describe the diagnostic yield, appropriateness of referral and malignancy detection rate of an upper gastrointestinal endoscopy service in a South African public-sector tertiary hospital. Data from other African settings assessing the appropriateness of OGD referrals are limited. In this cohort, 80.2% of indications that could be assessed met the predefined BSG red-flag criteria. This was substantially higher than the 40–46% reported from the Netherlands and Italy, but comparable to rates reported from Portugal (82.7%) and Malaysia (88.3%).^{13–16}

These differences should be interpreted cautiously because definitions of an appropriate referral and referral pathways vary between healthcare systems. The Dutch and Italian studies were conducted in open-access systems, in which primary care practitioners can refer patients directly for endoscopy, potentially increasing the proportion of inappropriate examinations.^{14,16} Conversely, specialist-mediated or “closed” referral systems may improve prioritisation but can also restrict access to patients whose symptoms are less specific. Thus, a high proportion of appropriate referrals cannot, by itself, be regarded as evidence of optimal utilisation. The objective is to balance avoidance of unnecessary procedures with timely investigation of patients with clinically important disease.

The lower rate of normal examinations in our cohort is relevant in this context. Only 18.6% of examinations were normal, compared with 36.1% in the Netherlands, 49.3% in Malaysia, 53.0% in Italy and 82.7% in Portugal.^{13–16} A Ghanaian study reported a normal endoscopy rate of 41.4%.¹⁹ Our lower rate, together with the high proportion of referrals meeting BSG criteria, may indicate effective selection of patients at higher risk of significant pathology. However, an alternative explanation is that patients with less severe or less specific symptoms may not reach endoscopy because of restricted access. South African patients may face substantial barriers including geographical distance from endoscopy services, transport costs, limited access to primary healthcare and complex referral pathways, with considerable differences in endoscopic availability between provinces.^{7,9,20} Consequently, the observed endoscopy population cannot be assumed to represent all patients in the catchment population who might potentially benefit from OGD.

This distinction is important because the study cannot determine whether patients who did not undergo endoscopy subsequently had significant pathology. The low normal-endoscopy rate should therefore not be interpreted simply as evidence of efficient triage, nor as evidence that the service is failing to investigate sufficient patients. The study period also included the COVID-19 pandemic, when less urgent procedures were frequently deferred or cancelled, potentially altering the pattern of referrals and findings. These factors limit the extent to which the observed normal-endoscopy rate can be regarded as representative of routine practice.

Table I: General demographics, endoscopy indications and urgency

Variable		
Age (n = 8425)		
Median age (IQR), years	55 (42–67)	
Sex (n = 8739)	n	%
Female	5 021	57.46
Male	3 718	42.54
Indication appropriate (n = 7205)		
Yes	5 776	80.17
No	1 429	19.83
Urgency (n = 8655)		
Elective	4 834	55.85
Urgent	2 218	25.63
Emergent	1 603	18.52

IQR – interquartile range. Percentages are calculated using the number of patients with available data for each variable. Age was unavailable for 348 patients, sex for 34 patients and urgency for 118. Appropriateness could be assessed in 7 205 patients with a recorded indication.

Table II: Distribution of endoscopic findings by category

Category	n	%
Normal	1 581	18.64
Mild	5 153	60.76
Significant	1 424	16.79
Malignant (histology proven)	323	3.81
Total *	8 481	100

*Endoscopic findings were unavailable or incompletely recorded for 292 of the 8 773 eligible examinations.

Table III: Multivariable analysis of demographic characteristics and endoscopy indications associated with malignancy

		Malignancy		No malignancy		<i>p</i> -value	Adjust <i>p</i> -value	Adjusted OR ^c (95% CI)
Demographics ^a (<i>n</i> = 8 425)								
Age (median [IQR])		62 (53–69) years		55 (41–66) years		< 0.001	< 0.001	1.03 (1.02–1.04)
		<i>n</i>	%	<i>n</i>	%			
Sex	Female	122	2.5	4724	97.5			
	Male	198	5.5	3 381	94.5	< 0.001	< 0.001	2.40 (1.85–3.11)
Indication for endoscopy ^b (<i>n</i> = 7 552)								
Anaemia	No (<i>n</i> = 6 227)	248	4.0	5 979	96.0	0.006	0.146	
	Yes (<i>n</i> = 1 325)	32	2.4	1 293	97.6			
Atypical chest pain	No <i>n</i> = 7 221)	278	3.8	6 943	96.2	0.002	0.019	0.18 (0.05–0.76)
	Yes (<i>n</i> = 331)	2	0.6	329	99.4			
Diarrhoea	No (<i>n</i> = 7 439)	279	3.8	7 160	96.2	0.110		
	Yes (<i>n</i> = 113)	1	0.9	112	99.1			
Dyspepsia	No (<i>n</i> = 5 434)	254	4.6	5 230	95.4	< 0.001	0.001	0.463 (0.29–0.74)
	Yes (<i>n</i> = 2 068)	26	1.3	2 042	98.7			
Dysphagia	No (<i>n</i> = 6 976)	171	2.5	6 805	97.5			
	Yes (<i>n</i> = 576)	109	18.9	467	81.1	< 0.001	< 0.001	7.64 (5.46–10.70)
Epigastric pain	No (<i>n</i> = 6 597)	261	4.0	6 336	96.0	0.003	0.195	
	Yes (<i>n</i> = 955)	19	2.0	936	98.0			
LOW ^d	No (<i>n</i> = 7 257)	260	3.6	6 997	96.4	0.004	0.013	1.94 (1.15–3.29)
	Yes (<i>n</i> = 295)	20	6.8	275	93.2			
Reflux	No (<i>n</i> = 7 453)	276	3.7	7 177	96.3	0.860		
	Yes (<i>n</i> = 99)	4	4.0	95	96.0			
Surveillance	No (<i>n</i> = 6 980)	264	3.8	6 716	96.2	0.231		
	Yes (<i>n</i> = 572)	16	2.8	556	97.2			
UGIB ^e	No (<i>n</i> = 6 471)	239	3.7	6 232	96.3	0.873		
	Yes (<i>n</i> = 1 081)	41	3.8	1 040	96.2			
Vomiting	No (<i>n</i> = 7 415)	270	3.6	7 145	96.4	0.025	< 0.001	3.31 (1.63–6.71)
	Yes (<i>n</i> = 137)	10	7.3	127	92.7			

^aExcluding 348 records with incomplete data, ^bExcluding 1 221 incomplete records, ^cAdjusted p-value and adjusted odds ratio from multivariable logistic regression only for variables that remained statistically significant, ^dLOW – loss of weight, ^eUGIB – upper gastrointestinal bleeding

Despite the lower normal-endoscopy rate, the confirmed malignancy rate of 3.8% was similar to that reported in other international studies.^{14,16} This is noteworthy because a lower proportion of normal examinations might be expected to result in a higher proportion of detected malignancies if additional examinations were being directed towards high-risk patients. The finding may reflect effective selection of patients with significant disease, differences in the underlying prevalence of malignancy, or differences in the classification of endoscopic findings between studies. For example, the Malaysian study classified minor abnormalities as a negative or normal result.¹⁴ Such differences make direct comparison of diagnostic yield between healthcare systems problematic.

As in previous studies, older age and male sex were independently associated with malignancy.^{14,16} Smoking could not be assessed because of inconsistent recording in the registry. This is an important limitation because smoking is an established risk factor for upper gastrointestinal malignancy and is also associated with other pathology, including refractory peptic ulcer disease and peptic strictures. Future registry development should therefore incorporate

consistent recording of smoking and other relevant clinical variables.

The strongest indication associated with malignancy was dysphagia, with approximately eightfold higher adjusted odds of malignancy compared with patients without dysphagia (OR 7.64, 95% CI 5.46–10.70). Almost one in five patients presenting with dysphagia had confirmed malignancy, compared with 2.5% of those without dysphagia. Dysphagia was also independently associated with significant endoscopic pathology. This strong association supports dysphagia as an important prioritising symptom when endoscopic capacity is limited. Its association with malignancy is consistent with its established role as an alarm symptom.²¹ Weight loss was also independently associated with malignancy, while the association with vomiting was less expected and should be interpreted cautiously until confirmed in other cohorts. When significant endoscopic findings, including malignancy, were considered as the outcome, dysphagia and UGIB were independently associated with significant pathology. This is clinically plausible, given the association of both symptoms with important structural and mucosal disease. Conversely,

Table IV: Multivariable analysis of factors associated with significant endoscopic findings, including malignancy

		Significant		Not significant		<i>p</i> -value	Adjust <i>p</i> -value ^c	Adjusted (95%CI)	OR ^a
Demographics ^a (<i>n</i> = 8425)									
Age (median [IQR])		59 (47–69) years		55 (41–66) years		< 0.001	< 0.001	1.01 (1.01–1.02)	
		<i>n</i>	%	<i>n</i>	%				
Sex	Female	817	16.9%	4029	83.1%	< 0.001	< 0.001	1.60 (1.42–1.80)	
	Male	919	25.7%	2660	74.3%				
Indication for endoscopy ^b (<i>n</i> = 7 552)									
Anaemia	No (<i>n</i> = 6 227)	1 275	20.5%	4952	79.5%	0.131			
	Yes (<i>n</i> = 1 325)	247	18.6%	1078	81.4%				
Atypical chest pain	No (<i>n</i> = 7 221)	1 478	20.5%	5743	79.5%	0.001	0.008	0.64 (0.46–0.89)	
	Yes(<i>n</i> = 331)	44	13.3%	287	86.7%				
Diarrhoea	No (<i>n</i> = 7 439)	1 516	20.4%	5923	79.6%	< 0.001	0.001	0.26 (0.11–0.59)	
	Yes (<i>n</i> = 113)	6	5.3%	107	94.7%				
Dyspepsia	No(<i>n</i> = 5 434)	1 294	23.6%	4190	76.4%	< 0.001	< 0.001	0.56 (0.47–0.67)	
	Yes (<i>n</i> = 2 068)	228	11.0%	1840	89.0%				
Dysphagia	No (<i>n</i> = 6 976)	1 318	18.9%	5658	81.1%	< 0.001	< 0.001	2.37 (1.93–2.90)	
	Yes (<i>n</i> = 576)	204	35.4%	372	64.6%				
Epigastric pain	No (<i>n</i> = 6 597)	1 382	20.9%	5215	79.1%	< 0.001	0.017	0.78 (0.63–0.96)	
	Yes (<i>n</i> = 955)	140	14.7%	815	85.3%				
LOW ^d	No (<i>n</i> = 7 257)	1 452	20.0%	5805	80.0%	0.118			
	Yes (<i>n</i> = 295)	70	23.7%	225	76.3%				
Reflux	No (<i>n</i> =7 453)	1 512	20.3%	5941	79.7%	0.012	0.052		
	Yes (<i>n</i> = 99)	10	10.1%	89	89.9%				
Surveillance	No (<i>n</i> = 6 980)	1 422	20.4%	5558	79.6%	0.098			
	Yes (<i>n</i> = 572)	100	17.5%	472	82.5%				
UGIB ^e	No (<i>n</i> = 6 471)	1 084	16.8%	5387	83.2%	< 0.001	< 0.001	2.73 (2.33–3.21)	
	Yes (<i>n</i> = 1 081)	438	40.5%	643	59.5%				
Vomiting	No (<i>n</i> = 7 415)	1 487	20.1%	5928	79.9%	0.112			
	Yes (<i>n</i> = 137)	35	25.5%	102	74.5%				

Multivariate analysis of demographics and endoscopy indication for association of significant findings (including malignancy) on endoscopy. ^aExcluding 348 records, with incomplete demographic data, ^bExcluding 1 221 incomplete records, ^cAdjusted *p*-value and adjusted odds ratio from multivariable logistic regression only for variables that remained statistically significant, ^dLOW – loss of weight, ^eUGIB – upper gastrointestinal bleeding

atypical chest pain, diarrhoea, dyspepsia and epigastric pain were independently associated with a lower likelihood of significant findings. The Ghanaian study similarly reported a negative association between dyspepsia and significant findings, as did the Portuguese study, while the other negative associations observed in our cohort have not been consistently reported in the comparable literature.^{15,19}

These findings should not be interpreted as suggesting that patients with non-red-flag symptoms should be denied endoscopy. Dyspepsia, epigastric pain and other non-specific symptoms remain common clinical presentations, and the absence of a BSG red-flag symptom does not exclude significant pathology.⁶ Rather, the findings support the use of clinical characteristics to prioritise limited endoscopic capacity while recognising that clinical judgement remains essential. The BSG criteria were developed in a different healthcare environment and were used in this study as an international benchmark, not as validated South African referral criteria.

The principal limitation of this study is the retrospective use of registry data, with incomplete information requiring different analytic denominators. Age was unavailable for 348 patients, sex for 34, endoscopic findings for 292 examinations and indication data for 1 221 examinations. These missing

data may introduce selection bias if incomplete recording was related to the indication, patient characteristics or endoscopic findings. Appropriateness was also assessed retrospectively from the recorded indication against predefined BSG criteria, without formal assessment of inter-rater variability. In addition, the registry included multiple endoscopists with differing levels of experience, potentially introducing variability in the recognition and recording of findings. These limitations highlight the importance of improving prospective data capture; mandatory fields for demographic, indication and procedural information are planned for the registry.

The study nevertheless provides an important local baseline. The combination of a relatively low normal-endoscopy rate, an 80.2% rate of indications meeting the predefined BSG criteria and a malignancy detection rate comparable with international reports suggests that the tertiary service is receiving a population enriched for clinically relevant pathology. Whether this represents optimal utilisation cannot be determined from diagnostic yield alone, because the study does not capture patients who were referred but did not undergo endoscopy. Future prospective and multicentre South African studies should therefore examine both patients undergoing OGD and

those excluded or not referred and should evaluate whether international red-flag criteria adequately identify significant pathology in the local healthcare environment.

Conclusion

This study demonstrated a lower proportion of normal OGDs than reported in most comparable international studies, while the rate of confirmed malignancy was similar. Most indications that could be assessed met the predefined BSG red-flag criteria, and dysphagia was the strongest indication associated with malignancy and significant endoscopic pathology.

There is unlikely to be a single “ideal” normal OGD rate applicable to all healthcare systems. In South Africa, the appropriate balance will depend on disease prevalence, referral pathways, endoscopic capacity and access to alternative investigations. The present findings provide a baseline for future local and multicentre studies aimed at determining how international referral criteria can best be adapted and validated for the South African and wider African context.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

This study was approved by the University of Cape Town Human Research Ethics Committee (HREC 778/2022). No direct patient contact occurred, and all data were anonymised prior to analysis.

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REFERENCES

- Thomson S, Hair C, Oyeleke GK. Outside the training paradigm: Challenges and Solutions for endoscopy provision in resource-limited settings. *Tech Innov Gastrointest Endosc.* 2024;26(3):270-82. <https://doi.org/10.1016/j.tige.2024.06.002>.
- Menachem T, Decker GA, Evans JA, et al; American Society for Gastrointestinal Endoscopy. Appropriate use of GI endoscopy. *Gastrointest Endosc.* 2012;75(6):1127-31. <https://doi.org/10.1016/j.gie.2012.01.011>.
- World Health Organization. The Global Cancer Observatory. Available from: <https://gco.iarc.fr/today/data/factsheets/cancers/7-Stomach-fact-sheet.pdf>. Accessed 14 June 2023.
- Statistics South Africa. Cancer in South Africa, 2008-2019. Pretoria: Statistics South Africa; 2023. Report No. 03-08-00.
- Talley NJ, Vakil NB, Moayyedi P. American Gastroenterological Association technical review on the evaluation of dyspepsia. *Gastroenterology.* 2005;129:1756-80. <https://doi.org/10.1053/j.gastro.2005.09.020>.
- British Society of Gastroenterology, The Association of Coloproctology of Great Britain and Ireland; Association of Upper Gastrointestinal Surgeons of Great Britain and Ireland. Guidance on the indications for diagnostic upper GI endoscopy, flexible sigmoidoscopy and colonoscopy. December 2019. Available from: www.bsg.org.uk/clinical-resource on 12 September 2022.
- Loots E, Clarke DL, Newton K, Mulder CJ. Endoscopy services in KwaZulu-Natal Province, South Africa, are insufficient for the burden of disease: Is patient care compromised? *S Afr Med J.* 2017;107(11):1022-5. <https://doi.org/10.7196/SAMJ.2017.v107i11.12484>.
- Perl D, Leddin D, Bizos D, et al. Endoscopic capacity in West Africa. *Afr Health Sci.* 2016;16(1):329-38. <https://doi.org/10.4314/ahs.v16i1.44>.
- Watermeyer G, Van Wyk ME, Goldberg PA. Audit of provincial gastroenterology services in the Western Cape. *S Afr J Surg.* 2008;46(3):68-72. PMID: 18807301.
- Mayosi BM, Benatar SR. Health and health care in South Africa - 20 years after Mandela. *N Engl J Med.* 2014;371(14):1344-53. <https://doi.org/10.1056/NEJMs1405012>.
- Okorafor OA. National Health Insurance reform in South Africa: Estimating the implications for demand for private health insurance. *Appl Health Econ Health.* 2012;10(3):189-200. <https://doi.org/10.2165/11594830-000000000-00000>.
- Padarath AKJ, Mackie E, Casciola J. South African Health Review. Durban: Health Systems Trust, 2016.
- Chan YM, Goh KL. Appropriateness and diagnostic yield of OGD: A prospective study in a large Asian hospital. *Gastrointest Endosc.* 2004;59:517-24. [https://doi.org/10.1016/S0016-5107\(04\)00002-1](https://doi.org/10.1016/S0016-5107(04)00002-1).
- Manes G, Balzano A, Marone P, Lionello M, Mosca S. Appropriateness and diagnostic yield of upper gastrointestinal endoscopy in an open-access endoscopy system: A prospective observational study based on the Maastricht guidelines. *Aliment Pharmacol Ther.* 2002;16:105-10. <https://doi.org/10.1046/j.1365-2036.2002.01136.x>.
- Mangualde J, Cremers MI, Vieira AM, et al. Appropriateness of outpatient gastrointestinal endoscopy in a non-academic hospital. *World J Gastrointest Endosc.* 2011;3:195-200. <https://doi.org/10.4253/wjge.v3.i10.195>.
- Crouwel F, Meurs-Szojda MM, Klemm-Kropp M, Fockens P, Grasman ME. The diagnostic yield of open-access endoscopy of the upper gastrointestinal tract in the Netherlands. *Endosc Int Open.* 2018;6(4):E383-E394. <https://doi.org/10.1055/s-0043-123185>.
- World Population Review. Available from: <https://worldpopulationreview.com/world-cities/cape-town-population>. Accessed 12 July 2023.
- Vandenbroucke JP, von Elm E, Altman DG, et al.; STROBE initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and elaboration. *Ann Intern Med.* 2007;147(8):W163-94. <https://doi.org/10.7326/0003-4819-147-8-200710160-00010-w1>.
- Dakubo JC, Clegg-Lamprey JN, Sowah P. Appropriateness of referrals for upper gastrointestinal endoscopy. *West Afr J Med.* 2011;30(5):342-7. PMID: 22752822.
- Nel D, Omar M, Chinnery G, Jonas E. Disparity in oesophageal cancer management in South Africa: A comparison between two tertiary centres with special focus on the palliation of dysphagia. *S Afr J Surg.* 2019;57(2):10-5. <https://doi.org/10.17159/2078-5151/2019/v57n2a2842>.
- Fransen GA, Janssen MJ, Muris JW, Laheij RJ, Jansen JB. Meta-analysis: The diagnostic value of alarm symptoms for upper gastrointestinal malignancy. *Aliment Pharmacol Ther.* 2004;20(10):1045-52. <https://doi.org/10.1111/j.1365-2036.2004.02251.x>.

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Predictors of intermediate and long-term survival in gastric variceal bleeding

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Background: Prognostic scores guide management of variceal haemorrhage, but comparative predictive data for intermediate and longterm survival in acute gastric variceal bleeding (GVB) are limited. This study evaluated the predictive value of Child-Pugh, MELD, MELD-Na and APACHE II scores for 90-day, 1, 3 and 5-year survival after acute GVB.

Methods: A retrospective cohort of 88 adults with endoscopically confirmed GVB treated between 1 January 1995 and 31 December 2024 at a tertiary referral centre was analysed. Scores were calculated from admission data. Primary endpoints were allcause mortality at 90 days, 1, 3 and 5 years. Cox proportional hazards regression and Kaplan-Meier analyses were performed.

Results: The 88 patients (56 men, 32 women), mean age 48.1 years (± 15.9), had an index admission mortality of 13.6%. Cumulative mortality at 90 days, 1, 3 and 5-years was 21.6%, 31.8%, 46.6% and 51.1%. Thresholds of Child-Pugh ≥ 10 , MELD ≥ 20 , MELD-Na ≥ 25 and APACHE II ≥ 20 identified patients at high risk of mortality. APACHE II was consistently associated with mortality across all time horizons (HR 1.59 at 90 days; HR 1.48 at 5 years), with the largest hazard ratios among the evaluated prognostic scores in this cohort. Clinical predictors of poor outcome included balloon tamponade, endotracheal intubation, and high transfusion requirements. Biochemical markers (hyponatraemia, hyperbilirubinaemia, elevated creatinine) further stratified risk. Patients with lower threshold scores (Child-Pugh A, MELD < 20 , MELD-Na < 25 , APACHE II < 20) had significantly better survival.

Conclusion: Prognostic thresholds of Child-Pugh ≥ 10 , MELD ≥ 20 , MELD-Na ≥ 25 and APACHE II ≥ 20 reliably stratify risk in acute GVB. APACHE II, by capturing systemic illness severity, demonstrated the strongest observed association with mortality across short- and long-term follow-up in this cohort. Integration of physiological and liver-specific scoring into clinical decision-making may improve triage, guide early salvage interventions, and enhance survival in this high-risk population.

Keywords: portal hypertension, gastric variceal bleeding, prognostic scores, survival, risk stratification

Introduction

Gastric varices (GV) occur in 20% of patients with portal hypertension either in isolation or in combination with oesophageal varices.¹ Although GVs account for only 10–15% of variceal bleeding cases, the clinical course is characteristically more severe with profuse bleeding, higher transfusion requirements and rebleeding rates, frequently requiring multiple endoscopic and salvage interventions with consequent long-term mortality rates as high as 30%.^{2,3} The complexity of management relates to two inter-related issues: gastric varices differ from oesophageal varices in their vascular anatomy and blood flow haemodynamics,⁴ and underlying spontaneous portosystemic shunts result in higher rebleeding rates and influence the type of endoscopic intervention required.⁴ Standard endoscopy tends to underestimate true GV prevalence, making accurate endoscopic identification of high-risk subcategories crucial for optimal management.⁵

The optimal treatment for acute gastric variceal bleeding (GVB) as endorsed by the American Society of

Gastrointestinal Endoscopy (ASGE),⁵ the National Institute for Health and Clinical Excellence (NICE),⁶ and the American Association for the Study of Liver Diseases (AASLD) practice guidelines⁷ recommend targeted endoscopic control after initial resuscitation. The Sarin anatomical classification identifies different bleeding risks according to gastric location which has important clinical implications: gastric variceal band ligation is used in Gastro-Oesophageal Varices type 1 (GOV1) varices while cyanoacrylate injection is effective in GOV1 and Isolated Gastric Varices type 1 (IGV1) subcategories.^{8–10} Endoscopic ultrasound-guided cyanoacrylate injection has recently emerged with improved success rates and lower rebleeding.¹¹ When conventional methods fail, emergency transjugular intrahepatic portosystemic shunt (TIPS) or balloon-occluded retrograde transvenous obliteration (BRTO) are salvage options, with surgical intervention as the final resort.^{12–14}

Contemporary series report variable rates of initial haemostasis, recurrent bleeding and need for salvage interventions.^{9,15–17} Limited consensus exists on risk

stratification for early aggressive therapy or prioritising candidates for definitive procedures. In both resource-constrained and tertiary settings, clinicians rely on prognostic scores to guide management.¹⁸⁻¹⁹ The Child-Pugh (C-P) classification and Model for End-Stage Liver Disease (MELD) scores quantify hepatic dysfunction, MELD sodium (MELD-Na) incorporates hyponatraemia for refined mortality prediction, while Acute Physiology and Chronic Health Evaluation II (APACHE II) adds prognostic information in critically ill patients.^{18,19} Despite routine use in oesophageal variceal bleeding, comparative data on the performance of these scores specifically in acute gastric variceal haemorrhage and their ability to predict intermediate and long-term survival are sparse.

In the absence of a dedicated prognostic score for acute GVB, this analysis evaluates the predictive values of C-P, MELD, MELD-Na and APACHE II scores for intermediate (90-day, 1 year) and long-term (3 and 5 year) survival after endoscopic intervention, in order to identify prognostic scoring threshold levels to aid risk stratification and therapeutic decision-making in this high-risk population.

Methods

This retrospective cohort study analysed consecutive adult patients with life-threatening GVB treated in the Surgical Gastroenterology Unit (SGU) at Groote Schuur Hospital and the University of Cape Town Academic Hospital in the 30-year period between 1 January 1995 and 31 December

2024. Patient follow-up data collection continued until 30 April 2026. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting observational studies.²⁰ Inclusion criteria for the study were (1) age over 18 years; (2) endoscopically proven confirmation of variceal bleeding; (3) the index endoscopic intervention and all subsequent endoscopic procedures were undertaken in the SGU. Exclusion criteria for the study were (1) age under 18 years; (2) prior liver transplantation; (3) prior surgical shunt, splenectomy, or operative intervention for variceal bleeding; (4) prior TIPS, splenic embolisation or radiological intervention for variceal bleeding.

The anonymised and de-identified electronic medical information was retrieved from a prospectively maintained faculty ethics approved RedCap variceal registry. Data relating to baseline demographics, aetiology of portal hypertension, clinical and endoscopic information and biochemical variables and outcome were analysed (Table I). Sarin's classification was used to categorise the GVs.⁸ C-P score and grade (A, B, or C), MELD, MELD-Na scores and APACHE II scores were calculated and used to grade the severity of the underlying liver disease. Patient age, sex, aetiology of cirrhosis, concomitant hepatocellular carcinoma, C-P grade, presentation of active bleeding, type of GVs, C-P score and MELD scores were considered as potential confounders for comparison.

Table I: Baseline characteristics of the cohort according to 90-day mortality status

Risk Factors	Total cohort (n = 88) ¹	Died < 90d (n = 19) ¹	Survived ≥ 90d (n = 69) ¹	p-value ²
Age, mean (SD)	48.1 (15.9)	50.7 (16.4)	47.4 (15.9)	0.4
Male	56 (63.6%)	12 (63.2%)	44 (63.8%)	> 0.9
Female	32 (36.4%)	7 (36.8%)	25 (36.2%)	
Units blood transfused, median (range)	4.0 (4.0–6.0)	6.0 (6.0–8.0)	4.0 (4.0–5.0)	< 0.001
Balloon tube: Yes	7 (8.0%)	7 (36.8%)	0 (0.0%)	< 0.001
Balloon tube: No	81 (92.0%)	12 (63.2%)	69 (100.0%)	
Endotracheal intubation: Yes	9 (10.2%)	9 (47.4%)	0 (0.0%)	< 0.001
Endotracheal intubation: No	79 (89.8%)	10 (52.6%)	69 (100.0%)	
Na ≤ 130 mmol	23 (26.1%)	15 (78.9%)	8 (11.6%)	< 0.001
Na > 130 mmol	65 (73.9%)	4 (21.1%)	61 (88.4%)	
Creatinine ≥ 120 µmol/L	11 (12.5%)	11 (57.9%)	0 (0.0%)	< 0.001
Creatinine < 120 µmol/L	77 (87.5%)	8 (42.1%)	69 (100.0%)	
Bilirubin ≥ 51 µmol/L	22 (25.0%)	13 (68.4%)	9 (13.0%)	< 0.001
Bilirubin < 51 µmol/L	66 (75.0%)	6 (31.6%)	60 (87.0%)	
Child-Pugh A	27 (30.7%)	0 (0.0%)	27 (39.1%)	< 0.001
Child-Pugh B	34 (38.6%)	4 (21.1%)	30 (43.5%)	
Child-Pugh C	27 (30.7%)	15 (78.9%)	12 (17.4%)	
Child-Pugh score < 10	61 (69.3%)	4 (21.1%)	57 (82.6%)	< 0.001
Child-Pugh score ≥ 10	27 (30.7%)	15 (78.9%)	12 (17.4%)	
MELD < 20	75 (85.2%)	7 (36.8%)	68 (98.6%)	< 0.001
MELD ≥ 20	13 (14.8%)	12 (63.2%)	1 (1.4%)	
MELD-Na < 25	75 (85.2%)	7 (36.8%)	68 (98.6%)	< 0.001
MELD-Na ≥ 25	13 (14.8%)	12 (63.2%)	1 (1.4%)	
APACHE II < 20	78 (88.6%)	10 (52.6%)	68 (98.6%)	< 0.001
APACHE II ≥ 20	10 (11.4%)	9 (47.4%)	1 (1.4%)	

¹Mean (±SD), n (%), Median (Q1–Q3)

²Wilcoxon rank sum test, Pearson's chi-square test, Fisher's exact test

Details of the acute bleeding management protocol and the endoscopic interventional techniques used in our unit have been published in detail previously.²¹⁻²³ If bleeding gastric varices were encountered, injection sclerotherapy (IST) with ethanolamine oleate or endoscopic variceal band ligation (EVL) or histoacryl/cyanoacrylate glue injection was used depending on the location and size of the varix.²³ In patients with uncontrollable bleeding a Sengstaken-Blakemore balloon tube was inserted for tamponade.²⁴ Endotracheal intubation was used for airway protection when necessary and further endoscopic procedures were performed within 24 hours.²³ In patients who had uncontrolled variceal bleeding or those with persistent refractory bleeding despite endoscopic intervention, radiological portosystemic shunting or salvage surgery was used as a rescue treatment. After discharge from hospital, patients underwent endoscopic follow-up after one month, three months and then every six months.

The primary end points of the study were 90-day, one-, three-, and five-year mortality. Primary sub-analysis differentiated between liver-related and non-liver-related deaths. Mortality due to haemorrhage (gastrointestinal bleeds), liver decompensation (encephalopathy, renal failure), or malignancy (HCC) were defined as liver-related deaths. Non-liver-related deaths were classified as death attributed to infection/s (sepsis, pneumonia, spontaneous bacterial peritonitis), cardiovascular disease or non-hepatic malignancy. Secondary endpoints were initial control of gastric variceal bleeding, subsequent rebleeding and the need for primary or secondary salvage procedures. All-cause mortality data was retrieved from the Faculty RedCap variceal registry and the national mortality database.

Statistical methods

The characteristics of the patients were summarised as median (interquartile range (IQR)) or mean ($\pm$ standard deviation) for continuous variables and numbers (percentages) for categorical data. Continuous variables were compared with independent t-tests, analysis of variance (ANOVA), or the nonparametric Mann-Whitney rank-sum test, as appropriate. Categorical variables were analysed with Pearson's chi-square test or Fisher's exact test as appropriate. All tests were two-sided. Time-to-event analyses were performed using Cox proportional hazards regression to evaluate prognostic factors for short- and long-term outcomes following variceal bleeding. Survival time was defined as the number of days from the index bleed to death or last follow-up. Given the limited number of deaths during follow-up and the overlap among liver-specific prognostic scores, multivariable Cox regression was not performed to avoid overfitting and collinearity. Instead, separate Cox proportional hazards models were fitted for C-P grade, C-P score, MELD score, MELD-Na score, and APACHE II score at four predefined time horizons (90 days, 1 year, 3 years, and 5 years following the index bleed). Patients who remained alive beyond each time horizon were administratively censored at that time point. C-P grade was entered as a categorical variable with C-P A as the reference group. Hazard ratios (HRs) with 95% confidence intervals (CIs) and *p*-values were reported. A *p*-value of < 0.05 was considered statistically significant. All statistical analyses were performed using R statistical software (R Foundation for Statistical Computing, Vienna, Austria), version 4.6.0.

The study protocol was approved by the Human Research Ethics Committee (HREC Ref No. 710/2021) of the University of Cape Town, and the research was conducted in accordance with the Declaration of Helsinki.

Results

A total of 626 patients with variceal bleeding were admitted to the SGU during the study period. In 88 patients (14.1%) bleeding was due to gastric varices, and this cohort forms the study population. Fourteen (15.9%) of the 88 patients had previously received endoscopic treatment for oesophageal variceal bleeding. The 56 (63.6%) men and 32 women had a mean age of 48.1 years (± 15.9). Cirrhosis was caused by alcohol in 44 (50%) patients, hepatitis B virus (HBV) in 9 (10.2%), both alcohol and HBV in 7 (7.9%), metabolic dysfunction-associated steatotic liver disease (MASLD) in 6 (6.8%), primary sclerosing cholangitis (PSC) in 4 (4.5%), bilharzia in 3 (3.4%), cryptogenic cirrhosis in 3 (3.4%) and haemochromatosis in 1 (1.1%). Two patients had portal hypertension and gastric varices due to congenital hepatic fibrosis (2.3%) and nine had portal or splenic vein thrombosis (10.2%). Cirrhosis in three patients was complicated by metastatic hepatocellular carcinoma (HCC) and three further patients at presentation had, in addition to cirrhosis, advanced human immunodeficiency virus (HIV) (World Health Organization stage ≥ 3 , CD4 cell count < 200 cells/mm³). The type of GV was GOV1 in 50 patients (56.8%), GOV2 in 31 patients (35.2%) and IGV1 in 7 patients (8.0%).

Endoscopic intervention in the 88 patients on 265 occasions during the index admission included glue injection in 53 patients (60.2%), endoscopic variceal ligation (EVL) in 21 patients (23.9%), injection sclerotherapy (IST) with ethanolamine oleate in 9 patients (10.2%) and EVL+IST in 5 patients (5.7%) (glue *n* = 135, EVL *n* = 72, IST *n* = 46, EVL+IST *n* = 12). Median units of blood transfused were 4.0 (IQR 1.0–6.0). Nine patients required endotracheal intubation, ventilation and inotropic support during resuscitation and endoscopic intervention. Salvage intervention for intractable or recurrent bleeding during the index admission included balloon tamponade (*n* = 7, 8.0%) and TIPS (*n* = 1, 1.1%) and surgical intervention with a gastric devascularisation (*n* = 2, 2.3%). The endoscopic failure rate of haemostasis during the index admission was 9.1% (8/88 patients). Forty-two (47.7%) patients in addition to gastric varices, also required endoscopic intervention for bleeding oesophageal varices during the index admission (EVL+IST *n* = 20; EVL *n* = 18, IST *n* = 4).

Twelve of the 88 patients (13.6%) died in hospital during the index admission (median 7.5, range 1–51 days) of uncontrolled GVB *n* = 3, adult respiratory distress syndrome *n* = 3, liver failure *n* = 2, multi-organ failure *n* = 1, metastatic hepatocellular carcinoma *n* = 1, sepsis due to candidaemia *n* = 1, and a cerebrovascular event *n* = 1. In the 12 patients who died during the index admission the mean C-P score was 11.6 (± 1.9), mean MELD score was 22.3 (± 4.2) and the mean MELD-Na score was 26.7 (± 5.7). Mortality in C-P grade A was 0%, C-P grade B 8.8% and C-P grade C 33.3%.

During the study period the 88 patients underwent a total of 780 endoscopic procedures (range 1–34, mean 5), 265 during the index admission and 515 procedures during subsequent follow-up. Gastric varices were eradicated in 47 (77%) of 61 patients alive at 1-year during follow-up

Table II: Kaplan-Meier estimated survival probabilities according to prognostic factors in 88 patients with bleeding gastric varices

Score	<i>n</i>	90-day survival	1-year survival	3-year survival	5-year survival	Log-rank <i>p</i> -value
Child-Pugh A	27	100.0%	100.0%	84.2%	79.8%	
Child-Pugh B	34	88.2%	73.5%	58.8%	55.4%	
Child-Pugh C	27	44.4%	29.6%	14.8%	4.9%	< 0.001
Child-Pugh score < 10	61	93.4%	85.2%	69.9%	66.0%	
Child-Pugh score ≥ 10	27	44.4%	29.6%	14.8%	4.9%	< 0.001
MELD < 20	75	90.7%	78.7%	62.1%	55.7%	
MELD ≥ 20	13	7.7%	7.7%	0.0%	0.0%	< 0.001
MELD-Na < 25	75	90.7%	78.7%	62.1%	55.7%	
MELD-Na ≥ 25	13	7.7%	7.7%	0.0%	0.0%	< 0.001
APACHE II < 20	78	87.2%	75.6%	59.7%	53.6%	
APACHE II ≥ 20	10	10.0%	10.0%	0.0%	0.0%	< 0.001

*Values are Kaplan-Meier estimated survival probabilities at each follow-up time point.

**Values represent estimated numbers of patients surviving at each time point based on Kaplan-Meier survival estimates

endoscopy. Varices recurred in 5 patients after eradication and rebled in 1 patient after eradication. Seventeen patients rebled before eventual endoscopic eradication of gastric varices. Endoscopic intervention failed to control GVB in 20 patients, 4 during the initial endoscopy, and in 16 patients as a secondary event during the eradication process.

Ultimately, during the full long-term study period 17 (19.3%) patients required a salvage procedure for endoscopically uncontrolled GVB. Salvage procedures included TIPS (*n* = 5), BRTO (*n* = 4), gastric devascularisation and splenectomy (*n* = 3), oesophageal transection and gastric devascularisation (*n* = 2), gastric devascularisation alone (*n* = 1), Warren distal splenorenal shunt (*n* = 1) and an Inokuchi selective portosystemic shunt between the coronary vein and the inferior vena cava (*n* = 1). Three patients who underwent an emergency salvage procedure (devascularisation *n* = 2, TIPS *n* = 1) during the index admission died due to liver failure (*n* = 2) and candidaemia (*n* = 1). Thirteen of the 14 remaining salvage interventions are alive as of 30 April 2026: BRTO (*n* = 4, mean 2.5 years, range 1–4 years), TIPS (*n* = 4, mean 6.0 years, range 1–19 years), devascularisation (*n* = 3, mean 12 years, range 2–16 years), and shunts (*n* = 2, mean 17 years, range 6–29 years).

Long-term follow-up showed substantial morbidity which included encephalopathy (*n* = 3) after TIPS which resolved on treatment, Klebsiella bacterial peritonitis (*n* = 3) which required IV antibiotics, aspiration pneumonia (*n* = 2) and COVID pneumonia (*n* = 2). Three patients had postoperative complications, wound sepsis (*n* = 2) and one patient had a partial wound sheath dehiscence which required resuturing. Seven patients had oesophageal sequelae after interventional endoscopy which included oesophageal mucosal ulceration (*n* = 3), oesophageal stricture which resolved with dilatation (*n* = 3), and one patient developed candida oesophagitis.

Index admission hospital mortality was 13.6% (12/88), 6-week mortality 15.9% (14/88), 90-day mortality 21.6% (19/88), 1-year overall mortality 31.8% (28/88), 3-year mortality 46.6% (41/88), and 5-year mortality was 51.1% (45/88). The leading causes of overall mortality at 5 years after discharge from hospital (*n* = 31) were progressive liver failure (*n* = 13) predominantly in C-P C patients with advanced decompensated cirrhosis, metastatic hepatocellular carcinoma in 5 patients, stage ≥ 3 HIV in 3 patients, uncontrolled recurrent oesophageal (*n* = 4)

Table III: Univariable Cox proportional hazards models for all-cause mortality

Outcome	Variable	HR	95% CI	<i>p</i> -value
90-day survival	Child-Pugh score	2.01	1.54–2.63	< 0.001
	MELD	1.28	1.18–1.38	< 0.001
	MELD-Na	1.26	1.16–1.36	< 0.001
	APACHE II	1.59	1.38–1.82	< 0.001
1-year survival	Child-Pugh score	1.76	1.47–2.12	< 0.001
	MELD	1.25	1.17–1.34	< 0.001
	MELD-Na	1.23	1.15–1.30	< 0.001
	APACHE II	1.51	1.36–1.68	< 0.001
3-year survival	Child-Pugh score	1.59	1.38–1.82	< 0.001
	MELD	1.24	1.17–1.31	< 0.001
	MELD-Na	1.20	1.14–1.26	< 0.001
	APACHE II	1.46	1.34–1.59	< 0.001
5-year survival	Child-Pugh score	1.60	1.40–1.83	< 0.001
	MELD	1.24	1.17–1.31	< 0.001
	MELD-Na	1.20	1.14–1.26	< 0.001
	APACHE II	1.48	1.36–1.61	< 0.001

CI – confidence interval, HR – hazard ratio

and gastric (*n* = 3) variceal bleeding and acute respiratory distress syndrome (ARDS) in 3 patients.

Overall survival rates at 90 days, 1-year, 3-years and 5-years were 78.4%, 68.2%, 53.4% and 48.9% respectively. On bivariate analysis, clinical characteristics which were significantly associated with 90-day mortality (*p* < 0.001) were ≥ 6 units of blood transfused, balloon tube placement and requirement for endotracheal intubation, while significant biochemical factors (*p* < 0.001) were Na ≤ 130 mmol/L, creatinine ≥ 120 μmol/L, bilirubin ≥ 51 μmol/L. Prognostic scoring factors significantly associated with 90-day mortality (*p* < 0.001) were C-P score ≥ 10, MELD ≥ 20, MELD-Na ≥ 25 and APACHE II score ≥ 20 (Table I). Ninety-day mortality for C-P grade C patients was 55.6%, for C-P score ≥ 10 48.4%, MELD score ≥ 20 91.7%, MELD-Na score ≥ 25 91.7%, and APACHE II score ≥ 20 90% (Table II). The MELD ≥ 20 and MELD-Na ≥ 25 groups each included only 12 patients. Consequently, the corresponding survival estimates were less precise, with

Table IV: Kaplan-Meier survival probabilities according to gastric variceal type

GV type	n	6-week survival	90-day survival	1-year survival	3-year survival	5-year survival	Log-rank <i>p</i> -value
GOV1	50	86.0%	78.0%	66.0%	45.6%	40.8%	0.10
GOV2	31	80.6%	77.4%	67.7%	57.6%	49.9%	
IGV1	7	85.7%	85.7%	85.7%	85.7%	85.7%	

*Values are Kaplan-Meier estimated survival probabilities at each follow-up time point

wider confidence intervals, and should be interpreted with caution.

Patients with C-P grade A, C-P score < 10, MELD score < 20, MELD-Na score < 25 and APACHE II scores < 20 had significantly better 90-day, 1, 3 and 5-year survival rates (Table II). Univariable Cox proportional hazards models demonstrated significant associations between APACHE II and mortality at 90 days, 1 year, 3 years and 5 years (HR 1.59, 1.51, 1.46 and 1.48, respectively). At 90 days, MELD and MELD-Na were also significantly associated with an increased hazard of death (HR 1.28 and 1.26, respectively) (Table III). Six-week survival of gastric variceal types GOV1, GOV2 and IGV1 were similar (86.0, 83.9, 85.7%) (Table IV). Although IGV1 appeared to have higher estimated 5-year survival rates than those with GOV1 or GOV2 (85.7% vs. 40.8 and 49.9% respectively), the overall survival curves did not differ significantly among the three gastric variceal types (log-rank test, *p* = 0.1).

Discussion

This study represents the largest single-centre series of GVB in sub-Saharan Africa and demonstrates three key findings. First, endoscopic haemostasis was achieved in most patients, yet in-hospital mortality remained high (13.6%), reflecting the severity of underlying liver disease and systemic compromise. Second, survival declined progressively after discharge, with five-year mortality approaching 50%, consistent with international data where in-hospital mortality for GVB ranges from 10–20% and five-year mortality approaches 50%.^{1,3,5-7,15} The leading causes of death, progressive liver failure, hepatocellular carcinoma, HIV-related complications, and recurrent variceal bleeding reflect the multifactorial nature of mortality in cirrhotic patients.^{18,19} Thirdly, this study identified clinically useful thresholds of C-P ≥ 10, MELD ≥ 20, MELD-Na ≥ 25 and APACHE II ≥ 20 that were associated with increased mortality. Mortality was especially pronounced at the index admission in C-P C patients, in whom the death rate was 33.3%, compared to 0% in C-P A patients. These results are concordant with large multicentre studies demonstrating that the C-P grade remains a consistent and powerful predictor of mortality following any variceal bleeding event.^{19,25,26} These findings reinforce the prognostic utility of established scoring systems in GVB, consistent with global literature.^{18,19} Although mortality rates in this cohort are comparable to those reported in Europe and Asia, the contribution of HIV and bilharzia to underlying liver disease is geographically distinctive highlighting the need for region-specific strategies that address the unique epidemiology of portal hypertension in Africa.

The study also highlights several clinical and biochemical predictors of poor outcome. Balloon tamponade, endotracheal intubation, and high transfusion requirements were strongly associated with index admission mortality. Biochemical markers including hyponatraemia, hyperbilirubinaemia, and elevated creatinine further stratified risk. These findings

mirror international reports that emphasise the prognostic importance of renal dysfunction, electrolyte imbalance, and transfusion burden in variceal bleeding.^{18,19,26} The MELD family of scores has gained wide acceptance in predicting mortality in variceal bleeding.^{18,19,24} In the current cohort, MELD ≥ 20 and MELD-Na ≥ 25 scores demonstrated high hazard ratios for mortality, suggesting that these thresholds may be useful in identifying patients requiring more aggressive support or earlier consideration for TIPS. However, the MELD ≥ 20 and MELD-Na ≥ 25 groups each comprised only 12 patients; therefore, the corresponding survival estimates should be interpreted with caution because of their reduced precision. The strong association between hyponatraemia and mortality reflected in the MELD-Na score is particularly noteworthy. Hyponatraemia reflects severe portal hypertension, systemic vasodilation, and impaired renal perfusion and has been identified as a major determinant of post-haemorrhage outcomes in multiple studies.^{18,19,26} Univariable Cox regression demonstrated APACHE II had the largest hazard ratios for mortality, particularly at 90 days, indicating the strongest association with mortality among the prognostic scores evaluated. As this study did not formally compare model discrimination or calibration, these findings should be interpreted as demonstrating a stronger association with mortality rather than definitive superiority of APACHE II as a prognostic model. This finding supports earlier evidence that variceal bleeding mortality is strongly influenced by extrahepatic organ dysfunction, particularly respiratory and renal failure, and that critical care scoring systems may complement liver disease assessment in emergency triage.^{19,26}

The reported mortality associated with acute GVB varies widely and is dependent on the availability of an integrated skilled endoscopy service experienced with cyanoacrylate injection and a proficient radiological intervention team offering salvage decompression treatment.^{19,20} Globally, cyanoacrylate injection remains the gold standard for control of GVB, with haemostasis rates exceeding 80%.^{5,15,16} In this study the failure rate of 9.1% is within expected ranges and the acute haemostasis rate was comparable to or better than most series of patients treated with a tissue adhesive.^{9,11} Differences observed between studies may reflect different injection techniques, different proportions of GV subtypes, and also inclusion of different patient populations.^{19,20} Some studies had a preponderance of noncirrhotic PHT, whereas in other studies more patients had cirrhosis and associated hepatic synthetic dysfunction.^{9,11,26,27} Sarin et al.⁸ reported that endoscopic success was weighted heavily by high efficacy in GOV1 (95% eradication) and was less effective for GOV2 and IGV1. In that study, rebleeding after elective EVS was less than 20% for patients with GOV1 and GOV2 but higher in patients with IGV1 (53%).⁸

In the present study, patients with IGV1 demonstrated the highest estimated 5-year survival; however, this difference did not reach statistical significance. This finding should

be interpreted with caution as there were only 7 patients in the IGV1 group and 1 death. The GOV2 subgroup was also relatively small compared with the GOV1 subgroup. The limited sample size and small number of events reduced the statistical power of the log-rank test, increasing the possibility of a type II error. Consequently, the absence of a statistically significant difference does not necessarily indicate equivalent long-term survival among the gastric variceal subtypes.

The data documented must be interpreted in the light of inherent limitations which include the long duration of the study. In addition, there inevitably will be a selection bias as the unit functions as a tertiary referral centre for high-risk patients. Management practices have evolved over the three decades, especially the availability of TIPS and BRTO, although core protocols remained consistent. Multivariable Cox regression was not performed due to the limited number of deaths and overlap among the prognostic scores which would have resulted in overfitting and collinearity; consequently, the reported associations should not be interpreted as independent effects. Additionally, this is a single-centre study, and results may not be generalisable to settings with different resources or expertise. The major strengths of this study include the sample size, a prospectively maintained registry, uniform management protocols, and detailed clinical and biochemical data. Few centres worldwide have comparable long-term experience managing GVB in a single specialised unit, making this dataset particularly valuable. A further strength is the analysis of real-world data from an unselected cohort of consecutively treated patients by the same lead author using specific endpoints.

The findings of this study have several important implications for patients with major GVB that cannot be controlled endoscopically. This high-risk group is best managed in a tertiary referral unit with a skilled multidisciplinary team. Patients in whom endoscopic intervention fails to control bleeding should be identified early so that TIPS or BRTO can be performed before the deleterious consequences of deteriorating liver function and multi-organ failure occur. Prognostic scores such as CP, MELD, MELD-Na, and APACHE II should be routinely applied to guide management decisions and identify patients at high-risk of dying. Endoscopic glue injection remains the mainstay of therapy, but training and resource allocation should be prioritised to ensure its widespread availability.

Conclusion

This study provides valuable insights into the management and outcomes of GVB in South Africa. The findings emphasise the importance of early risk stratification, aggressive resuscitation within evidence-based protocols, and timely referral for salvage procedures. The data demonstrate that mortality after acute GVB is driven primarily by the severity of underlying liver disease and acute physiological instability, rather than failure of endoscopic haemostasis alone. Prognostic scores remain essential tools with the C-P, MELD, MELD-Na, and APACHE II scores all providing meaningful risk stratification. APACHE II demonstrated the strongest association with mortality in this cohort, although formal comparisons of predictive performance were not undertaken. Expanding access to advanced salvage interventions such as TIPS and BRTO, alongside integrated

management of comorbidities, offers the best opportunity to improve survival in this high-risk population.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

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REFERENCES

1. Henry Z, Patel K, Patton H, Saad W. AGA clinical practice update on management of bleeding gastric varices: Expert review. *Clin Gastroenterol Hepatol*. 2021;19(6):1098-107.e1. <https://doi.org/10.1016/j.cgh.2021.01.027>.
2. Novelli PM, Orons PD. Gastric varices: Anatomic considerations and management. *Tech Vasc Interv Radiol*. 2025;28(4):101082. <https://doi.org/10.1016/j.tvir.2025.101082>.
3. Bazarbashi AN, Ryou M. Gastric variceal bleeding. *Curr Opin Gastroenterol*. 2019;35(6):524-34. <https://doi.org/10.1097/MOG.0000000000000581>.
4. Ryan BM, Stockbrugger RW, Ryan JM. A pathophysiologic, gastroenterologic, and radiologic approach to the management of gastric varices. *Gastroenterology*. 2004;126:1175-89. <https://doi.org/10.1053/j.gastro.2004.01.058>.
5. ASGE Standards of Practice Committee. The role of endoscopy in the management of variceal haemorrhage. *Gastrointest Endosc*. 2014;80:221-7. <https://doi.org/10.1016/j.gie.2013.07.023>.
6. Dworzynski K, Pollit V, Kelsey A, et al. Management of acute upper gastrointestinal bleeding: Summary of NICE guidance. *BMJ* 2012;344:e3412. <https://doi.org/10.1136/bmj.e3412>.
7. Kaplan DE, Ripoll C, Thiele M, et al. AASLD Practice guidance on risk stratification and management of portal hypertension and varices in cirrhosis. *Hepatology*. 2024 May 1;79(5):1180-211. <https://doi.org/10.1097/HEP.0000000000000647>.
8. Sarin SK, Lahoti D, Saxena SP, Murthy NS, Makwana UK. Prevalence, classification and natural history of gastric varices: A long-term follow-up study in 568 portal hypertension patients. *Hepatology*. 1992;16:1343-9. <https://doi.org/10.1002/hep.1840160607>.
9. Osman KT, Nayfeh T, Abdelfattah AM, et al. Secondary prophylaxis of gastric variceal bleeding: A systematic review

- and network meta-analysis. *Liver Transpl.* 2022;28:945. <https://doi.org/10.1002/lt.26383>.
10. Qiao W, Ren Y, Bai Y, et al. Cyanoacrylate injection versus band ligation in the endoscopic management of acute gastric variceal bleeding: Meta-analysis of randomised, controlled studies based on the PRISMA Statement. *Medicine (Baltimore)*. 2015;94(41):e1725. <https://doi.org/10.1097/MD.0000000000001725>.
 11. Florencio de Mesquita C, Antunes VLJ, Milioli NJ, et al. EUS-guided coiling plus glue injection compared with endoscopic glue injection alone in endoscopic treatment for gastric varices: A systematic review and meta-analysis. *Gastrointest Endosc.* 2025;101:331-40.e8. <https://doi.org/10.1016/j.gie.2024.10.005>.
 12. Wang Y-B, Zhang J-Y, Gong J-P, et al. Balloon-occluded retrograde transvenous obliteration versus transjugular intrahepatic portosystemic shunt for treatment of gastric varices due to portal hypertension: A meta-analysis. *J Gastroenterol Hepatol.* 2016;31:727-33. <https://doi.org/10.1111/jgh.13248>.
 13. Gimm G, Chang Y, Kim HC, et al. Balloon-occluded retrograde transvenous obliteration versus transjugular intrahepatic portosystemic shunt for the management of gastric variceal bleeding. *Gut Liver.* 2018;12(6):704-13. <https://doi.org/10.5009/gnl17515>.
 14. Paleti S, Notalapati V, Fathallah J, Jeepalyam S, Rustagi T. Balloon-occluded retrograde transvenous obliteration (BRTO) versus transjugular intrahepatic portosystemic shunt (TIPS) for treatment of gastric varices because of portal hypertension: A systematic review and meta-analysis. *J Clin Gastroenterol.* 2020;54(7):655-60. <https://doi.org/10.1097/MCG.0000000000001275>.
 15. Lee EW, Shahrouki P, Alanis L, Ding P, Kee ST. Management options for gastric variceal haemorrhage. *JAMA Surg.* 2019;154(6):540-8. <https://doi.org/10.1001/jamasurg.2019.0407>.
 16. Philips CA, Ahamed R, Rajesh S, et al. Beyond the scope and the glue: Update on evaluation and management of gastric varices. *BMC Gastroenterol.* 2020;20(1):361. <https://doi.org/10.1186/s12876-020-01513-7>.
 17. Maydeo A, Patil G. How to approach a patient with gastric varices. *Gastroenterology.* 2022;162(3):689-95. <https://doi.org/10.1053/j.gastro.2021.12.277>.
 18. Tantai XX, Liu N, Yang LB, et al. Prognostic value of risk scoring systems for cirrhotic patients with variceal bleeding. *World J Gastroenterol.* 2019;25(45):6668-80. <https://doi.org/10.3748/wjg.v25.i45.6668>.
 19. Yang L, Sun R, Wei N, Chen H. Systematic review and meta-analysis of risk scores in prediction for the clinical outcomes in patients with acute variceal bleeding. *Ann Med.* 2021;53(1):1806-15. <https://doi.org/10.1080/07853890.2021.1990394>.
 20. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Lancet.* 2007;370(9596):1453-7. [https://doi.org/10.1016/S0140-6736\(07\)61602-X](https://doi.org/10.1016/S0140-6736(07)61602-X).
 21. Krige JE, Kotze UK, Bornman PC, Shaw JM, Klipin M. Variceal recurrence, rebleeding, and survival after endoscopic injection sclerotherapy in 287 alcoholic cirrhotic patients with bleeding oesophageal varices. *Ann Surg.* 2006;244(5):764-70. <https://doi.org/10.1097/01.sla.0000231704.45005.4e>.
 22. Krige JEJ, Bornman PC. Endoscopic therapy in the management of oesophageal varices: Injection sclerotherapy and variceal ligation. In: Blumgart L, editor. *Surgery of the Liver, Biliary Tract and Pancreas*, 4th ed. Saunders, Elsevier; Philadelphia: 2007. p. 1579-93. <https://doi.org/10.1016/B978-1-4160-3256-4.50112-5>.
 23. Krige JEJ, Bernon MM, Jonas EG. Endoscopic therapy in the management of oesophageal varices. In: Ellison EC, Upchurch GR, editors. *Fischer's Mastery of Surgery*, 8th ed. Wolters Kluwer; Philadelphia: 2024. p. 181831.
 24. Fortune BE, Garcia-Tsao G, Ciarleglio M, et al. Child-Turcotte-Pugh class is best at stratifying risk in variceal haemorrhage: Analysis of a US multicentre prospective study. *J Clin Gastroenterol.* 2017;51(5):446-53. <https://doi.org/10.1097/MCG.0000000000000733>.
 25. Garcia-Tsao G, Abraldes JG, Berzigotti A, Bosch J. Portal hypertensive bleeding in cirrhosis: Risk stratification, diagnosis, and management: 2016 practice guidance by the American Association for the study of liver diseases. *Hepatology.* 2017;65(1):310-35. <https://doi.org/10.1002/hep.28906>.
 26. Yeom KM, Chang JI, Yoo JJ, et al. Addition of kidney dysfunction type to MELD-Na for the prediction of survival in cirrhotic patients awaiting liver transplantation in comparison with MELD 3.0 with albumin. *Diagnostics (Basel)*. 2023;14(1):39. <https://doi.org/10.3390/diagnostics14010039>.
 27. Biswas S, Vaishnav M, Gamanagatti S, et al. Endoscopic glue injection vs glue plus BRTO or TIPSS for preventing gastric variceal bleeding: A randomised controlled trial. *Clin Gastroenterol Hepatol.* 2025;23(6):954-64.e10. <https://doi.org/10.1016/j.cgh.2024.06.023>.

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Clinical presentation and spectrum of comorbidity in a South African achalasia cohort

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Background: Achalasia is a rare oesophageal motility disorder characterised by aperistalsis and failure of lower oesophageal sphincter (LOS) relaxation. While the aetiology remains unclear, autoimmune myenteric neuronal degeneration is suspected.

Methods: A retrospective review of the symptomatology and comorbidities present in a South African achalasia cohort undergoing high-resolution oesophageal manometry (HRM) between January 2012 and December 2024.

Results: During the 12-year study period, 258 patients with achalasia were included, with 181 (70.1%) newly diagnosed cases and 77 (29.8%) cases with an intervention prior to HRM. The median age was 47 (IQR 35–69) years with a slight female majority ($n = 136$; 52.7%). Median symptom duration prior to HRM was 36 months (IQR 12–84 months) with a median Eckhardt score of 7 (IQR 6–9). At time of achalasia diagnosis 12 patients (4.6%) had a known autoimmune condition.

Of the 217 patients having a oesophagogastroduodenoscopy (EGD) prior to their HRM, 54 (24.9%) were reported normal. Only seven (3.2%) of 219 contrast swallows performed were reported normal. Type I achalasia was most prevalent ($n = 131$, 50.8%), followed by type II ($n = 121$, 46.9%) and type III ($n = 6$, 2.3%). Compared to type II achalasia, type I had a significantly longer symptom duration prior to HRM (48 vs 24 months, $p = 0.026$) and lower rate of normal gastroscopy findings prior to HRM (12.2% vs 29.8%, $p = 0.004$).

Conclusion: The clinical and manometric presentation of achalasia in South Africa is similar to previous international reports, however the associated presence of autoimmune conditions within this cohort is much less than detailed elsewhere.

Keywords: achalasia, clinical presentation, comorbidities, manometry

Introduction

Achalasia is a rare oesophageal motility disorder with a global incidence of 0.78 cases per 100 000 person-years.¹ While the incidence in Africa is reportedly the lowest (0.09 cases per 100 000 person-years), this may be an underrepresentation due to a significant scarcity of data from the continent.¹ Achalasia is characterised by abnormal peristalsis and failure of lower oesophageal sphincter (LOS) relaxation due to the loss of inhibitory innervation of the myenteric plexus of Auerbach.^{2,3} Although chronic inflammation of this nerve plexus has been described, the aetiology of primary achalasia is likely multifactorial. There appears to be an association with autoimmune conditions as histological examination of the LOS shows evidence of an inflammatory response with T-cell infiltrates, with achalasia 3.6 times more likely to occur in patients with a co-existing autoimmune condition.⁴⁻⁷ There exists a possible genetic

predisposition as the condition has been reported in first degree relatives, monozygotic twins and patients with chromosomal abnormalities such as Down's syndrome.^{8,9} Viral pathogens have also been postulated to trigger the development of achalasia.¹⁰⁻¹²

While achalasia may present at any age, the peak incidence of presentation is between 30 and 60 years of age.¹³ The dominant symptom of dysphagia, typically for both fluids and solids, is gradually progressive and usually presents after some years of symptom compensation often culminating in unintentional loss of weight. Regurgitation of undigested food and commonly frothy saliva are regular complaints, especially when supine. Chest pain with achalasia may be due to a combination of progressive oesophageal distention, stasis oesophagitis, candidiasis or pill oesophagitis.^{14,15} Endoscopy, contrast swallow and high-resolution oesophageal manometry (HRM) are integral in the diagnostic work-up. Evaluation by HRM

remains the gold standard with classification presently still into three manometric sub-types according to Chicago 4.0; type I (absent contractility), type II (pan-oesophageal pressurisation) and type III (spastic).^{16,17} This differentiation into sub-types helps explain differences in presentation, treatment options and outcomes.

Our study aimed to evaluate presentation, endoscopic, radiological and manometric findings within a sub-Saharan achalasia cohort. We compared clinical and diagnostic variables between the three manometric achalasia subtypes and reviewed the prevalence of autoimmune conditions.

Methods

Study design

This was a retrospective descriptive cohort study of all patients diagnosed on high-resolution oesophageal manometry (HRM) with achalasia by the Oesophageal Motility Unit at Groote Schuur Hospital between 1 January 2012 and 31 December 2024. The objectives of this study were to document the symptomatology and spectrum of comorbidities present within a South African cohort of confirmed achalasia patients, including the clinical presentation, the duration of symptoms at time of diagnosis on initial HRM, patient comorbidities, and associated investigations (oesophagogastroduodenoscopy [EGD], HRM and contrast swallow). However, due to the shortage of motility services available in South Africa, this initial HRM followed prior intervention for achalasia (where achalasia diagnosis was initially based only on contrast swallow and EGD) in selected cases. LOS metrics, including the median resting LOS pressure and the median integrated relaxation pressure (IRP) were only included for analysis in patients without prior intervention for achalasia.

Study population

All adult patients (> 18 years of age) diagnosed with achalasia on oesophageal HRM during the study period were evaluated for possible inclusion. Patients with oesophageal motility disorders not classified as achalasia were excluded. Duration of presenting symptoms prior to diagnosis of achalasia was determined as the period prior to the initial confirmatory HRM only.

Patient demographics and results of relevant investigations (HRM, EGD and contrast swallow) of confirmed achalasia patients were documented with patient folder review confirming

the presence of any comorbidities. In addition, chronic prescriptions were assessed with relevance to the treatment of any additional comorbidities.

Definitions

Achalasia diagnosis by high resolution manometry

HRM was performed using the Solar™ GI HRM system from Laborie Medical Technologies Corporation with a 24-channel water-perfused catheter, according to the modified protocol initially taken from the Chicago Classification version 3.0 and more recently version 4.0.¹⁶ LOS metrics were captured and depending on the manometric pattern, categorised into achalasia sub-types (Figure 1).

Symptom duration and severity

Symptom duration was defined in months from symptom onset (as reported by the patient) to achalasia confirmation on HRM. The Eckardt score was used to define symptom severity (Addendum 1).¹⁷

Endoscopy

A retrospective review of available EGD reports were assessed as to whether the EGD was deemed normal by the attending endoscopist or if findings were noted in keeping-

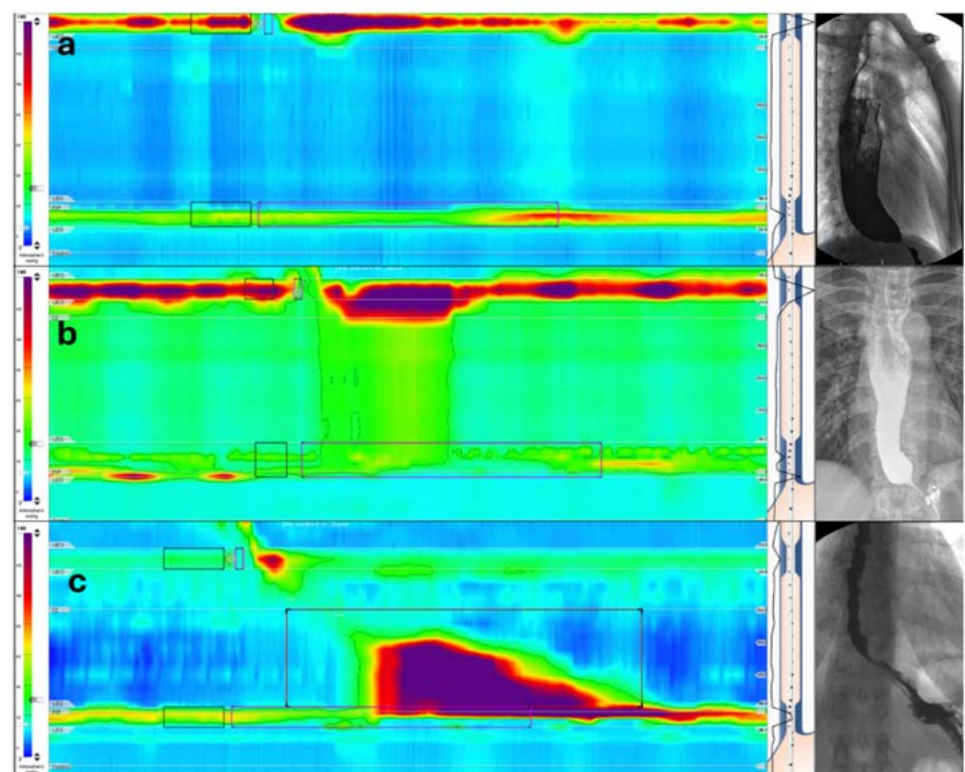


Figure 1: Characteristic high-resolution oesophageal manometry and contrast swallow findings in the three types of achalasia

In all three the median integrated relaxation pressure is above normal (> 18mmHg with 24 channel water-perfused catheter in a supine position using MMS Laborie software). a. Type I achalasia: 100% failed peristalsis; very dilated, “bird’s beak”. b. Type II achalasia: ≥ 20% pan-oesophageal pressurisation (note also the oesophageal shortening demonstrated by the upward movement of the lower oesophageal sphincter pressure line); moderate to very dilated, significant stasis. c. Type III achalasia (≥ 20% premature (spastic) contractions (distal latency in this image was 4.2 seconds (normal > 4.5 seconds); less dilatation, “cork-screw”, tertiary contractions

with a possible oesophageal dysmotility disorder (including dilatation or tortuosity of the oesophagus, retained saliva/fluid/food, stasis oesophagitis and/or oesophageal candidiasis and a “tight” but intubatable OGJ).

Contrast swallow

Contrast swallow oesophagograms and reports were retrospectively reviewed on Picture Archiving and Communicating System (PACS) where available. Most were simple contrast swallows and not formal timed contrast swallow studies. While a bird’s beak or rat’s tail sign is almost pathognomonic of achalasia, if oesophageal dilatation, tortuosity, delayed oesophageal emptying with a contrast-fluid level or tertiary contractions were reported, a possible oesophageal dysmotility disorder was considered.¹⁷ Normal contrast swallow reports by the reporting radiologist were noted as such.

Presence of comorbidities

Patient folders and prescription charts were retrospectively reviewed for the presence of any comorbidities. Within the comorbidities, special note was made of any autoimmune conditions.

Data analysis

Data analysis was done using Microsoft Excel and IBM SPSS Statistics (version 28.0.1.1). The following data categories were described using simple descriptive statistics: patient demographics, medical comorbidities, clinical presentation, including Eckhardt score and dysphagia duration and grade at presentation. Manometry, contrast swallow and EGD findings were also included. Parametric data were described using mean with standard deviation and non-parametric data were described using median with inter-quartile range. Univariate analysis to assess for associations between numerous parameters and type of achalasia was performed using the chi-squared test for categorical data and the Kruskal-Wallis test to allow for comparison of multiple groups with non-parametric data. Further post-hoc multiple comparison analyses using the Mann-Whitney U test were performed on any variables shown to be statistically significant. Spearman’s Rank Correlation was used to assess for correlation between HRM metrics (LOSP and IRP) and total Eckardt symptom score. A *p* - value of < 0.05 was considered statistically significant.

Results

Patient demographics, presentation and comorbidities

During the study period, a total of 258 patients were diagnosed with achalasia on HRM (Table I). Within this achalasia cohort, 181 patients (70.2%) were newly diagnosed, and 77 (29.8%) underwent HRM only post-intervention (including 26 dilatations, 32 laparoscopic Heller’s myotomies and 19 patients with both previous dilatations and Heller’s myotomies). The age at initial diagnosis of achalasia was 47.0 years (IQR 35.0–69.3), with a narrow majority of female patients (136; 52.7%). Type III achalasia patients tended to be older at diagnosis, but this was not determined to be significant (Table II).

In the newly diagnosed group, the duration of symptoms overall was a median of 36.0 months (IQR 12.0–84.0 months). When symptom duration was reviewed as per achalasia subtype, type I and III achalasia patients had a longer symptom duration compared to type II achalasia. On post-hoc analysis the symptom duration difference was found to be statistically significant only for type I compared to type II (*p* = 0.026). Overall symptom severity at time of achalasia diagnosis on HRM was a median Eckardt score of 7 (IQR 6–9). While type II had a higher median Eckardt score, this was not determined significant when evaluated across the three achalasia sub-types (Table II).

At the time of achalasia diagnosis, 147 patients (57.0%) were being treated for one or more chronic comorbidities, most commonly hypertension, asthma and diabetes mellitus. Twelve patients (4.7%) had a known autoimmune condition, with a higher prevalence in type III achalasia but this did not reach statistical significance (*p* = 0.337) (Table II).

Table I: Patient demographics, comorbidities and symptom history at time of achalasia diagnosis on high resolution manometry (HRM)

Demographics	Median	IQR
Age (years)	47.0	35.0–69.3
	<i>n</i>	%
Female	136	52.7
Male	122	47.3
Comorbidities		
Hypertension	67	26.0
Diabetes mellitus	21	8.1
Asthma	22	8.5
Ischaemic heart disease	17	6.6
Tuberculosis	15	5.8
Mental healthcare user	12	4.7
HIV ^a positive	12	4.7
Chronic kidney disease	9	3.5
Other	76	29.5
Autoimmune conditions		
Myasthenia gravis	2	
Polyarthritis rheumatica	2	
Hashimoto’s thyroiditis	1	
Sarcoidosis	1	
Systemic lupus erythematosus	1	
Stephen-Johnsons syndrome	1	
Systemic sclerosis	1	
Type I diabetes mellitus	1	
Ulcerative colitis	1	
Von Willebrand disease	1	
	Median	IQR
Symptom History		
Symptom Duration Prior to HRM (months)	36.0	12.0–84.0
Total Eckardt Score	7.0	6.0–9.0

HIV – human immunodeficiency virus, HRM – high-resolution manometry

Table II: Univariate analysis of numerous factors for association with achalasia type

	Type I		Type II		Type III		<i>p</i> -value [#]	post-hoc <i>p</i> -value [§]		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		I vs II	I vs III	II vs III
Female Sex	73	55.7%	60	49.6%	3	50.0%	0.617			
Hypertension	36	27.5%	28	23.1%	3	50.0%	0.293			
Diabetes	9	6.9%	10	8.3%	2	33.3%	0.069			
Chronic kidney disease	4	3.1%	4	3.3%	1	16.7%	0.205			
Ischaemic heart disease	9	6.9%	7	5.8%	1	16.7%	0.569			
Mental healthcare user	8	6.1%	4	3.3%	0	0.0%	0.495			
HIV ^a Positive	6	4.6%	6	5.0%	0	0.0%	0.853			
Tuberculosis	11	8.4%	4	3.3%	0	0.0%	0.188			
Asthma	7	5.3%	14	11.6%	1	16.7%	0.162			
Autoimmune condition	5	3.8%	6	5.0%	1	16.7%	0.337			
Hiatus hernia on HRM ^b (<i>n</i> = 173)	15	11.5%	16	13.2%	2	33.3%	0.445			
Normal endoscopy	16	12.2%	36	29.8%	2	33.3%	0.012	0.004	0.158	0.736
Normal contrast swallow	3	2.3%	4	3.3%	0	0.0%	0.85			
Age	46.0 (35.0–61.0)		46.0 (36.0–62.0)		66.0 (60.0–75.0)		0.108			
Symptom duration (months)	48.0 (12.0–96.0)		24.0 (12.0–72.0)		96.0 (24.0–120.0)		0.041	0.026	0.365	0.133
Eckardt total score	7.0 (5.0–9.0)		8.0 (6.0–9.0)		6.5 (6.0–11.0)		0.478			
IRP ^c (mmHg) (<i>n</i> = 142)	25.0 (19.0–31.0)		28.0 (20.0–37.0)		23.0 (22.0–39.0)		0.156			
Resting LOSP ^d (mmHg) (<i>n</i> = 142)	30.5 (25.0–47.0)		41.0 (29.0–52.0)		36.0 (33.0–39.0)		0.093			

All numerical data represented as median with interquartile range. ^aHIV – human immunodeficiency virus, ^bHRM – high-resolution manometry, ^cIRP – integrated relaxation pressure, ^dLOSP – lower oesophageal sphincter pressure, [#]Kruskal-Wallis test, [§]Mann-Whitney U test for post-hoc analysis

Oesophagogastroduodenoscopy and contrast swallow

Of the 217 patients having EGD prior to their HRM, 54 (24.9%) were reported as normal. Normal endoscopy differed significantly across the three subtypes ($p = 0.012$). Compared to type II achalasia, type I achalasia had a statistically significantly smaller percentage of reported normal EGDs (12.2% vs 29.8%, $p = 0.004$) (Table II). While EGD is an integral investigation in dysphagia, in 41 patients the actual endoscopy reports were not available for review.

In 39 patients a contrast swallow was either not performed, or the imaging/report was unavailable for review. Of the contrast swallows accessible for review, only seven (3.2%) were reported normal. EGD was falsely negative (normal) in 24.9% of patients compared to only 3.2% of contrast swallows.

High-resolution manometry

HRM identified type I achalasia as most prevalent (50.8%; $n = 131$), followed by type II achalasia (46.9%; $n = 121$). Type III achalasia was confirmed on only 6 HRMs (2.3%).

LOS metrics were analysed in 142 patients (Table II). Although both the integrated relaxation pressure (IRP) and lower oesophageal sphincter pressure (LOSP) were higher in type II achalasia, this did not reach statistical significance. The presence of a hiatus hernia on HRM was noted in 33 patients (12.8%). The remaining 116 HRMs were excluded due to inaccurate LOS metrics (77 patients presented for HRM after a prior intervention for achalasia; in 39 patients the manometry catheter could not cross the OGJ).

Increasing IRP and Eckhardt's score demonstrated a weak positive correlation (Spearman's $p = 0.175$; $p = 0.039$) based on 140 paired observations. Contrastingly, LOSP and symptom severity had only a very weak positive, but not

statistically significant, correlation (Spearman's $p = 0.038$; $p = 0.658$).

Discussion

This study on the clinical presentation of a manometrically confirmed achalasia cohort is the largest to our knowledge from sub-Saharan Africa. Only two additional regional studies exist, one from Algeria and a single sub-Saharan study from Zimbabwe (from 1985), highlighting the near complete absence of data from the African continent as regards achalasia.^{18,19}

Within our cohort, the demographics and spread across the three achalasia subtypes was similar to international reports. With achalasia usually diagnosed between 25–60 years, our type I and II achalasia patients fell well within this age range, but the type III achalasia group were noticeably older, as has been documented elsewhere before.²⁰ Our overall incidence of associated autoimmune disease was only 4.7%, much lower than the 12.3–16.7% in other series.^{4-7,21,22} While our type III achalasia patients had a higher prevalence of autoimmune disorders, our small numbers limit meaningful comparison. This unexpectedly low autoimmune disease incidence within our achalasia population may point to possibly underdiagnosing autoimmune disease locally, a different genetic population or may be highlighting poor documentation as a limitation of this retrospective study, with no clear conclusions possible.

Due to its rarity and initially insidious onset, achalasia has a mean diagnostic delay commonly reported internationally between two to five years.^{6,23} Within this cohort the duration of reported symptoms was 3 years prior to presentation for diagnostic HRM which is somewhat surprising considering the very limited availability of oesophageal motility services in South Africa. This likely reflects referral bias due to the retrospective nature of this study in reviewing preselected

patients. The shorter preceding symptom duration and higher IRP and LOSP noted in the type II achalasia group (although the IRP and LOSP comparisons did not reach statistical significance) are in keeping with the accepted theory that type II achalasia is the precursor to type I achalasia.²⁴ As such higher pressures should be associated positively with severity of symptoms, keeping in mind that morphological shape with associated distal stasis is responsible for many of the chronic symptoms in achalasia.^{25,26}

While HRM is accepted as the gold standard for diagnosing achalasia, locally EGD and contrast swallows still hold much diagnostic weight when suspecting an oesophageal dysmotility.²⁷ Our results suggest that early achalasia may be frequently missed (29.4%) on EGD. Type I achalasia, with the associated stasis and dilatation is more endoscopically obvious. Within this cohort, normal EGDs were reported not infrequently in type II and III achalasia. While this study was not designed to assess diagnostic accuracy, contrast swallow had a much-improved diagnostic rate due to its ability to simultaneously functionally assess oesophageal transit and review oesophageal anatomy, with only 3.2% of contrast swallows missing an oesophageal dysmotility within this cohort.

Despite limitations due to its retrospective nature and referral bias, this study is the first clinical description of a South African manometrically confirmed achalasia cohort. There are similarities in demographics, clinical presentation, investigative outcomes and achalasia subtype rates compared to international studies. Similar delays in diagnosis and availability of specialised investigations are noted. Our findings support the local relevance of contrast swallows complementing EGD when investigating for oesophageal dysmotility. This study documents the real-world scenario where lack of access to high-resolution oesophageal manometry in South Africa may result in patients diagnosed and treated for achalasia without prior HRM. This study should prompt further research into achalasia on the African continent and highlight the need to expand specialised oesophageal motility services across sub-Saharan Africa.

Conflict of interest

The authors declare no conflict of interest.

Funding source

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Ethical approval

This study was approved by the Human Research Ethics Committee of the University of Cape Town (HREC 130/2022).

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REFERENCES

1. Lee K, Hong SP, Yoo IK, et al. Global trends in incidence and prevalence of achalasia, 1925-2021: A systematic review and meta-analysis. *United European Gastroenterol J*. 2024;12(4):504-15. <https://doi.org/10.1002/ueg2.12555>.
2. Vaezi MF, Felix VN, Penagini R, et al. Achalasia: From diagnosis to management. *Ann NY Acad Sci*. 2016;1381(1):34-44. <https://doi.org/10.1111/nyas.13176>.
3. Patel DA, Kim HP, Zifodya JS, Vaezi MF. Idiopathic (primary) achalasia: A review. *Orphanet J Rare Dis*. 2015;10:89. <https://doi.org/10.1186/s13023-015-0302-1>.
4. Cassarano S, Pesce M, Cargiolli M, et al. Clinical correlation and disease phenotype in patients with oesophageal achalasia and comorbid autoimmune diseases. *Dis Oesophagus*. 2021;34(1):doaa072. <https://doi.org/10.1093/dote/doaa072>.
5. Hoshino M, Omura N, Yano F, et al. Immunohistochemical study of the muscularis externa of the oesophagus in achalasia patients. *Dis Oesophagus*. 2013;26(1):14-21. <https://doi.org/10.1111/j.1442-2050.2011.01318.x>.
6. Booy JD, Takata J, Tomlinson G, Urbach DR. The prevalence of autoimmune disease in patients with oesophageal achalasia. *Dis Oesophagus*. 2012;25(3):209-13. <https://doi.org/10.1111/j.1442-2050.2011.01249.x>.
7. Gaber CE, Cotton CC, Eluri S, et al. Autoimmune and viral risk factors are associated with achalasia: A case-control study. *Neurogastroenterol Motil*. 2022;34(7):e14312. <https://doi.org/10.1111/nmo.14312>.
8. Ghoshal UC, Daschakraborty SB, Singh R. Pathogenesis of achalasia cardia. *World J Gastroenterol*. 2012;18(24):3050-7. <https://doi.org/10.3748/wjg.v18.i24.3050>.
9. Gockel HR, Gockel I, Schimanski CC, et al. Etiopathological aspects of achalasia: Lessons learned with Hirschsprung's disease. *Diseases of the oesophagus*. 2011;25(6):566-72. <https://doi.org/10.1111/j.1442-2050.2011.01277.x>.
10. Wu XY, Liu ZQ, Wang Y, et al. The aetiology of achalasia: An immune-dominant disease. *J Dig Dis*. 2021;22(3):126-35. <https://doi.org/10.1111/1751-2980.12973>.
11. Blonski W, Slone S, Richter JE. Update on the diagnosis and treatment of achalasia. *Dysphagia*. 2022. <https://doi.org/10.1007/s00455-022-10435-3>.
12. Tanaka S, Abe H, Sato H, et al. Frequency and clinical characteristics of special types of achalasia in Japan: A large-scale, multicentre database study. *J Gastroenterol Hepatol*. 2021;36(10):2828-33. <https://doi.org/10.1111/jgh.15557>.
13. Sadowski DC, Ackah F, Jiang B, Svenson LW. Achalasia: Incidence, prevalence and survival. A population-based study. *Neurogastroenterol Motil*. 2010;22:e256-61. <https://doi.org/10.1111/j.1365-2982.2010.01511.x>.
14. Stavropoulos SN, Friedel D, Modayil R, Parkman HP. Diagnosis and management of oesophageal achalasia. *BMJ*. 2016;354:i2785. <https://doi.org/10.1136/bmj.i2785>.
15. Cappell MS, Stavropoulos SN, Friedel D. Updated systematic review of achalasia, with a focus on POEM therapy. *Dig Dis Sci*. 2020;65(1):38-65. <https://doi.org/10.1007/s10620-019-05784-3>.
16. Rohof WOA, Bredenoord AJ. Chicago classification of oesophageal motility disorders: Lessons learned. *Curr Gastroenterol Rep*. 2017;19(8):37. <https://doi.org/10.1007/s11894-017-0576-7>.
17. Patti MG, Schlottmann F, Herbella FA, editors. *Dysphagia: Diagnosis and treatment of oesophageal motility disorders*. Elsevier; 2023 Jan 6.
18. Tebaibia A, Boudjella MA, Boutarene D, et al. Incidence, clinical features and para-clinical findings of achalasia in Algeria: Experience of 25 years. *World J Gastroenterol*. 2016;22(38):8615-23. <https://doi.org/10.3748/wjg.v22.i38.8615>.
19. Stein CM, Gelfand M, Taylor HG. Achalasia in Zimbabwean blacks. *S Afr Med J*. 1985;67(7):261-2. PMID: 3983775.

20. Surdea-Blaga T, David L, Pop A, Tantau M, Dumitrascu DL. Clinical and manometric characteristics of patients with achalasia: One disease with three presentations or three diseases with one presentation? *J Gastrointest Liver Dis.* 2020;29(4):501-8. <https://doi.org/10.15403/jgld-2995>.
21. Shiwaku A, Shiwaku H, Okada H, Kusaba H, Hasegawa S. Treatment outcomes and oesophageal cancer incidence by disease type in achalasia patients undergoing peroral endoscopic myotomy: Retrospective study. *Dig Endosc.* 2025;37(4):376-90. <https://doi.org/10.1111/den.14928>.
22. Zaninotto G, Bennett C, Boeckxstaens G, et al. The 2018 ISDE achalasia guidelines. *Dis Oesophagus.* 2018;31(9):10.1093/dote/doy071. <https://doi.org/10.1093/dote/doy071>.
23. Li DP, Han YX, He YS, et al. A global assessment of incidence trends of autoimmune diseases from 1990 to 2019 and predicted changes to 2040. *Autoimmun Rev.* 2023;22(10):103407. <https://doi.org/10.1016/j.autrev.2023.103407>.
24. Niebisch S, Hadzijusufovic E, Mehdorn M, et al. Achalasia - An unnecessary long way to diagnosis. *Dis Oesophagus.* 2017;30(5):1-6. <https://doi.org/10.1093/dote/dow004>.
25. Salvador R, Voltarel G, Savarino E, et al. The natural history of achalasia: Evidence of a continuum-"The evolutive pattern theory". *Dig Liver Dis.* 2018;50(4):342-7. <https://doi.org/10.1016/j.dld.2017.11.012>.
26. Nguyen A, Zhang J, Ward M, et al. 505 Surprising lack of correlation between integrated relaxation pressure level and symptom severity in patients with achalasia. *Dis Oesophagus.* 2020;33(Suppl_1). <https://doi.org/10.1093/dote/daaa087.131>.
27. Müller M, Förchler S, Wehrmann T, et al. Atypical presentations and pitfalls of achalasia. *Dis Oesophagus.* 2023;36(10):doad029. <https://doi.org/10.1093/dote/doad029>.

Addendum 1: Eckardt Score¹⁷

Score	Dysphagia	Retrosternal pain	Regurgitation	Weight loss
0	None	None	None	None
1	Occasional	Occasional	Occasional	< 5kg
2	Daily	Daily	Daily	5–10kg
3	Each meal	Each meal	Each meal	> 10kg

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Small-bowel video capsule endoscopy: a 4-year experience

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Background: Video capsule endoscopy (VCE) is an established non-invasive investigation of the small bowel. However, data describing its use and findings in sub-Saharan Africa remain limited. We evaluated the indications, findings, safety and factors associated with abnormal VCE examinations at a tertiary academic centre in South Africa.

Methods: We conducted a retrospective review of consecutive patients who underwent VCE at Groote Schuur Hospital between June 2021 and June 2025. Demographic characteristics, clinical indications, previous investigations, VCE findings, examination completion, complications and documented subsequent investigations or interventions were recorded. The primary outcome was the presence of an abnormal VCE finding. Secondary outcomes included small-bowel pathology, examination completion, safety and factors associated with an abnormal examination.

Results: Seventy patients underwent VCE, with a mean age of 59.8 ± 15.3 years; 39 (55.7%) were female. Iron-deficiency anaemia was the most common indication (53/70; 75.7%), followed by overt gastrointestinal bleeding (14/70; 20.0%). An abnormal VCE finding was identified in 49 patients (70.0%), while small-bowel pathology was identified in 39/70 (55.7%). Angiodysplasia was the most common small-bowel abnormality (28/70; 40.0%), followed by masses or polyps (8/70; 11.4%) and ileitis (3/70; 4.3%). Gastritis was identified in 11 patients (15.7%) and colonic polyps or masses in 2 (2.9%). Seven of 28 patients with angiodysplasia subsequently underwent double balloon enteroscopy and argon plasma coagulation. Complete examination was achieved in all patients, with no capsule retention or procedure-related complications. No significant associations were identified between abnormal VCE findings and age, sex, iron-deficiency anaemia, overt gastrointestinal bleeding or weight loss.

Conclusion: VCE identified abnormalities in 70% of patients in this South African tertiary-care cohort, with small-bowel pathology present in 55.7%. The procedure was safe and achieved complete examinations in all patients. Angiodysplasia was the predominant finding, and VCE directed subsequent therapeutic enteroscopy in a subset of patients. These findings support the role of VCE in appropriately selected patients and provide further regional data from sub-Saharan Africa, while highlighting the need for prospective studies assessing subsequent management and patient-centred outcomes.

Keywords: endoscopy, gastrointestinal, diagnostic yield, South Africa

Introduction

Video capsule endoscopy (VCE) was first described in 2000 and entered clinical practice in the early 2000s, subsequently becoming an established non-invasive modality for evaluating small-bowel pathology.¹ In patients with suspected small-bowel bleeding, VCE has demonstrated good diagnostic performance compared with conventional cross-sectional imaging, including computed tomography enterography.²

Its principal application remains the evaluation of suspected small-bowel bleeding following negative upper and lower gastrointestinal endoscopy.^{3,4} However, its applications extend beyond bleeding to the detection of inflammatory, vascular and neoplastic small-bowel lesions and other mucosal abnormalities that may be difficult to identify by conventional imaging.^{3,4} In selected patients, these findings may provide a direction for further investigation, including targeted enteroscopy or biopsy, and may occasionally reveal an unsuspected or uncommon diagnosis.

VCE is generally considered safe, with a low complication rate. Capsule retention remains the most clinically significant adverse event, occurring in approximately 1% of examinations, particularly in patients with stricturing

disease or tumours.^{5,6} Other limitations include incomplete examinations, delayed gastric transit and, less commonly, difficulty with capsule ingestion.⁷

Although the indications, diagnostic yield and safety profile of VCE are well described internationally, with substantial experience reported across a range of clinical indications and patient populations, data from sub-Saharan Africa remain limited.^{8,9} Recent published experience includes a single-centre study from Kenya and a South African study from our own institution, both highlighting the limited regional evidence base.^{10,11} Local data are important for informing patient selection, optimising resource utilisation and guiding clinical practice. This study aimed to evaluate the clinical indications, VCE findings, safety and predictors of abnormal findings at a tertiary academic centre in South Africa, providing real-world data from a resource-limited setting.

Methods

Study design

We conducted a retrospective review of the medical records of consecutive patients who underwent small-bowel VCE at

the Gastrointestinal Clinic, Groote Schuur Hospital, between June 2021 and June 2025. Data collected included patient demographics, clinical indications, prior investigations, VCE findings, examination completion, complications and documented subsequent management following VCE.

Data were collected and entered by a single investigator through systematic review of the medical records and captured in a secure Research Electronic Data Capture (REDCap) database.

The primary aim was to describe the clinical indications and findings of small-bowel VCE in this tertiary-care cohort. Secondary aims were to describe examination completion and safety, document subsequent investigations and interventions following VCE where these were recorded and assess whether demographic or clinical variables were associated with an abnormal VCE finding.

Clinical indications and definitions

Indications for VCE were categorised as iron-deficiency anaemia (IDA), overt gastrointestinal bleeding, diarrhoea and weight loss. Patients with more than one documented indication were included in all relevant categories.

Overt gastrointestinal bleeding was defined as documented haematochezia, melena or haematemesis, including coffee-ground vomiting. IDA was defined according to the documented clinical diagnosis in the medical record. Although IDA may prompt investigation for gastrointestinal blood loss, it was not considered synonymous with occult gastrointestinal bleeding, as iron deficiency may have non-gastrointestinal causes.

Diarrhoea was recorded when symptoms persisted despite prior evaluation without an identified cause. Weight loss was defined as documented unintentional reduction in body weight recorded in the clinical record.

Prior investigations

Previous investigations were recorded, including upper gastrointestinal endoscopy, colonoscopy, cross-sectional imaging and angiography when performed before VCE. The extent of prior investigation was documented to describe the clinical context in which VCE was undertaken.

VCE procedure

VCE was performed using the PillCam™ SB3 system (Medtronic, USA), comprising an ingestible capsule, external sensors, a portable data recorder and dedicated analysis software. All patients underwent bowel preparation with three sachets of Pico-Prep approximately 8 hours before the procedure and fasted overnight. Capsule progression was monitored using the data recorder at 2, 4 and 6 hours after ingestion. At the 2-hour assessment if the capsule was retained in the stomach oral metoclopramide was administered to facilitate passage of the VCE into the small bowel. Patients were permitted to resume normal activity and oral intake four hours after capsule ingestion.

Recorded data were downloaded and analysed using PillCam™ RAPID version 8.0 software. Interpretation was carried out by the gastroenterology fellow under supervision by a consultant gastroenterologist experienced in interpreting VCE. VCE findings were categorised as angiodysplasia, mass or polyp, gastropathy, duodenitis, ileitis or ulceration. Additional abnormalities identified during examination were recorded where present.

Suboptimal mucosal visualisation was defined as inadequate visualisation documented by the interpreting clinician because of residual luminal contents or inadequate bowel preparation that limited assessment of the small-bowel mucosa.

A complete examination was defined as passage of the capsule to the caecum within the recording period. Capsule retention was defined as persistence of the capsule within the gastrointestinal tract beyond 72 hours, confirmed radiologically or requiring intervention for retrieval.

Outcome definitions

An abnormal VCE finding was defined as any abnormality identified during capsule examination, irrespective of whether the finding explained the presenting indication or resulted in a change in management. The overall abnormal-finding rate was defined as the proportion of patients with any abnormal finding identified on VCE.

Small-bowel pathology was defined as a pathological abnormality identified within the small bowel, including angiodysplasia, masses or polyps, and ileitis. Findings outside the small bowel, including gastropathy and colonic lesions, were recorded separately and were not automatically considered explanations for the presenting indication.

Documented subsequent clinical impact was defined as a subsequent investigation, therapeutic intervention or other management change attributable to a VCE finding. Because subsequent management was not systematically recorded for the entire cohort, this was analysed descriptively rather than as a formal measure of clinical outcome.

Evidence of active bleeding or stigmata of recent haemorrhage was recorded as a bleeding-related VCE finding.

Subsequent investigation and management

Where documented in the medical record, subsequent investigations and interventions following VCE were recorded. These included DBE, endoscopic biopsy, histological assessment and therapeutic intervention.

Double balloon enteroscopy (DBE) was used as the standard term throughout the manuscript for subsequent enteroscopic procedures.

Statistical analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistics were used to summarise baseline characteristics, clinical indications, VCE findings, examination completion, complications and documented subsequent management.

Associations between clinical variables and the presence of an abnormal VCE finding were assessed using t-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables, as appropriate. A two-sided p -value < 0.05 was considered statistically significant.

Results

A total of 70 patients underwent small-bowel video capsule endoscopy (VCE) at the Gastrointestinal Clinic, Groote Schuur Hospital, between June 2021 and June 2025. The mean age was 59.8 ± 15.3 years (range 16–86), and 39 patients (55.7%) were female. Iron-deficiency anaemia (IDA) was the most common indication for VCE, occurring

in 53 patients (75.7%), followed by overt gastrointestinal bleeding in 14 (20.0%). Diarrhoea was recorded in 3 patients (4.3%) and weight loss in 3 (4.3%).

All patients had undergone previous upper gastrointestinal endoscopy and 68 (97.1%) had undergone colonoscopy before VCE. Cross-sectional imaging with CT or MRI had been performed in 26 patients (37.1%), while 5 (7.1%) had undergone angiography for acute gastrointestinal bleeding before VCE.

An abnormal VCE finding was identified in 49 of 70 patients (70.0%). Small-bowel pathology was identified in 39 patients (55.7%). Angiodysplasia was the most common small-bowel abnormality, identified in 28 patients (40.0% of the total cohort), followed by masses or polyps in 8 (11.4%) and ileitis in 3 (4.3%). Non-small-bowel findings included gastropathy in 11 patients (15.7%) and colonic polyps or masses in 2 (2.9%) (Table I). Three patients had concomitant angiodysplasia and gastropathy; consequently, individual findings were not mutually exclusive.

Among the 21 patients with no abnormal VCE finding, IDA was the predominant indication ($n = 16$), followed by overt gastrointestinal bleeding ($n = 2$) and diarrhoea ($n = 3$). Suboptimal mucosal visualisation due to inadequate bowel

preparation was documented in five cases and may have contributed to the absence of an abnormal finding.

All patients completed bowel preparation, and a complete small-bowel examination was achieved in all cases, with the capsule reaching the caecum within the recording period. Prokinetic agents were used in 2 patients (2.9%). No capsule retention or procedure-related complications were observed.

Where documented, subsequent investigations included DBE, endoscopic biopsy and histological assessment. Histological evaluation of 4 lesions identified on VCE confirmed a single patient with each of the subsequent pathologies: adenocarcinoma, gastrointestinal stromal tumour, benign capillary haemangioma and duodenal tubular adenomas. Among the 28 patients with angiodysplasia, 7 subsequently underwent DBE and argon plasma coagulation. These documented interventions represent subsequent management in a subset of patients; clinical outcomes were not systematically recorded for the entire cohort.

Associations between clinical variables and the presence of an abnormal VCE finding are shown in Table II. No significant associations were identified for age, sex, IDA, overt gastrointestinal bleeding, weight loss. Diarrhoea was associated with an absence of an abnormal VCE finding ($p = 0.024$); however, this finding was based on only three patients with diarrhoea, all of whom had normal examinations, and should therefore be interpreted cautiously.

Discussion

In this retrospective single-centre cohort, VCE identified an abnormal finding in 70% of patients, while small-bowel pathology was identified in 55.7%. Angiodysplasia was the predominant small-bowel abnormality, followed by masses or polyps and ileitis. Most patients were referred for IDA or overt gastrointestinal bleeding, reflecting the principal clinical applications of VCE. Complete examinations were achieved in all patients, with no capsule retention or procedure-related complications.

The mean age of 59.8 years is broadly consistent with international VCE experience and reflects the increasing frequency of vascular and neoplastic small-bowel pathology

Table I: Findings identified on video capsule endoscopy

Finding	<i>n</i>	% of total cohort (<i>n</i> = 70)
Overall findings		
No abnormal finding	21	30.0
Any abnormal finding	49	70.0
Small-bowel pathology		
Angiodysplasia	28	40.0
Masses/polyps	8	11.4
Ileitis	3	4.3
Non-small-bowel findings		
Gastropathy	11	15.7
Colonic polyps/masses	2	2.9

Individual findings are not mutually exclusive. Three patients had concomitant angiodysplasia and gastropathy. Percentages therefore do not sum to 70%.

Table II: Factors associated with an abnormal VCE finding

Variable	No abnormal finding (<i>n</i> = 21)		Abnormal finding (<i>n</i> = 49)		<i>p</i> -value
Age, years, mean ± SD	57.2 ± 17.2		61.0 ± 14.5		0.347 ^t
Sex	<i>n</i>	%	<i>n</i>	%	0.713 ^c
Male	10	47.6	21	42.9	
Female	11	52.4	28	57.1	
Diarrhoea					
No	18	85.7	49	100	0.024 ^f
Yes	3	14.3	0	0.0	
Iron-deficiency anaemia					
No	5	23.8	12	24.5	0.951 ^c
Yes	16	76.2	37	75.5	
Overt gastrointestinal bleeding					
No	19	90.5	37	75.5	0.202 ^f
Yes	2	9.5	12	24.5	
Weight loss					
No	19	90.5	48	98.0	0.513 ^f
Yes	2	9.5	1	2.0	

^t t-test, ^c chi-square test, ^f Fisher's exact test

with advancing age.^{5,6,9} The predominance of IDA and overt gastrointestinal bleeding also reflects the established role of VCE following negative conventional endoscopic assessment.^{3,4} Selective referral in a resource-constrained setting may have contributed to the relatively high frequency of small-bowel abnormalities.

The 70% abnormal-finding rate should be interpreted in the context of our definitions. Of the 49 patients with an abnormal examination, 39 (55.7% of the total cohort) had small-bowel pathology, while the remainder had findings such as gastropathy or colonic lesions. Detection of an abnormality does not necessarily explain the presenting indication; in particular, isolated gastropathy should not automatically be regarded as an explanation for suspected small-bowel bleeding. The findings therefore describe the spectrum of abnormalities detected rather than assuming that every abnormality represents a clinically explanatory diagnosis.

The frequency of small-bowel pathology is comparable with that reported in international VCE series.^{5,9,12,13} Differences may reflect variation in patient selection, indications, timing of examination and referral pathways. In resource-constrained settings, selective referral may increase the pretest probability of pathology because VCE is generally reserved for patients in whom conventional investigations have not established a diagnosis.

Angiodysplasia was the most common small-bowel abnormality, identified in 28 patients (40.0%), consistent with its recognised importance in suspected small-bowel bleeding, particularly in older patients.^{7,9,12} Seven of these patients subsequently underwent therapeutic enteroscopy. Although this demonstrates documented subsequent intervention, it cannot be regarded as a measure of overall clinical impact because subsequent management was not systematically captured. It nevertheless illustrates how VCE findings can direct targeted enteroscopic investigation and treatment.

Our previous institutional study similarly demonstrated that detection of a lesion did not necessarily translate into measurable improvement in iron or haemoglobin support.¹¹ The present study extends this local experience by describing a broader VCE population and distinguishing abnormal findings from small-bowel pathology and documented intervention. The value of VCE should therefore not be judged solely by the number of abnormalities detected, but also by whether findings can subsequently be investigated or treated.

Masses and polyps were identified in 8 patients (11.4%). Histological assessment of 4 lesions resulted in a diagnosis. Although numbers were small, these findings illustrate the potential role of VCE in identifying otherwise undiagnosed lesions and directing subsequent enteroscopy and biopsy. No inference regarding the prevalence of small-bowel neoplasia in the wider South African or sub-Saharan African population can be drawn from this selected cohort.

Non-small bowel findings included gastropathy and colonic lesions. These abnormalities highlight the broader range of findings that may be encountered during VCE but require appropriate clinical interpretation and should not automatically be considered explanations for the presenting indication.¹⁴

Only three patients underwent VCE for diarrhoea, and all three examinations were normal. The association between

diarrhoea and an absence of an abnormal finding should therefore be interpreted cautiously and does not provide evidence that VCE has limited value for this indication. No significant associations were identified for age, sex, iron-deficiency anaemia, overt gastrointestinal bleeding, and weight loss. Given the sample size, the absence of significant associations should not be interpreted as evidence that these factors have no influence on VCE findings.

The absence of NSAID-related small-bowel ulceration is noteworthy, as NSAID enteropathy is a recognised contributor to small-bowel pathology.¹⁵ In our cohort, this may reflect differences in medication exposure, prescribing patterns, referral characteristics or the small sample size. It should not be interpreted as evidence of a regional difference in NSAID-related small-bowel disease.

The findings should also be considered in the context of the limited published experience from sub-Saharan Africa. A recent Kenyan study and our previous South African experience represent some of the available regional data but remain small compared with the international literature.^{10,11} The present study adds further South African data describing the indications, spectrum of findings and safety of VCE in routine tertiary-care practice.

VCE was safe in this cohort, with complete examinations achieved in all patients and no capsule retention or procedure-related complications. This is consistent with the established favourable safety profile of the technique.^{7,8}

Advances in capsule technology, including artificial intelligence-assisted image analysis, may further improve detection of subtle vascular and mucosal abnormalities.¹⁶ However, increased detection does not necessarily equate to improved clinical outcomes, particularly when detected lesions are incidental or subsequent therapeutic enteroscopy is unavailable. Future evaluation of AI-assisted VCE should therefore consider clinically meaningful outcomes in addition to lesion detection.

This study is limited by its retrospective design, relatively small sample size and single-centre setting, which restrict the power to detect associations and generalisability. The diarrhoea association was based on only three patients and should therefore be interpreted cautiously. Subsequent management and patient-centred outcomes were not systematically recorded, limiting assessment of longer-term clinical impact.

Conclusion

VCE identified abnormal findings in 70% of patients in this South African tertiary-care cohort, with small-bowel pathology identified in 55.7%. Angiodysplasia was the predominant finding and documented therapeutic enteroscopy followed in a subset of patients. VCE was safe, with complete examinations achieved in all patients. These findings support the use of VCE in appropriately selected patients while highlighting the need for prospective studies assessing subsequent management and patient-centred outcomes.

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding was required.

Ethical approval

The study was approved by the University of Cape Town Health Sciences Human Research Ethics Committee (HREC) (HREC Ref: 821/2025).

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REFERENCES

1. Iddan G, Meron G, Glukhovsky A, Swain P. Wireless capsule endoscopy. *Nature*. 2000;405(6785):417. <https://doi.org/10.1038/35013140>.
2. Yaghoobi M, Tan J, Alshammari YT, et al. Video capsule endoscopy versus computed tomography enterography in assessing suspected small bowel bleeding: A systematic review and diagnostic test accuracy meta-analysis. *Eur J Gastroenterol Hepatol*. 2023;35(11):1253-62. <https://doi.org/10.1097/MEG.0000000000002651>.
3. Pennazio M, Spada C, Eliakim R, et al. Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy*. 2015;47(4):352-76. <https://doi.org/10.1055/s-0034-1391855>.
4. Gerson LB, Fidler JL, Cave DR, Leighton JA. ACG Clinical Guideline: Diagnosis and management of small bowel bleeding. *Am J Gastroenterol*. 2015;110(9):1265-87. <https://doi.org/10.1038/ajg.2015.246>.
5. Mustafa BF, Samaan M, Langmead L, Khasraw M. Small bowel video capsule endoscopy: An overview. *Expert Rev Gastroenterol Hepatol*. 2013;7(4):323-9. <https://doi.org/10.1586/egh.13.20>.
6. Pennazio M, Rondonotti E, Despott EJ, et al. Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Guideline: Update 2022. *Endoscopy*. 2023;55(1):58-95. <https://doi.org/10.1055/a-1973-3796>.
7. Rezapour M, Amadi C, Gerson LB. Retention associated with video capsule endoscopy: Systematic review and meta-analysis. *Gastrointest Endosc*. 2017;85(6):1157-68.e2. <https://doi.org/10.1016/j.gie.2016.12.024>.
8. Rondonotti E, Herrerias JM, Pennazio M, et al. Complications, limitations, and failures of capsule endoscopy: A review of 733 cases. *Gastrointest Endosc*. 2005;62(5):712-6. <https://doi.org/10.1016/j.gie.2005.05.002>.
9. Liao Z, Gao R, Xu C, Li Z. Indications and detection, completion, and retention rates of small-bowel capsule endoscopy: A systematic review. *Gastrointest Endosc*. 2010;71(2):280-6. <https://doi.org/10.1016/j.gie.2009.09.031>.
10. Kuka WP, Mugo GW, Oluoch EB, et al. Indications and outcomes of video capsule endoscopy in sub-Saharan Africa: A 5-year single-centre experience in Nairobi, Kenya. *J Trop Med*. 2025;2025:6495299. <https://doi.org/10.1155/jotm/6495299>.
11. Machiridza TR, Setshedi M, Thomson SR. Small bowel capsule endoscopy for obscure gastrointestinal bleeding not associated with a reduction in iron or haemoglobin support. *S Afr J Gastroenterol Hepatol*. 2025;2(2):83-7. <https://doi.org/10.36303/SAJGH.2894>.
12. Aljemeeli FA, Alzead AA, Al Shareef S, et al. Utility of video capsule endoscopy in clinical practice, experience at King Faisal Specialist Hospital and Research Centre, Riyadh. 2022;9(4):384-92. <https://doi.org/10.18203/2349-3933.ijam20220733>.
13. Tontini GE, Wiedbrauck F, Cavallaro F, et al. Small-bowel capsule endoscopy with panoramic view: Results of the first multicentre, observational study (with videos). *Gastrointest Endosc*. 2016;85(2):401-8. <https://doi.org/10.1016/j.gie.2016.07.063>.
14. Calabrese C, Gelli D, Dussias N, Melotti L. Capsule endoscopy in the detection of non-small bowel lesions missed by endoscopy. 2021;1-9. <https://doi.org/10.21203/rs.3.rs-263791/v1>.
15. Watanabe T, Fujiwara Y, Chan FKL. Current knowledge on non-steroidal anti-inflammatory drug-induced small-bowel damage: A comprehensive review. *J Gastroenterol*. 2020;55(5):481-495. <https://doi.org/10.1007/s00535-019-01657-8>.
16. Sullivan P, Gupta S, Powers PD, Marya NB. Artificial intelligence research and development for application in video capsule endoscopy. *Gastrointest Endosc Clin N Am [Internet]*. 2021;31(2):387-97. <https://doi.org/10.1016/j.giec.2020.12.009>.

An analysis of adverse oesophageal events after endoscopic variceal ligation

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Endoscopic variceal ligation (EVL) is the preferred endoscopic treatment for acute oesophageal variceal bleeding and is used for primary and secondary prophylaxis because of its efficacy and improved safety compared with injection sclerotherapy. Nevertheless, procedure-related adverse events remain clinically important, particularly in patients with advanced portal hypertension and decompensated liver disease. Published complication rates vary widely due to differences in patient selection, operator experience, study design, duration of follow-up and inconsistent definitions and reporting of adverse events. This narrative review evaluates the spectrum, mechanisms, clinical presentation, prevention and management of oesophageal complications associated with EVL. Local oesophageal complications include intra-procedural bleeding, post-banding ulceration, post-banding ulcer bleeding, incomplete variceal eradication, recurrent varices, early rebleeding, dysmotility, dysphagia, oesophageal obstruction, stricture and perforation. Gastric mucosal consequences, including portal hypertensive gastropathy and duodenopathy are also considered. In addition, device-related technical complications, including band deployment failure, barrel dislodgement and ligator malfunction are included because of the distinct mechanisms and preventive strategies. Most complications are uncommon and can be minimised by careful patient selection, meticulous endoscopic technique, appropriate equipment checks and early recognition of evolving adverse events. Although serious complications are infrequent, prompt diagnosis and multidisciplinary management are essential to optimise patient outcomes. The review also highlights the lack of uniform reporting standards for EVL-related adverse events and emphasises the need for prospective, standardised classification systems to facilitate meaningful comparisons between studies. Improved understanding of the mechanisms, prevention and management of EVL-related complications should further enhance the safety and effectiveness of this established endoscopic therapy.

Keywords: oesophageal variceal bleeding, adverse events, endoscopic variceal ligation

Introduction

Endoscopic therapy has transformed the management of portal hypertensive bleeding and is now central to the treatment of both oesophageal and gastric varices (Figure 1).¹ Endoscopic variceal ligation (EVL) has replaced injection sclerotherapy (IST) as the first-line treatment for bleeding oesophageal varices, both during acute haemorrhage and for secondary prophylaxis because randomised controlled trials have demonstrated more rapid variceal eradication, lower rebleeding rates and fewer procedure-related complications.^{2,3} Despite the favourable safety profile, both elective and emergency EVL remain associated with procedure-related adverse events.⁴

Among 17 prospective randomised controlled trials comparing EVL with IST, reported complication rates ranged from 2–69%, reflecting inconsistent definitions and reporting of adverse events rather than true differences in safety.⁵ The absence of standardised reporting requirements has hindered accurate estimation of complication rates, which range from transient self-limiting symptoms to life-threatening haemorrhage and procedure-related mortality.⁴ Although the recently developed AGREE (Adverse events in Gastrointestinal Endoscopy) classification provides a standardised framework for reporting endoscopic complications, retrospective application to the existing

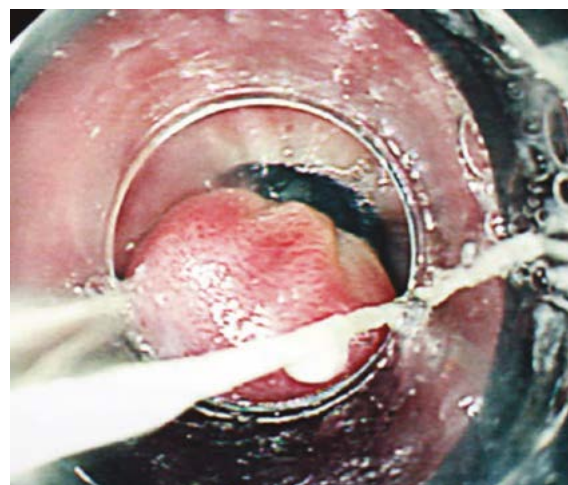


Figure 1: Ligated oesophageal varix with a secure band in situ

literature is limited because most studies predate its introduction and lack the clinical detail required for accurate severity grading.⁶

This review provides a contemporary overview of complications associated with endoscopic therapy for oesophageal varices. Complications are classified according

to their anatomical location, pathophysiological mechanism and clinical significance, with emphasis on their incidence, pathogenesis, prevention and management. Particular attention is given to post-banding ulcer bleeding, technical complications, and the evolving role of standardised complication reporting to facilitate future research and quality improvement.

Literature search

The literature reviewed in this narrative article was identified through comprehensive searches of PubMed/MEDLINE, PMC, Web of Science, Scopus, Primo and the Cochrane Library from database inception to 30 June 2026. Search terms included combinations of portal hypertension, oesophageal varices, endoscopic variceal ligation, complications, adverse events, rebleeding, post-banding ulcer bleeding,

oesophageal obstruction, oesophageal stricture, perforation, and technical complications (Supplementary Table I). Reference lists of relevant articles, systematic reviews and international guidelines were manually searched to identify additional publications.

Data synthesis

As considerable heterogeneity existed in study designs, definition of complications and outcome reporting, formal meta-analysis was not appropriate and evidence was synthesised narratively. Complications were categorised as either (i) local or (ii) technical and device-related, and reviewed with regard to incidence, pathogenesis, clinical significance, prevention and management. Where possible, incidence estimates and management recommendations were based on systematic reviews, meta-analyses and prospective

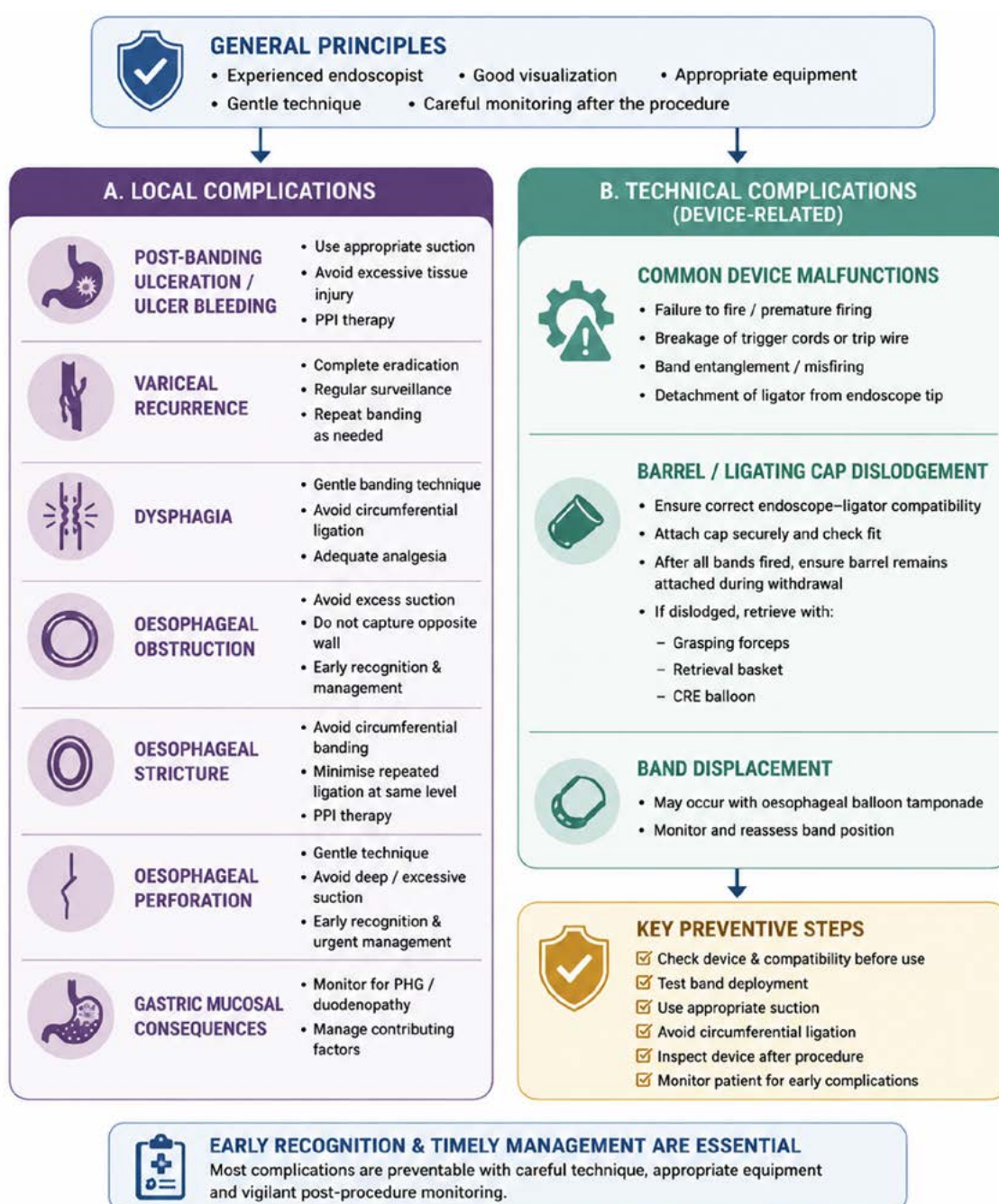


Figure 2: Local and technical complications following endoscopic variceal ligation: principles of prevention
PPI – proton pump inhibitor, PHG – portal hypertensive gastropathy

studies; however, uncommon complications were interpreted with caution because evidence was frequently limited to isolated case reports or small case series.

Incidence of complications after endoscopic therapy

There is no universally accepted definition or classification of complications following endoscopic treatment of oesophageal varices, and reported incidence rates therefore vary widely.⁴ This variability reflects differences in study design, patient selection, operator experience, emergency versus elective treatment, duration of follow-up and inconsistent reporting of adverse events.⁷ Patients undergoing endoscopic therapy frequently have advanced liver disease, making it difficult to distinguish procedure-related complications from those attributable to the underlying disease. Prospective studies with systematic data collection generally report higher complication rates than retrospective series, and outcomes are reported variably on a per-patient or per-procedure basis.^{4,7} Despite these limitations, the best available evidence suggests that 10–15% of patients experience a procedure-related complication, whereas procedure-related mortality remains < 1%.⁴

Categorisation of EVL-related complications

Complications of EVL are grouped according to their anatomical location, pathophysiological mechanism and clinical impact. For the purposes of this review, adverse events have been grouped into two categories: (i) local and (ii) technical or device-related complications (Figure 2). Local complications occur at or adjacent to the site of endoscopic treatment and include ulceration, bleeding, obstruction, stricture and perforation. Technical complications relate to equipment malfunction, device failure or procedural factors. This practical categorisation provides a framework for discussing the incidence, mechanisms, prevention and management of adverse events. Not reviewed are the systemic and sedation-related risks associated with

therapeutic variceal endoscopy which are beyond the remit of this analysis.

EVL-induced ulceration

Post-ligation ulceration is an inevitable consequence of successful EVL and represents the normal healing response rather than a true complication. Following thrombosis and sloughing of the ligated varix, a superficial mucosal ulcer develops and usually heals within 2–3 weeks by granulation, re-epithelialisation and scar formation.^{8–10} Although ulceration is universal, most ulcers remain asymptomatic or cause only mild retrosternal discomfort, odynophagia or transient dysphagia. The principal clinical significance is that the ulcers provide the substrate for post-banding ulcer bleeding. Ulcer healing may be impaired by advanced liver disease, persistent portal hypertension, coagulopathy, infection or continued acid exposure. In a randomised controlled trial, pantoprazole significantly reduced post-banding ulcer size, although ulcer number and symptoms were unchanged, suggesting that proton pump inhibitors may promote mucosal healing without proven benefit for clinically important outcomes.¹¹

EVL-induced ulcer bleeding

Post-banding ulcer bleeding (PBUB) is the most serious local complication of EVL and is associated with substantial morbidity and mortality. Bleeding occurs when sloughing of the ligated tissue or premature band detachment exposes a patent underlying varix before complete thrombosis has occurred.¹² This may result from incomplete suction of the varix into the ligating cap or inaccurate band placement during emergency endoscopy.¹³ Endoscopically, PBUB is defined as either active bleeding from an ulcer base with a patent underlying varix or bleeding from a post-ligation ulcer following premature band slippage or dislodgement.¹⁴ The pathogenesis is multifactorial. Premature band slippage with incomplete variceal thrombosis is the principal mechanism, while delayed ulcer healing secondary to gastro-oesophageal reflux, coagulopathy, local infection, advanced liver disease and technical factors may further increase the risk.¹⁵ Clinically significant PBUB occurs in 3.6–15% of patients and carries a reported mortality of up to 52%.¹⁵ Although reported outcomes vary because of inconsistent definitions and heterogeneous study populations, endoscopic classification into Type A (spurting), Type B (oozing), Type C (adherent clot) and Type D (clean ulcer base) may assist therapeutic decision-making.¹⁶

Management depends on the severity of bleeding and available expertise. Endoscopic options include repeat EVL, cyanoacrylate or sclerosant injection, haemostatic powders, through-the-scope and over-the-scope clips, while rescue therapies include oesophageal self-expanding metal stents (SEMS), Sengstaken-Blakemore balloon tamponade and transjugular intrahepatic portosystemic shunt (TIPS).¹² In a retrospective series, SEMS achieved haemostasis in 82.1% of patients and served as an effective bridge to definitive portal decompression.¹⁷ Proton pump inhibitors may accelerate ulcer healing and have been associated with improved bleeding-free survival, although definitive evidence for improved clinical outcomes remains limited.¹⁸

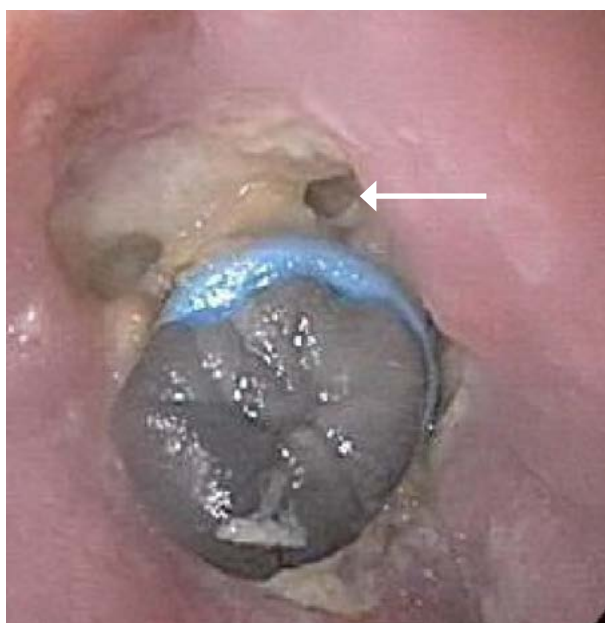


Figure 3: Necrotic banded varix and associated oesophageal ulceration (arrow)

Variceal eradication and recurrence

Complete endoscopic eradication of oesophageal varices is the principal therapeutic endpoint of EVL and is recommended by current AASLD/ACG guidelines to reduce recurrent haemorrhage.¹⁹ However, reported eradication rates vary from 55–95%, reflecting differences in treatment protocols, follow-up schedules and definitions of eradication.⁵ Some studies considered residual varices too small for ligation as eradicated, whereas others required complete endoscopic disappearance. Variceal recurrence should be distinguished from persistent varices; recurrence refers to reappearance after documented eradication, whereas persistence reflects incomplete initial treatment. Failure to differentiate these entities contributes to the wide variation in reported recurrence rates.⁵

Recurrence reflects the limitations of EVL rather than treatment failure alone. Band ligation eradicates the intraluminal varix but does not obliterate the perforating veins connecting the submucosal varices to the extramural collateral circulation, allowing progressive redevelopment of varices.²⁰ In addition, residual varices become increasingly difficult to ligate because of their small size and progressive mucosal fibrosis following repeated treatment sessions.⁵ These anatomical and technical limitations explain the need for repeated treatment and continued endoscopic surveillance after apparent variceal eradication.

Variceal rebleeding

Variceal rebleeding remains a major cause of morbidity and mortality following EVL. According to the Baveno VII consensus, rebleeding is classified as failure to control bleeding within 5 days of the index procedure or early rebleeding occurring within 6 weeks after initial haemostasis.²¹ Early rebleeding occurs in 10–20% of patients and is associated with mortality approaching 40%.²¹

Early rebleeding comprises several distinct mechanisms, including persistent bleeding from incompletely ligated varices, premature band slippage with PBUB, recurrent haemorrhage from incompletely thrombosed varices, bleeding from untreated adjacent (“virgin”) varices and non-variceal sources such as portal hypertensive gastropathy or peptic ulcer disease. Failure to distinguish between these mechanisms has contributed to the heterogeneity of published studies evaluating rebleeding after EVL.^{7,22}

Risk factors include advanced liver disease, particularly Child-Pugh class C cirrhosis, active bleeding at index endoscopy, large varices, red wale signs, spontaneous bacterial peritonitis, severe ascites, hypoalbuminaemia, anaemia, elevated blood urea nitrogen, coagulopathy and a hepatic venous pressure gradient exceeding 16 mmHg.²³ Technical factors, including inadequate suction and premature band slippage related to variations in ligation-band retraction forces, may further increase the risk of recurrent haemorrhage.²⁴ Careful band placement, complete suction of the target varix, meticulous surveillance and appropriate secondary prophylaxis remain the principal strategies for preventing rebleeding.²⁵

Dysmotility

The effects of EVL on oesophageal motility have been inadequately studied, and the true incidence and clinical significance of post-EVL dysmotility remain uncertain. Before treatment, patients with oesophageal varices

often demonstrate impaired oesophageal motor function, characterised by reduced peristaltic amplitude, prolonged contractions and delayed oesophageal transit, while lower oesophageal sphincter (LOS) function is usually preserved. Gastro-oesophageal reflux disease is present in up to 64% of patients.²⁶

Unlike IST, which significantly impairs oesophageal motility, EVL has little effect on oesophageal motor function. Manometric studies demonstrate no significant changes in LOS pressure or peristaltic amplitude, duration or propagation following ligation. Although transient impairment of oesophageal transit may occur immediately after treatment, it resolves as oedema subsides and ulcer healing progresses. Persistent dysmotility should therefore prompt investigation for alternative structural complications rather than being attributed to EVL itself.²⁶

Dysphagia

Transient dysphagia is one of the most common symptoms following EVL. Although oesophageal motility is generally preserved, up to 75% of patients experience swallowing difficulty during the first 24–72 hours, probably because of local oedema, oesophageal spasm and temporary luminal narrowing from the ligated varices rather than permanent neuromuscular dysfunction.²⁶ Symptoms are usually mild and resolve spontaneously as oedema subsides and post-ligation ulcers heal, requiring only reassurance, dietary modification and simple analgesia.

Persistent or progressive dysphagia is not an expected consequence of EVL and should prompt endoscopic evaluation to exclude structural complications such as oesophageal obstruction, stricture or, rarely, perforation. The distinction between transient and persistent dysphagia is clinically important, as the latter usually indicates an underlying complication requiring further investigation and treatment.²⁶

Oesophageal obstruction

Complete oesophageal obstruction is an uncommon but potentially serious complication of EVL. It results from excessive suction during band deployment, with inadvertent capture of the opposite oesophageal wall, producing circumferential luminal entrapment into a single elastic band. Only 12 cases have been reported.²⁷ Patients typically present within hours of EVL with severe dysphagia, odynophagia, inability to swallow saliva, retrosternal pain and regurgitation. Endoscopy confirms complete luminal occlusion. Although obstruction has been reported more frequently in women, elderly patients, those with large varices and after repeated ligation sessions, the limited number of cases precludes firm conclusions regarding risk factors.²⁸

Most patients respond to conservative management with intravenous fluids, analgesia, proton pump inhibitors and temporary fasting, with spontaneous restoration of luminal patency after band sloughing. Endoscopic band removal has been described but should be undertaken cautiously because of the risk of precipitating haemorrhage. Surgical intervention is rarely required.²⁹

Prevention depends on meticulous technique, avoiding excessive suction and ensuring that only the target varix and adjacent mucosa are captured within the ligation band. Early recognition and endoscopic assessment are essential

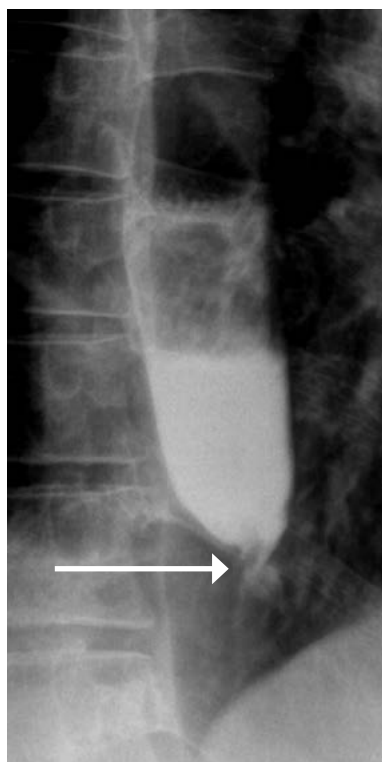


Figure 4: Gastrografin swallow showing complete distal oesophageal obstruction (arrow)

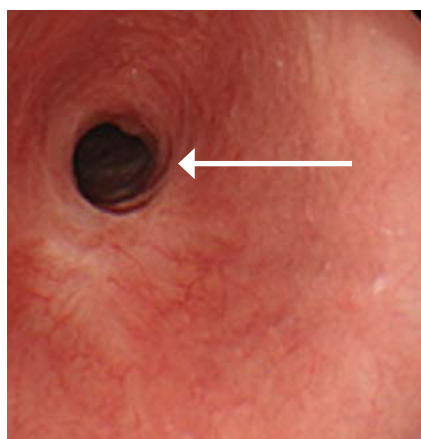


Figure 5: Distal oesophageal stricture after eradication of varices (arrow)

to prevent progression to pressure necrosis, perforation or subsequent stricture formation.^{28,29}

Oesophageal stricture

Oesophageal stricture is an uncommon late complication of EVL resulting from excessive fibrosis during healing of post-ligation ulcers. Unlike IST, which causes deep mural inflammation and is strongly associated with stricture formation, EVL generally limits injury to the mucosa and submucosa, making clinically significant strictures uncommon.^{30,31} Strictures usually develop several weeks after treatment and are associated with circumferential or overlapping band placement, repeated ligation at the same oesophageal level and healing of extensive post-banding ulceration. Previous endoscopic therapy, large varices and severe ulceration may further increase the risk.³¹

Patients typically present with progressive dysphagia, initially to solids and later to liquids, with or without odynophagia, weight loss or food bolus impaction. Persistent dysphagia beyond the expected post-EVL recovery period should prompt repeat endoscopy, which usually demonstrates a short fibrotic narrowing at the previous ligation site.^{29,31}

Most strictures respond well to endoscopic dilatation using balloon or bougie dilators, although repeated treatment sessions may occasionally be required; however, dilatation should be undertaken cautiously in patients with persistent varices because of the risk of precipitating haemorrhage. Proton pump inhibitors are commonly prescribed to promote mucosal healing, while prevention depends on meticulous ligation technique, avoiding circumferential band placement and repeated banding at the same oesophageal level.³¹

Oesophageal perforation

Oesophageal perforation is a rare but serious complication of endoscopic of EVL. Unlike IST, where deep mural necrosis predisposes to perforation, tissue injury after EVL is usually confined to the mucosa and submucosa, making full-thickness perforation exceptionally uncommon.²⁴ Perforation may occur during band deployment because of excessive suction or traumatic instrumentation, or later as a consequence of deep ulceration, circumferential tissue injury, oesophageal obstruction or mural ischaemia. Previous endoscopic therapy and extensive fibrosis may further increase the risk.²⁴

Patients typically present with severe retrosternal pain, dysphagia, odynophagia, fever and signs of mediastinitis or sepsis. Because early symptoms may resemble expected post-EVL discomfort, a high index of suspicion is essential. Contrast-enhanced CT with water-soluble oral contrast is the investigation of choice, while endoscopy should be undertaken cautiously when perforation is suspected.

Management depends on the size of the perforation and the patient's clinical condition. Initial treatment includes fasting, broad-spectrum antibiotics, proton pump inhibitors, nutritional support and drainage of infected collections when necessary. Selected contained perforations may be managed conservatively or with endoscopic therapies, including clips, covered self-expanding metal stents or endoscopic vacuum therapy, whereas extensive perforations, uncontrolled contamination or sepsis require urgent surgery. Early diagnosis and prompt multidisciplinary management are the principal determinants of outcome. Prevention relies on meticulous technique, avoiding excessive suction and circumferential banding. Oesophageal perforation should always be considered in patients who develop severe chest pain, persistent dysphagia or systemic toxicity after EVL.³²

Gastric mucosal consequences

EVL is directed at oesophageal varices but may alter portal venous haemodynamics, raising concern that variceal eradication could contribute to the development or progression of portal hypertensive gastropathy (PHG) and portal hypertensive duodenopathy. The proposed mechanism is redistribution of portal blood flow following obliteration of oesophageal varices, although the available evidence remains limited and conflicting.³³

In a prospective study of 60 patients undergoing variceal eradication with EVL or IST, the prevalence of both PHG and portal hypertensive duodenopathy increased after treatment, with no significant difference between the two modalities.³⁴ These findings suggest that the observed changes are more likely related to progression of the underlying portal hypertension than to the endoscopic technique itself. Most patients remain asymptomatic, although severe PHG may cause chronic iron-deficiency anaemia or, less commonly,



Figure 6: Wilson-Cook® multi-band ligation device demonstrating the vacuum-assisted cap and six-band delivery mechanism

acute gastric bleeding. Patients presenting with recurrent anaemia or upper gastrointestinal bleeding after successful variceal eradication should therefore be evaluated for gastric mucosal lesions as well as recurrent varices.^{33,34}

Technical complications of multi-band ligation devices

Since the development of the original single-shot ligating device by Stiegmann in 1986,^{35,36} numerous disposable and reusable multi-band ligators have been introduced. Although designs differ in the number of preloaded bands and deployment mechanisms, all operate on the same principles of vacuum-assisted tissue capture and elastic band release. Successful EVL depends not only on operator expertise but also on correct device assembly, compatibility and performance. Device malfunction may compromise haemostasis, prolong procedures and occasionally result in patient injury.^{2,4}

Analysis of the United States Food and Drug Administration Manufacturer and User Facility Device Experience (MAUDE) database identified 3 531 reports describing 4720 device malfunctions and 258 patient-related adverse events between 2011 and 2021.³⁷ Common failures included unsuccessful or premature band deployment, trigger-cord or trip-wire breakage, component entanglement, device misfiring and detachment of the ligating cap. Reported patient complications included recurrent variceal bleeding, dysphagia, oesophageal laceration, perforation, haematoma and, rarely, death.³⁷

An uncommon technical complication is dislodgement of the ligating barrel or cap within the oesophagus, usually resulting from incompatibility between the ligator and slimmer endoscopes or disengagement of the trigger cords after deployment of all bands.^{38,39} The detached cap acts as an oesophageal foreign body and can usually be retrieved endoscopically using grasping forceps, retrieval baskets or a controlled radial expansion balloon.⁴⁰ Previously deployed bands may also be displaced during oesophageal balloon tamponade for uncontrolled bleeding.⁴¹

Most device-related complications are preventable. Before each procedure, compatibility between the ligator and endoscope should be confirmed, the cap securely attached

and the deployment mechanism tested. Inspection of the device following ligation to ensure that the barrel remains attached to the endoscope is a simple but important safety measure.^{25,40,41}

Strategies to prevent EVL-related complications

Prevention of complications after EVL begins with careful patient selection, meticulous endoscopic technique and early recognition of evolving adverse events. Although most complications are minor and self-limiting, serious events occur predominantly in patients with advanced liver disease, active bleeding or technically demanding procedures. Optimal outcomes therefore depend on technical proficiency, sound clinical judgement and prompt recognition of complications.⁴²

Adequate resuscitation should precede emergency endoscopy, and procedures should be performed by experienced endoscopists with appropriate assistance and equipment. Good visualisation is essential for accurate band placement and complete identification of bleeding varices.⁴³ The target varix should be suctioned into the cap until a red-out is achieved, with suction maintained until band deployment. However, excessive suction with circumferential mucosal capture and repeated banding at the same level should be avoided to minimise the risk of stricture formation.^{25,44} Careful inspection of the ligation device before and after deployment, including confirmation of endoscope compatibility, further reduces device-related complications.⁴³

Following EVL, patients should be monitored for persistent chest pain, dysphagia, fever or recurrent bleeding, which may indicate PBUB, obstruction or perforation.⁴⁴ Early endoscopic reassessment and cross-sectional imaging should be undertaken when significant complications are suspected. Proton pump inhibitors may promote ulcer healing and reduce PBUB, although they do not prevent ulcer formation.¹⁸ Persistent or recurrent bleeding despite appropriate endoscopic therapy should prompt consideration of rescue interventions such as TIPS.^{25,44}

Meticulous technique, adequate training, appropriate device selection, vigilant post-procedure assessment and timely intervention remain the cornerstones of preventing EVL-related complications while maintaining the excellent efficacy of variceal ligation.⁴²

Conclusion

Endoscopic variceal ligation remains the treatment of choice for oesophageal varices because of its high efficacy and favourable safety profile. Although most adverse events are minor and self-limiting, serious complications – including post-banding ulcer bleeding, obstruction, stricture, perforation and device-related failures – may occur and require early recognition and prompt management. Reported complication rates vary considerably because of inconsistent definitions and heterogeneous reporting, limiting meaningful comparison between studies. Greater standardisation of adverse event reporting, together with meticulous endoscopic technique, appropriate patient selection and familiarity with ligation devices, should further improve procedural safety. A better understanding of the mechanisms, prevention and management of EVL-related complications will enhance patient outcomes while

supporting continued refinement of endoscopic therapy for portal hypertension.

Conflict of interest

The authors declare no conflict of interest.

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REFERENCES

- Aggeletopoulou I, Konstantakis C, Manolakopoulos S, Triantos C. Role of band ligation for secondary prophylaxis of variceal bleeding. *World J Gastroenterol*. 2018;24(26):2902-17. <https://doi.org/10.3748/wjg.v24.i26.2902>.
- Tait IS, Krige JE, Terblanche J. Endoscopic band ligation of oesophageal varices. *Br J Surg*. 1999;86(4):437-46. <https://doi.org/10.1046/j.1365-2168.1999.01109.x>.
- Krige JE, Shaw JM, Bornman PC. The evolving role of endoscopic treatment for bleeding oesophageal varices. *World J Surg*. 2005;29(8):966-73. <https://doi.org/10.1007/s00268-005-0138-2>.
- Krige JE, Bornman PC, Shaw JM, Apostolou C. Complications of endoscopic variceal therapy. *S Afr J Surg*. 2005;43(4):177-88, 190-4. PMID: 16440594.
- Krige J, Jonas E, Kotze U, et al. Defining the advantages and exposing the limitations of endoscopic variceal ligation in controlling acute bleeding and achieving complete variceal eradication. *World J Gastrointest Endosc*. 2020;12(10):365-77. <https://doi.org/10.4253/wjge.v12.i10.365>.
- Nass KJ, Zwager LW, van der Vlugt M, et al. Novel classification for adverse events in GI endoscopy: The AGREE classification. *Gastrointest Endosc*. 2022;95(6):1078-85.e8. <https://doi.org/10.1016/j.gie.2021.11.038>.
- Krige JE, Jonas EG, Bernon MM. The safety profile of endoscopic variceal ligation in patients with oesophageal varices. *Hepatol Int*. 2024;18(3):1060-1. <https://doi.org/10.1007/s12072-023-10619-5>.
- Nijhawan S, Rai RR. Does post-ligation oesophageal ulcer healing require treatment? *Lancet*. 1994 Jan 8;343(8889):116-7. [https://doi.org/10.1016/S0140-6736\(94\)90844-3](https://doi.org/10.1016/S0140-6736(94)90844-3).
- Arasu S, Liaquat H, Suri J, Ehrlich AC, Friedenberg FK. Incidence and risk factors of dysphagia after variceal band ligation. *Clin Mol Hepatol*. 2019;25(4):374-80. <https://doi.org/10.3350/cmh.2019.0019>.
- Karki B, Shrestha R, Paudel BN, et al. Outcome of post EVL treatment with sucralfate and PPI versus PPI alone. *Nepal Med J*. 2019;2(1):25-9. <https://doi.org/10.3126/nmj.v2i2.24930>.
- Shaheen NJ, Stuart E, Schmitz SM, et al. Pantoprazole reduces the size of post-banding ulcers after variceal band ligation: A randomised, controlled trial. *Hepatology*. 2005;41(3):588-94. <https://doi.org/10.1002/hep.20593>.
- Tierney A, Toriz BE, Mian S, Brown KE. Interventions and outcomes of treatment of post-banding ulcer haemorrhage after endoscopic band ligation: A single-centre case series. *Gastrointest Endosc*. 2013 Jan;77(1):136-40.e1. <https://doi.org/10.1016/j.gie.2012.08.031>.
- Tosetti G, Farina E, Caccia R, Dell'Era A, Primignani M. Post-banding ulcer bleeding in the elective setting: Are there any risk factors? *Dig Liver Dis*. 2021;53(5):658-60. <https://doi.org/10.1016/j.dld.2021.01.016>.
- Young MF, Sanowski RA, Rasche R. Comparison and characterisation of ulcerations induced by endoscopic ligation of oesophageal varices versus endoscopic sclerotherapy. *Gastrointest Endosc*. 1993;39(2):119-22. [https://doi.org/10.1016/S0016-5107\(93\)70049-8](https://doi.org/10.1016/S0016-5107(93)70049-8).
- Vanbiervliet G, Giudicelli-Bornard S, Piche T, et al. Predictive factors of bleeding related to post-banding ulcer following endoscopic variceal ligation in cirrhotic patients: A case-control study. *Aliment Pharmacol Ther*. 2010;32(2):225-32. <https://doi.org/10.1111/j.1365-2036.2010.04331.x>.
- Jamwal K, Kumar M, Maiwall R, et al. Post EVL ulcer bleeding: A new classification and outcomes. *Gastroenterology*. 2017;152(5):S908. [https://doi.org/10.1016/S0016-5085\(17\)33101-3](https://doi.org/10.1016/S0016-5085(17)33101-3).
- Elbahr O, Kamal A, Alsebaey A, et al. Self-expandable metallic stents (SEMS) in oesophageal varices post-band ulcer refractory bleeding: A retrospective study. *Egypt Liver J*. 2021;11(1):30. <https://doi.org/10.1186/s43066-021-00100-z>.
- Kang SH, Yim HJ, Kim SY, et al. Proton pump inhibitor therapy is associated with reduction of early bleeding risk after prophylactic endoscopic variceal band ligation: A retrospective cohort study. *Medicine (Baltimore)*. 2016;95(8):e2903. <https://doi.org/10.1097/MD.0000000000002903>.
- Garcia Tsao G, Abraldes JG, Berzigotti A, Bosch J. Portal hypertensive bleeding in cirrhosis. *Hepatology*. 2017;65(1):310-35. <https://doi.org/10.1002/hep.28906>. Epub 2016 Dec 1. Erratum in: *Hepatology*. 2017;66(1):304. <https://doi.org/10.1002/hep.29169>.
- Terblanche J, Stiegmann GV, Krige JE, Bornman PC. Long-term management of variceal bleeding: The place of varix injection and ligation. *World J Surg*. 1994;18(2):185-92. <https://doi.org/10.1007/BF00294399>.
- De Franchis R, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C. Baveno VII: Renewing consensus in portal hypertension. *J Hepatol*. 2022;76(4):959-74. <https://doi.org/10.1016/j.jhep.2021.12.022>.
- Krige JE, Jonas EG, Bernon MM. Quality indicators and the safety profile of endoscopic intervention in patients with bleeding oesophageal varices. *Hepatology*. 2025;81(2):E40-E41. <https://doi.org/10.1097/HEP.0000000000001153>.
- Lee SW, Lee TY, Chang CS. Independent factors associated with recurrent bleeding. *Dig Dis Sci*. 2009;54(5):1128-34. <https://doi.org/10.1007/s10620-008-0454-0>.
- Polski JM, Brunt EM, Saeed ZA. Chronology of histological changes after band ligation of oesophageal varices in humans. *Endoscopy*. 2001;33(5):443-7. <https://doi.org/10.1055/s-2001-14259>.
- Krige JE, Thomson SR. Endoscopic therapy in the management of oesophageal and gastric varices. 7th ed. In: Nyhus R, Baker J, Fischer E, editors. *Mastery of Surgery*; 2015. p. 1616-29.
- Fass R, Landau O, Kovacs TO, Ippoliti AF. Oesophageal motility abnormalities in cirrhotic patients before and after endoscopic variceal treatment. *Am J Gastroenterol*. 1997;92(6):941-6. PMID: 9177506.

Full list of references available on request

The expanding role of therapeutic endoscopy in metabolic and bariatric surgery

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Summary

The global prevalence of obesity has reached epidemic proportions, with more than one billion people worldwide living with obesity and its associated metabolic complications. As the most effective long-term treatment for severe obesity, metabolic and bariatric surgery (MBS) has expanded rapidly, with laparoscopic sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) becoming the most commonly performed procedures. Although generally safe, increasing procedural volume has been accompanied by postoperative complications including leaks, fistulas, strictures, bleeding and weight recurrence. Historically, many patients required revisional surgery, exposing them to considerable morbidity and mortality. Over the past decade, advances in therapeutic endoscopy have fundamentally changed this paradigm. Contemporary techniques, including endoscopic vacuum therapy, internal drainage, endoscopic suturing, over-the-scope clips and transoral outlet reduction, now achieve clinical success rates approaching or exceeding 80–90% for many indications, allowing most appropriately selected patients to avoid reoperation. Flexible endoscopy has therefore evolved from a predominantly diagnostic modality into an essential therapeutic discipline spanning postoperative rescue and long-term obesity care.

Introduction

Nearly 880 million adults and 159 million children and adolescents aged 5–19 years are currently living with obesity, and current projections suggest that by 2030 almost half of the world's adult population will have overweight or obesity.¹ Metabolic and bariatric surgery (MBS) remains the most effective long-term treatment for severe obesity and its associated metabolic complications. Reflecting the escalating global burden of obesity, procedure numbers continue to rise, with laparoscopic sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) accounting for more than 90% of metabolic operations worldwide.²

The success of MBS has inevitably been accompanied by an increasing absolute number of postoperative complications. Although overall morbidity is low, staple-line and anastomotic leaks, fistulas, strictures, bleeding, marginal ulceration, weight recurrence and altered gastrointestinal anatomy remain important therapeutic challenges. Historically, many required revisional surgery, exposing patients to substantial morbidity, prolonged hospitalisation and, in severe cases, increased mortality.

Over the past decade, advances in therapeutic endoscopy have fundamentally changed the management of postoperative complications following MBS. Contemporary techniques – including endoscopic vacuum therapy, internal drainage, over-the-scope clips, endoscopic suturing, self-expanding metal stents and endoscopic revision procedures – now achieve clinical success rates approaching or exceeding 80–90% for many indications, allowing most appropriately selected patients to avoid reoperation. Therapeutic endoscopy has therefore become a preferred first-line approach for many stable patients, preserving

surgical reconstruction while reducing the morbidity of revisional surgery.

This evolution has redefined the role of the endoscopist within the multidisciplinary metabolic surgery team. Although endoscopy contributes to preoperative assessment, operative planning and long-term surveillance, its greatest impact has been the development of minimally invasive therapies that can diagnose and treat postoperative complications during the same procedure. The modern therapeutic endoscopist contributes to management of leaks, bleeding and strictures, as well as weight recurrence and dumping syndrome, Barrett's surveillance after SG, and biliary access in altered anatomy. Successful management increasingly depends on collaboration among surgeons, gastroenterologists, interventional radiologists, anaesthetists, dietitians and specialist nursing staff.

This review focuses on the expanding therapeutic role of endoscopy across MBS, examining contemporary evidence for minimally invasive management of postoperative complications and long-term sequelae, and how these advances have established the endoscopist as an integral member of the modern metabolic surgery team.

The metabolic surgery patient: unique challenges for the therapeutic endoscopist

Although early postoperative endoscopy following MBS is safe, patients after SG and RYGB present unique clinical and technical challenges.^{3,4} Early complications include leaks, bleeding and obstruction; later problems include strictures, marginal ulceration, weight recurrence, Barrett's oesophagus after SG and difficult biliary access after RYGB. Successful management requires technical expertise together with an

METABOLIC AND BARIATRIC SURGERY: UNIQUE AND COMMON COMPLICATIONS

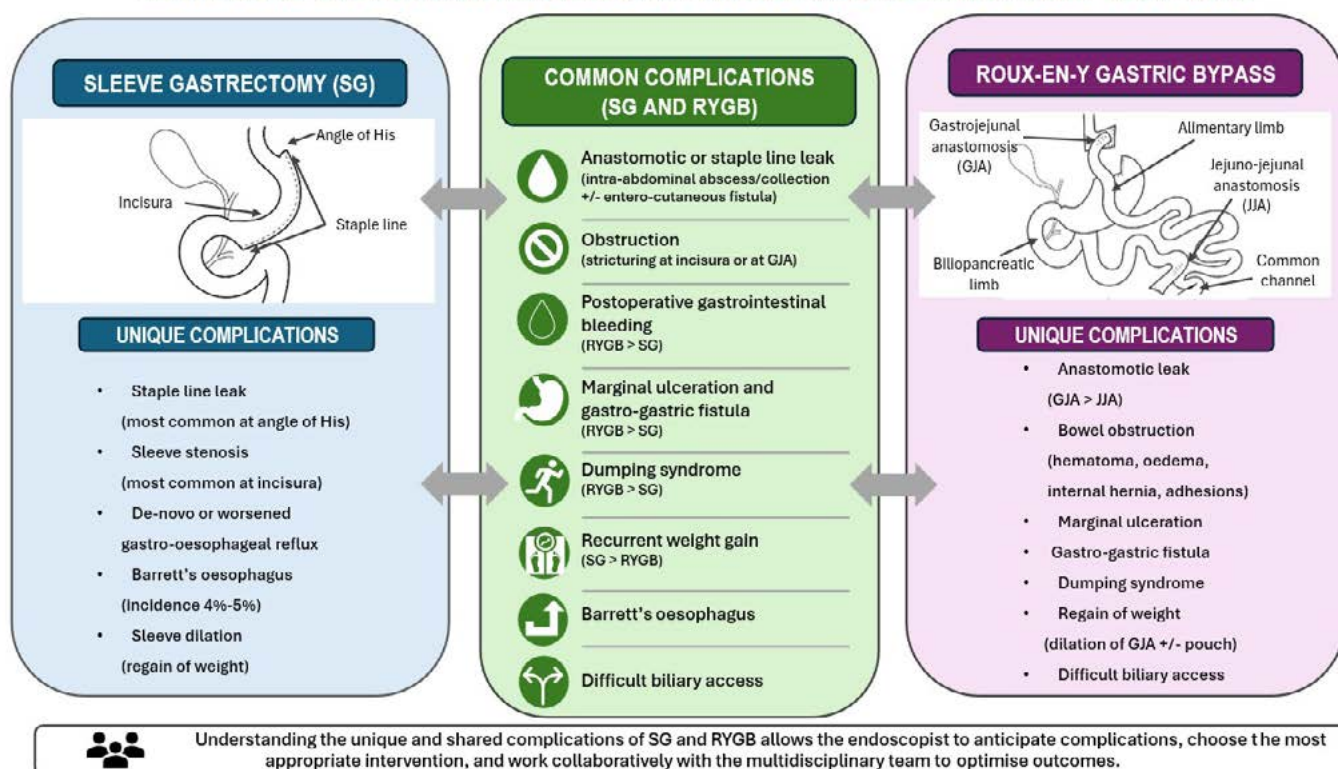


Figure 1: Anatomy and complications after sleeve gastrectomy and Roux-en-Y gastric bypass

understanding of altered anatomy, postoperative physiology and the natural history of complications (Figure 1).

Patients with severe obesity may present additional diagnostic and therapeutic challenges. Serious complications can initially manifest only as tachycardia or tachypnoea, while radiological assessment may be technically difficult or less reliable. Airway management, obstructive sleep apnoea and multiple metabolic comorbidities further complicate decision-making. Early recognition and timely multidisciplinary assessment are therefore critical.

Management has evolved from an approach centred on revisional surgery to individualised multidisciplinary care. Patients with generalised peritonitis, uncontrolled sepsis or multiorgan failure still require prompt surgery, often with radiological drainage. In physiologically stable patients, however, therapeutic endoscopy has altered the treatment paradigm achieving high clinical success while preserving surgical reconstruction and avoiding reoperation in appropriately selected patients.

Within this framework, the therapeutic endoscopist has assumed an increasingly pivotal role. Beyond diagnosis, the endoscopist provides definitive treatment through closure of leaks and fistulas, internal drainage, management of bleeding and strictures, treatment of weight recurrence and dumping syndrome, and long-term surveillance. Because many patients require staged interventions, close collaboration with surgeons, interventional radiologists, anaesthetists, dietitians and specialist nursing staff is essential.

The following sections review the principal postoperative complications after SG and RYGB and examine how advances in therapeutic endoscopy have transformed their management, establishing the endoscopist as a key contributor to both rescue and long-term care.

All endoscopic interventions should be guided by a consistent set of principles: early recognition and prompt intervention; multidisciplinary decision-making; preservation of the original operation; control of sepsis before closure; prioritisation of drainage over closure when infected collections are present; early restoration of enteral nutrition; expectation of staged or repeated interventions rather than a single procedure; and timely escalation to surgery when endoscopic therapy is unlikely to succeed or the patient is physiologically unstable (Figure 2).

The therapeutic endoscopist as the rescue specialist

Management of staple-line and anastomotic disruption

Staple-line and anastomotic disruption remain an important early complication of MBS. Management requires early recognition, control of sepsis and contamination, preservation of the surgical reconstruction and restoration of enteral nutrition. Treatment depends on timing and location of the leak, defect size, associated collection, distal obstruction and physiological status. Haemodynamic instability, generalised peritonitis or multiorgan failure remain indications for surgery; in appropriately selected stable patients, therapeutic endoscopy can frequently avoid revisional surgery.

Following SG, reported leak rates have fallen from 1–8% in older series to approximately 0.3–1.5% in recent meta-analyses.^{5,6} Most occur at the angle of His, with distal sleeve narrowing and increased intraluminal pressure contributing to persistence. Diabetes, chronic kidney disease, steroid use and smoking are additional risk factors. After RYGB,

PRINCIPLES OF THERAPEUTIC ENDOSCOPY AFTER METABOLIC AND BARIATRIC SURGERY

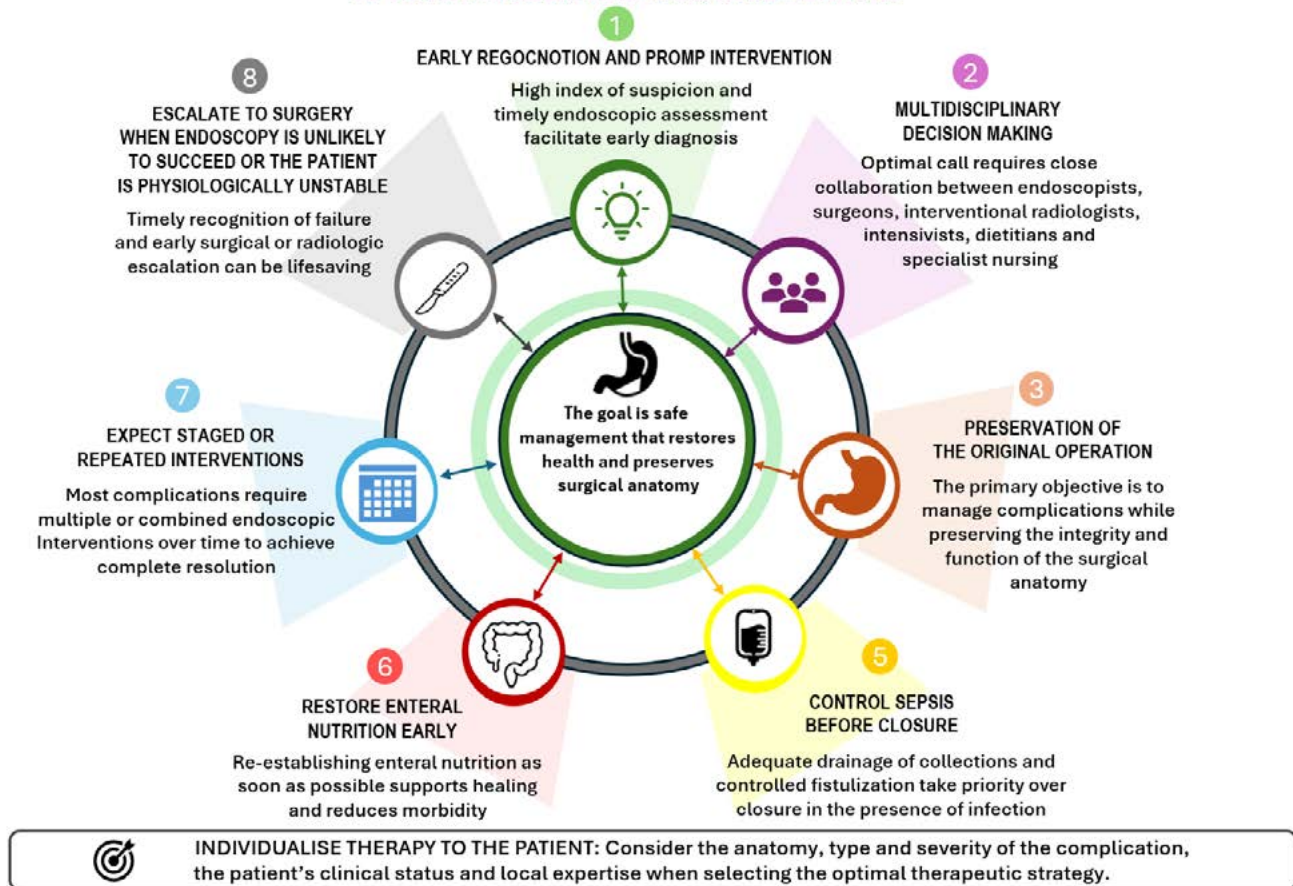


Figure 2: Principles of therapeutic endoscopy after metabolic and bariatric surgery

the gastrojejunal anastomosis is the most common site, usually related to anastomotic tension and exposure to gastric secretions; jejuno-jejunal leaks are less common but technically more difficult to access.⁷

Endoscopic assessment defines the location and size of the defect, tissue viability and chronicity, distal obstruction and the presence of a collection.⁸ These findings determine whether the priority should be diversion, closure, drainage or a combination. Closure should not be regarded as the sole goal: when an infected or poorly drained collection is present, effective drainage and source control take precedence.

Endoscopic stenting

Self-expanding metal stents (SEMS) divert enteric contents and reduce intraluminal pressure. Longer, larger-diameter bariatric stents were developed to cover leaks and potentially relieve distal sleeve narrowing, but comparative studies have not consistently shown superiority over conventional covered oesophageal stents.^{9,10} For SG leaks, stents generally extend from the distal oesophagus beyond the incisura and, selectively, across the pylorus.¹¹ Migration remains the major limitation, occurring in up to 40–60% of SG cases. Fixation with sutures or clips may reduce migration but can complicate removal and cause tissue injury.^{4,12} Reflux, nausea and vomiting are common; nasojejunal feeding should be considered when oral intake is inadequate.

Systematic evidence suggests clinical success of approximately 72.8% for SG leaks and 76.1% for RYGB

leaks.¹³ Stenting remains effective for diversion, but tolerance, migration and the likelihood of repeated procedures must be considered.

Endoscopic closure

Direct closure includes tissue sealants, over-the-scope clips (OTSCs) and full-thickness endoscopic suturing. Tissue adhesives are generally suited to small fistulas, while OTSCs and suturing are used for larger or well-defined defects. Meta-analytic evidence shows variable outcomes, emphasising careful selection.^{8,11}

Defect characteristics and chronicity are critical. Acute leaks with healthy tissue may be amenable to direct closure, whereas chronic epithelialised fistulas are more difficult to close. OTSCs may suit smaller defects, while suturing can be useful for larger ones; tissue preparation or combined techniques may improve closure in selected chronic fistulas.¹⁰

Closure should never substitute for source control. An undrained infected collection should be treated before definitive closure.

Endoscopic drainage

Effective drainage is often more important than immediate closure. Periluminal collections can be treated with endoscopic vacuum therapy (EVT), transmural double-pigtail drainage or, in selected chronic sleeve leaks,

septotomy. The aim is to control contamination, drain infection and establish controlled internal drainage while the defect heals.

EVT places a polyurethane sponge within the lumen or leak cavity and applies continuous negative pressure to reduce contamination and oedema and promote granulation.¹⁴ Repeated exchanges are usually required.¹⁵ A meta-analysis reported 87.2% clinical success with EVT, with adverse events in 6%; a mean 6.47 exchanges were required at approximately 4.4-day intervals, with dislodgement in 12.5%.¹⁶ Comparative evidence suggests EVT may be more effective than conventional stenting for upper gastrointestinal transmural defects, although evidence remains heterogeneous.¹⁷

Transmural double-pigtail drainage is particularly useful when a well-defined collection is accessible from the gastric lumen.¹¹ A meta-analysis found similar pooled closure rates for pigtail drainage and EVT (91.6% vs 85.2%), but treatment duration was longer with pigtail drainage (approximately 78 vs 28 days).¹⁸

Endoscopic septotomy provides internal drainage for selected chronic SG leaks by dividing the fibrous septum between the lumen and mature cavity.¹⁰ It is most useful when a well-defined cavity is present without significant distal stenosis.

These approaches demonstrate that no single procedure is universally appropriate. Pigtail drainage, EVT and septotomy can achieve success rates approaching 90% in selected patients, but treatment should be tailored to anatomy, chronicity, collections, distal obstruction and clinical status. Staged or repeated drainage, debridement, stenting or closure may be necessary.¹⁰

Management is therefore a coordinated process rather than a choice between devices. Early recognition, multidisciplinary assessment, source control, preservation of reconstruction, nutritional support and repeated intervention when required are central. Surgery remains essential for instability, uncontrolled sepsis or anatomy unsuitable for endoscopic therapy; in selected stable patients, endoscopy increasingly provides effective anatomy-preserving treatment with an overall clinical success rate of 88%.¹⁹

Management of postoperative gastrointestinal bleeding

Gastrointestinal bleeding may occur early or late after MBS. Following RYGB, early bleeding commonly arises from the gastrojejunal or jejuno-jejunal anastomosis; after SG, staple-line bleeding more often occurs into the peritoneal cavity. Later bleeding after RYGB is mostly related to marginal ulceration.

Endoscopy provides localisation and definitive treatment in appropriately selected patients.²⁰ Mechanical haemostasis with clips may be advantageous for early postoperative bleeding because it can permit earlier resumption of pharmacological thromboprophylaxis when thromboembolic risk remains high.

Marginal ulceration may present with bleeding, perforation or stricture. Endoscopic therapy may provide haemostasis and, in refractory cases, selected intervention such as endoscopic suturing.²¹ The therapeutic endoscopist must therefore recognise the underlying structural problem

and plan subsequent treatment when ulceration leads to fistula or stricture.

Management of postoperative strictures

Postoperative strictures are important late complications of SG and RYGB. After SG, stenosis most often occurs at the incisura and may create a high-pressure zone with reflux and proximal sleeve dilatation. After RYGB, stricturing usually occurs at the gastrojejunal anastomosis and may reflect the original configuration or scarring from marginal ulceration.

Endoscopy should define the site and severity of narrowing and identify associated ulceration, angulation or downstream obstruction. Treatment is generally staged and tailored to the anatomy and cause.

For SG strictures, staged treatment may begin with radial expansion and progress to pneumatic dilation, with target diameters of approximately 20 mm initially and 30–35 mm subsequently.¹¹ A meta-analysis of 28 studies involving 1 000 patients reported a pooled response of approximately 78%, with a mean 1.82 dilations; subsequent stenting and surgery were required in 19.3% and 16%, respectively.²²

Gastrojejunal strictures after RYGB generally respond to balloon dilation, with a target diameter of approximately 12 mm; about 38% require a second dilation.²³ Guidewire-assisted technique is important in the potentially angulated Roux limb, with a reported overall complication rate of approximately 3–4%.²³ Larger diameters should be approached cautiously because of perforation risk and potential loss of restriction.¹¹

Strictures associated with marginal ulceration are more difficult to treat and carry greater perforation risk.²² Conventional SEMS have inconsistent results, while lumen-apposing metal stents (LAMS) have shown encouraging early success in selected refractory gastrojejunal strictures, although evidence remains limited and does not support routine use.^{24,25}

Successful treatment therefore depends on addressing the cause of the narrowing rather than simply enlarging the lumen. Repeated endoscopic therapy is often preferable to immediate revisional surgery when anatomy remains suitable and the patient can be managed safely.

Management of gastro-gastric fistula

Gastro-gastric fistula is an uncommon late consequence of a contained leak or perforation after RYGB. Re-establishment of communication between the pouch and excluded stomach can reduce the restrictive and metabolic effects of bypass and may present with recurrent weight gain.

Management requires characterisation of the tract and surrounding tissue. Conventional clips are often unsuccessful; larger defects may be treated with OTSCs or endoscopic suturing, although long-term success with suturing alone is modest at approximately 30–35%.¹¹ Chronic epithelialised fistulas may benefit from argon plasma coagulation or submucosal dissection before closure.

Endoscopic versus surgical treatment should be individualised according to fistula size, chronicity, tissue quality, ulceration and patient factors. OTSC placement may complicate subsequent laparoscopic revision, making close communication between endoscopist and surgeon essential.

The therapeutic endoscopists role in the long-term management of the obese patient

Endoscopic management of weight recurrence and dumping syndrome

The endoscopist's role now extends to long-term management of weight recurrence and dumping syndrome. Weight recurrence is increasingly viewed as part of the postoperative trajectory rather than simply failure of the original operation. The 2024 IFSO (International Federation for the Surgery and Other Therapies for Obesity) consensus defines recurrent weight gain as an increase of > 30% of maximum total weight loss, or significant worsening of an obesity-related complication; suboptimal response is weight loss < 20% or inadequate improvement in an obesity-related complication.²⁶

Mechanisms differ by procedure: sleeve dilatation may reduce restriction after SG, while enlargement of the gastrojejunal outlet after RYGB may reduce satiety, accelerate emptying and contribute to dumping. Weight regain exceeding 10% has been reported in approximately 17.6% of patients after RYGB and SG, with longer-term randomised data suggesting greater recurrence after SG.²⁷

Management should be multidisciplinary and include dietary, metabolic and pharmacological assessment. Endoscopy is most useful when an anatomical target is present. After SG, endoscopic sleeve-in-sleeve (SIS) has emerged as a less invasive alternative to surgical conversion or re-sleeve. A 2026 propensity-matched cohort reported similar one-year weight loss to surgery, although confirmation in larger multicentre studies is needed.²⁸

After RYGB, transoral outlet reduction (TORe) is the principal endoscopic revisional intervention for an enlarged gastrojejunal anastomosis. By reducing outlet diameter with endoscopic suturing, TORe restores restriction and slows pouch emptying.²⁹ TORe can generally be performed as a minimally invasive day-case procedure with lower morbidity than surgical revision. A 2025 ASGE-associated meta-analysis reported approximately 9.5% weight loss at one year, increasing to 12.8% with a purse-string technique; pooled clinical success for dumping syndrome was approximately 83%.^{29,30} Adjunctive mucosal ablation may enhance tissue remodelling.

Endoscopic revision therefore represents a shift from automatic surgical revision towards individualised assessment of anatomy, metabolic factors, behaviour and medical therapy. The therapeutic endoscopist has become part of long-term obesity management rather than simply a provider of rescue therapy.

Long-term surveillance and management of altered anatomy

The endoscopist's role continues beyond postoperative complications. Long-term surveillance and management of altered gastrointestinal anatomy are increasingly important components of care after MBS.

Barrett's oesophagus after sleeve gastrectomy

Sleeve gastrectomy can worsen gastro-oesophageal reflux and is associated with Barrett's oesophagus, with an estimated prevalence of approximately 4.6%; the extent

to which SG increases oesophageal adenocarcinoma risk remains uncertain.³¹

Endoscopic surveillance is therefore an important long-term role. Current recommendations support screening after SG, with subsequent intervals determined by findings.³¹ The endoscopist should assess reflux injury and anatomy and ensure appropriate surveillance or treatment when dysplasia is identified.

Biliary access after Roux-en-Y gastric bypass

Altered anatomy after RYGB creates a distinctive challenge when biliary disease develops. Rapid weight loss increases gallstone risk, while the excluded stomach and Roux limb make conventional endoscopic retrograde cholangiopancreatography (ERCP) difficult or impossible.³²

Options include laparoscopic-assisted ERCP, device-assisted enteroscopy and EUS-directed transgastric ERCP (EDGE). EDGE creates temporary access between the pouch and excluded stomach with a LAMS, allowing use of a conventional duodenoscope.

EDGE has reported technical success of approximately 96%, but timing must balance early stent dislodgement against persistent fistula if the tract is allowed to mature. A recent meta-analysis reported dislodgement in approximately 7%, persistent fistula in 17% and subsequent weight regain in about 4%.³³ These risks must be weighed against the morbidity of alternative surgical approaches.

Biliary management after RYGB therefore exemplifies the broader role of the therapeutic endoscopist in altered anatomy: advanced techniques can provide access to otherwise inaccessible organs and permit complex therapy while avoiding major revisional surgery.

Conclusion

Therapeutic endoscopy has transformed the management of patients undergoing metabolic and bariatric surgery. High clinical success rates for leaks and other postoperative complications now allow many appropriately selected patients to be treated without repeat surgery, while preserving the original reconstruction. Its role has subsequently expanded to include strictures, gastro-gastric fistulas, weight recurrence, dumping syndrome, Barrett's surveillance and biliary intervention in altered anatomy.

Many of these interventions are staged and require close collaboration between the therapeutic endoscopist, bariatric surgeon and wider multidisciplinary team. The endoscopist should therefore no longer be regarded simply as a proceduralist called upon when complications arise, but as an integral member of the metabolic surgery team. The future of care lies in early recognition, anatomy-preserving intervention and appropriate escalation to surgery when endoscopic therapy is unlikely to succeed. As therapeutic techniques continue to evolve, the integration of advanced endoscopy into metabolic bariatric programmes will be increasingly important to achieving safe, effective and durable outcomes.

Conflict of interest

The author declares no conflict of interest.

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REFERENCES

- World Obesity Atlas 2025. World Obesity Federation. Available from: <https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2025>. Accessed 1 August 2026.
- Hany M, Torensma B, Zidan MH, et al. Trends and evolution of metabolic bariatric surgery over a decade: Analysis of IFSO global registry reports' data collection, clinical trends, and a FAIR-informed appraisal of report-level transparency. *eClinicalMedicine*. 2026;97. <https://doi.org/10.1016/j.eclinm.2026.104068>.
- Sharma G, Ardila-Gatas J, Boules M, et al. Upper gastrointestinal endoscopy is safe and feasible in the early postoperative period after Roux-en-Y gastric bypass. *Surgery*. 2016;160(4):885-91. <https://doi.org/10.1016/j.surg.2016.07.001>.
- Birda CL, Dhar J, Kumar N, et al. Endoscopic management for gastrointestinal leaks, perforations, and fistulae: Technical tips and outcomes. *World J Gastrointest Endosc*. 2025;17(12):111782. <https://doi.org/10.4253/wjge.v17.i12.111782>.
- Ma L, Gao Z, Luo H, et al. Comparison of the postoperative outcome with and without intraoperative leak testing for sleeve gastrectomy: A systematic review and meta-analysis of 469 588 cases. *Int J Surg*. 2024;110(2):1196-205. <https://doi.org/10.1097/JS9.0000000000000919>.
- Gagner M, Kemmeter P. Comparison of laparoscopic sleeve gastrectomy leak rates in five staple-line reinforcement options: A systematic review. *Surg Endosc*. 2020;34(1):396-407. <https://doi.org/10.1007/s00464-019-06782-2>.
- Lee S, Carmody B, Wolfe L, et al. Effect of location and speed of diagnosis on anastomotic leak outcomes in 3828 gastric bypass cases. *J Gastrointest Surg Off J Soc Surg Aliment Tract*. 2007;11(6):708-13. <https://doi.org/10.1007/s11605-007-0085-3>.
- Doyle WN, Netzley A, Mhaskar R, et al. Endoscopic closure techniques of bariatric surgery complications: A meta-analysis. *Surg Endosc*. 2024;38(5):2894-9. <https://doi.org/10.1007/s00464-024-10799-7>.
- Hamid HKS, Emile SH, Saber AA, et al. Customised bariatric stents for sleeve gastrectomy leak: Are they superior to conventional oesophageal stents? A systematic review and proportion meta-analysis. *Surg Endosc*. 2021;35(3):1025-38. <https://doi.org/10.1007/s00464-020-08147-6>.
- Galloro G, Giglio MC, Chini A, et al. Endoscopic treatment of staple-line leaks after sleeve gastrectomy in patients with obesity: Which one is the best option, if any? A systematic review with meta-analysis and meta-regression. *Obes Surg*. 2025;35(12):5496-514. <https://doi.org/10.1007/s11695-025-08294-6>.
- Schulman AR, Watson RR, Abu Dayyeh BK, et al. Endoscopic devices and techniques for the management of bariatric surgical adverse events (with videos). *Gastrointest Endosc*. 2020;92(3):492-507. <https://doi.org/10.1016/j.gie.2020.04.002>.
- Law R, Prabhu A, Fujii-Lau L, Shannon C, Singh S. Stent migration following endoscopic suture fixation of oesophageal self-expandable metal stents: A systematic review and meta-analysis. *Surg Endosc*. 2018;32(2):675-81. <https://doi.org/10.1007/s00464-017-5720-9>.
- Okazaki O, Bernardo WM, Brunaldi VO, et al. Efficacy and safety of stents in the treatment of fistula after bariatric surgery: A systematic review and meta-analysis. *Obes Surg*. 2018;28(6):1788-96. <https://doi.org/10.1007/s11695-018-3236-6>.
- Schmidt F, Mennigen R, Vowinkel T, et al. Endoscopic vacuum therapy (EVT): A new concept for complication management in bariatric surgery. *Obes Surg*. 2017;27(9):2499-505. <https://doi.org/10.1007/s11695-017-2783-6>.
- Archid R, Wichmann D, Klingert W, et al. Endoscopic vacuum therapy for staple line leaks after sleeve gastrectomy. *Obes Surg*. 2020;30(4):1310-5. <https://doi.org/10.1007/s11695-019-04269-6>.
- Intriago JMV, de Moura DTH, do Monte Junior ES, et al. Endoscopic vacuum therapy (EVT) for the treatment of post-bariatric surgery leaks and fistulas: A systematic review and meta-analysis. *Obes Surg*. 2022;32(10):3435-51. <https://doi.org/10.1007/s11695-022-06228-0>.
- Do Monte Junior ES, de Moura DTH, Ribeiro IB, et al. Endoscopic vacuum therapy versus endoscopic stenting for upper gastrointestinal transmural defects: Systematic review and meta-analysis. *Dig Endosc Off J Jpn Gastroenterol Endosc Soc*. 2021;33(6):892-902. <https://doi.org/10.1111/den.13813>.
- Laopeamthong I, Akethanin T, Kasetsermwiriya W, Techapongsatorn S, Tansawet A. Vacuum therapy and internal drainage as the first-line endoscopic treatment for post-bariatric leaks: A systematic review and meta-analysis. *Visc Med*. 2022;38(1):63-71. <https://doi.org/10.1159/000518946>.
- Minakari M, Sebgatollahi V, Namaki M. Success rate of endoscopic treatment for post-sleeve gastrectomy leaks: A systematic review and meta-analysis. *Obes Surg*. 2025;35(8):3228-40. <https://doi.org/10.1007/s11695-025-08014-0>.
- Barola S, Magnuson T, Schweitzer M, et al. Endoscopic suturing for massively bleeding marginal ulcer 10 days post Roux-en-Y gastric bypass. *Obes Surg*. 2017;27(5):1394-6. <https://doi.org/10.1007/s11695-017-2621-x>.
- Salame M, Jawhar N, Belluzzi A, et al. Marginal ulcers after Roux-en-Y gastric bypass: Aetiology, diagnosis, and management. *J Clin Med*. 2023;12(13):4336. <https://doi.org/10.3390/jcm12134336>.
- Eguchi M, Nogueira R, Balthazar da Silveira CA, et al. Endoscopic management of gastric stenosis after sleeve gastrectomy: A systematic review and single-arm meta-analysis. *Surg Endosc*. 2025;39(8):5324-47. <https://doi.org/10.1007/s00464-025-11843-w>.
- Baumann AJ, Mramba LK, Hawkins RB, et al. Endoscopic dilation of bariatric RNY anastomotic strictures: A systematic review and meta-analysis. *Obes Surg*. 2018;28(12):4053-63. <https://doi.org/10.1007/s11695-018-3491-6>.
- Bazerbachi F, Heffley JD, Abu Dayyeh BK, et al. Safety and efficacy of coaxial lumen-apposing metal stents in the management of refractory gastrointestinal luminal strictures: A multicentre study. *Endosc Int Open*. 2017;5(9):E861-E867. <https://doi.org/10.1055/s-0043-114665>.
- Puig CA, Waked TM, Baron TH, Wong Kee Song LM, Gutierrez J, Sarr MG. The role of endoscopic stents in the management of chronic anastomotic and staple line leaks and chronic strictures after bariatric surgery. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2014;10(4):613-7. <https://doi.org/10.1016/j.soard.2013.12.018>.
- Salminen P, Kow L, Aminian A, et al. IFSO consensus on definitions and clinical practice guidelines for obesity management: An international Delphi study. *Obes Surg*. 2024;34(1):30-42. <https://doi.org/10.1007/s11695-023-06913-8>.

27. Athanasiadis DI, Martin A, Kapsampelis P, Monfared S, Stefanidis D. Factors associated with weight regain post-bariatric surgery: A systematic review. *Surg Endosc.* 2021;35(8):4069-84. <https://doi.org/10.1007/s00464-021-08329-w>.
28. Jirapinyo P, Siranart N, Thompson CC. Endoscopic versus surgical management of recurrent weight gain following sleeve gastrectomy. *Gastrointest Endosc.* 2026;103(6):1173-9. <https://doi.org/10.1016/j.gie.2025.11.004>.
29. Beran A, Ramai D, Albakri A, et al. Transoral outlet reduction for dumping syndrome after Roux-en-Y gastric bypass: A comprehensive systematic review and meta-analysis. *Obes Surg.* 2025;35(11):4620-7. <https://doi.org/10.1007/s11695-025-08275-9>.
30. Jirapinyo P, Kumar N, Thompson CC, et al. Association for Bariatric Endoscopy systematic review and meta-analysis assessing the American Society for Gastrointestinal Endoscopy preservation and incorporation of valuable endoscopic innovations thresholds for transoral outlet reduction. *Gastrointest Endosc.* 2025;102(4):440-53.e6. <https://doi.org/10.1016/j.gie.2025.05.020>.
31. Fisher OM, Chan DL, Talbot ML, et al. Barrett's oesophagus and bariatric/metabolic surgery - IFSO 2020 Position Statement. *Obes Surg.* 2021;31(3):915-34. <https://doi.org/10.1007/s11695-020-05143-6>.
32. Enestvedt BK, Kothari S, Pannala R, et al.; ASGE Technology Committee. Devices and techniques for ERCP in the surgically altered GI tract. *Gastrointest Endosc.* 2016;83(6):1061-75. <https://doi.org/10.1016/j.gie.2016.03.018>.
33. Deliwala SS, Mohan BP, Yarra P, et al. Efficacy and safety of EUS-directed transgastric endoscopic retrograde cholangiopancreatography (EDGE) in Roux-en-Y gastric bypass anatomy: A systematic review and meta-analysis. *Surg Endosc.* 2023;37(6):4144-58. <https://doi.org/10.1007/s00464-023-09926-7>.

Gastroduodenal intussusception in an adult: a rare case of a bleeding gastrointestinal stromal tumour with biliary dilatation

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Summary

Gastroduodenal intussusception in adults is a rare entity with gastric gastrointestinal stromal tumours being the most common aetiology of this presentation. This case is the first reported in South Africa. Clinical manifestations can be in the form of upper gastrointestinal bleeding, gastric outlet obstruction, obstructive jaundice and pancreatitis. The case highlights the importance of a high-quality endoscopy and the potentially life-threatening consequences of missed or misinterpreted pathology. In the common presentation of upper gastrointestinal bleeding, clinicians should be familiar with appropriate diagnostic algorithms and be wary of attributing massive bleeding to minor endoscopic findings without further investigation.

Keywords: gastroduodenal intussusception, gastrointestinal stromal tumour, biliary dilatation, massive gastrointestinal bleed

Case report

A 34-year-old male patient with a history of peptic ulcer disease presented with features of an upper gastrointestinal bleed (UGIB) based on a history of melaena and symptomatic anaemia. On examination, he was tachycardic with a heart rate of 130 beats/minute, had significant pallor, and an ejection systolic flow murmur; however, no melaena stools were present on rectal examination. Laboratory investigations revealed severe iron-deficiency anaemia with

a haemoglobin of 3.3 g/dL (13.4–17.5) requiring transfusion of 5 units of packed red blood cells. Gastroscopy revealed mild gastritis along the greater curvature of the stomach with no active bleeding source identified. The patient was discharged after haemoglobin normalisation without further investigation and prescribed proton pump inhibitors, haematinics and *Helicobacter pylori* eradication therapy. He was followed up for one year and labelled with a diagnosis of “gastritis” despite the absence of clear risk factors, with repeated prescriptions of proton pump inhibitors.

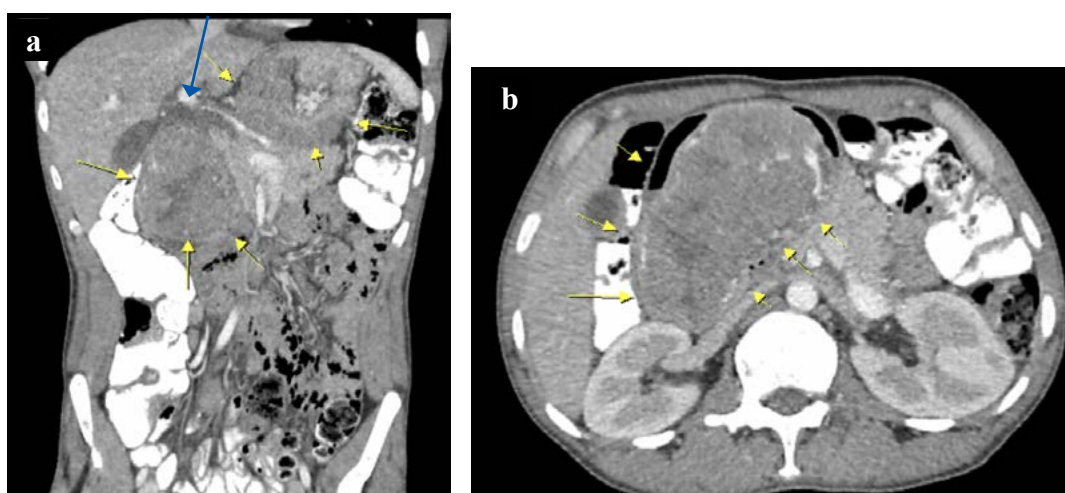


Figure 1: (1a) Coronal view of large gastric tumour projecting into the duodenum (yellow arrows) causing biliary dilatation (blue arrow). (1b) Axial view of the tumour protruding into the duodenum (yellow arrows) compressing porta hepatis

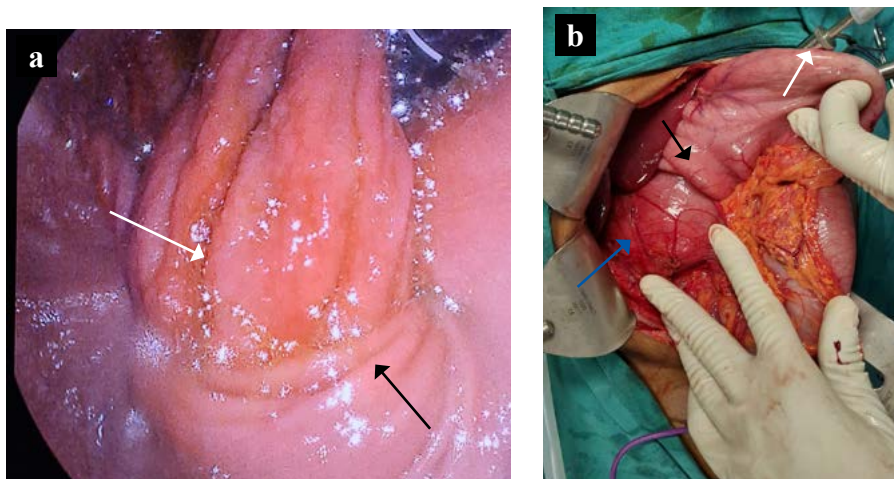


Figure 2: (2a) Endoscopic image of gastroduodenal intussusception; fundus of the stomach (white arrow) intussuscepting through the pylorus (black arrow). (2b) Intraoperative image of the fundal GIST intussuscepting into the duodenum (blue arrow), the pyloric area (black arrow) and the suction tip going through the invaginated fundus of the stomach (white arrow)

Eighteen months after the index presentation, he re-presented with severe symptomatic microcytic anaemia (haemoglobin 2.6 g/dL) and a 6 cm epigastric mass. He was not clinically or biochemically jaundiced and had normal liver function tests. Contrast-enhanced computed tomography (CT) demonstrated an exophytic intraluminal mass arising from the pylorus and extending into the duodenum, causing local mass effect and compression of the porta hepatis and pancreatic head with resultant biliary, intrahepatic and pancreatic duct dilatation (Figure 1). The differential at this stage was an intraluminal gastrointestinal stromal tumour (GIST), gastric adenocarcinoma or lymphoma based on the radiographic evidence.

Repeat gastroscopy demonstrated gastroduodenal intussusception, with the gastric fundus telescoping through the pylorus. The attached mass had telescoped within the duodenum and could not be accessed endoscopically (Figure 2a). Intraoperatively, the mass was milked out of the duodenum and a wedge resection was performed (Figure 2b). The patient had an uncomplicated postoperative course and was discharged. The mitotic rate was approximately 1 per 10 high-power fields (HPF), with no tumour necrosis and mild-to-moderate nuclear pleomorphism. Immunohistochemistry was strongly positive for CD117, DOG1 and CD34. The tumour measured 110 mm in maximal diameter and was classified as intermediate risk. As the neoplasm was completely resected and the tumour showed no imatinib-sensitive mutations, no further oncological treatment was offered. The patient is back to baseline activities and undergoing surveillance at the surgical outpatient department.

Discussion

Gastroduodenal intussusception in adults is rare, with gastric GISTs representing the most reported underlying cause worldwide. In the South African setting, it is important to consider lymphoma as a differential.¹ There are fewer than 30 globally reported cases of a GIST as a cause of this rare pathology with this case being the first reported from South Africa.² Even more rare is this pathology being a cause for biliary duct and pancreatic duct dilatation via ampullary compression. This case report serves to bring attention to a rare cause of obstructive jaundice, pancreatitis and

gastric outlet obstruction that could be the consequences of this pathological process. It highlights the necessity of further investigation in the form of imaging or endoscopy in patients without a convincing aetiology in these conditions. An interesting aspect in this case is the absence of recognition of the GIST in the index oesophagogastroduodenoscopy (OGD). Given the low mitotic index, published data suggest that such tumours may exhibit slow growth kinetics, often progressing only a few millimetres per year and evolving over many years.^{3,4} It can be assumed that this GIST was present on the initial endoscopy which leaves two options; either the endoscopy was inadequately performed for the tumour to have been missed or the tumour was not visible as it had telescoped into the pylorus and this was misinterpreted as gastritis. Failure to recognise or correctly interpret pathology at endoscopy may result in delayed diagnosis and potentially life-threatening complications, as illustrated in this case. Therefore, OGD should be performed by endoscopically trained personnel or under the supervision of a doctor with formal training which can be a challenge in the South African setting with limited resources and specialist availability. An option to address this shortfall is to prioritise the training of junior doctors with formal endoscopy courses or a period of supervised procedures under an experienced practitioner.

Another important aspect was the poor correlation between the clinical severity and endoscopic findings. In practice, it is common to label a patient with a specific diagnosis without interrogation thereof in subsequent visits, i.e. gastritis, gastro-oesophageal reflux disease, hiatus hernia to name a few. These patients are subjected to a lifetime of unnecessary chronic medication and follow-up visits and, most importantly, of new worrisome symptoms incorrectly being attributed to this misdiagnosis. Gastritis as a cause does not explain a significant drop in haemoglobin. The differential in this case was either an UGIB with an obscure cause or a small bowel bleed. In stable patients with ongoing bleeding and no identifiable upper gastrointestinal source, further evaluation should follow established algorithms, including repeat endoscopy by an experienced endoscopist, colonoscopy to exclude brisk lower gastrointestinal bleeding, CT angiography, and small bowel evaluation using capsule endoscopy or deep enteroscopy.⁵⁻⁷

Contrast-enhanced CT is the first-line imaging choice to characterise the mass to aid in the diagnosis of a GIST and evaluate the extent of disease as the initial staging. A tissue diagnosis is not mandatory if imaging and endoscopic features are typical of a GIST, the tumour is resectable and neoadjuvant therapy is not required. A biopsy does not change the management of the patient that will proceed directly to resection; however, in cases where the tumour is unresectable, has atypical imaging features or there is evident metastatic disease, a biopsy is required to confirm diagnosis and guide neoadjuvant treatment. A tissue diagnosis is challenging in a GIST as it is a submucosal lesion requiring stacked biopsies and there is a risk of bleeding and rupture.⁸

Surgery is the primary treatment of choice in resectable GIST lesions. There are a few reports of small GISTs being treated successfully with endoscopic submucosal resection as an alternative especially in elderly patients. Intraoperative principles include complete resection of the macroscopic tumour with an intact tumour capsule. As the tumours are fragile in nature, they should be handled with care to avoid tumour rupture. Segmented or wedge resection is usually adequate to achieve negative margins. Given the low incidence of nodal metastases, lymphadenectomy is not required but resection of the pathological enlarged lymph nodes can be considered in certain cases. Re-resection is not indicated for pathology showing a microscopically positive margin.⁸ Laparoscopy can be considered in favourable anatomical locations such as anterior gastric wall, jejunum and ileum with a meta-analysis showing no difference in long-term outcomes but less blood loss, lower complication rates and shorter hospital stays in the laparoscopic cases.⁹

This case highlights a rare but clinically significant cause of upper gastrointestinal bleeding and biliary obstruction. It underscores the importance of adequate endoscopic training, careful clinical-endoscopic correlation, and appropriate escalation of investigations when findings are incongruent. In the South African setting of limited resources and specialist availability, structured training and supervision in endoscopy are essential to prevent avoidable morbidity. Knowledge of the appropriate diagnostic pathways for upper gastrointestinal bleeding in the setting of a normal gastroscopy is critical and may be life-saving.

Conflict of interest

The authors declare no conflict of interest.

Funding source

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Ethical approval

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REFERENCES

1. Wagh AN, Ganesan B, Jawale HM, Mishra RA, Bhatt R. A rare case report of large B cell lymphoma in adult presentation as intussusception. *Clin Pract.* 2020;10(4):1292. <https://doi.org/10.4081/cp.2020.1292>.
2. Hsieh YL, Hsu WH, Lee CC, et al. Gastroduodenal intussusception caused by gastric gastrointestinal stromal tumour: A case report and review of the literature. *World J Clin Cases.* 2021;9(4):838-46. <https://doi.org/10.12998/wjcc.v9.i4.838>.
3. Jeon HK, Kim GH. Natural history of gastric subepithelial tumours: Long-term outcomes and surveillance strategies. *J Clin Med.* 2025;14(18):6354. <https://doi.org/10.3390/jcm14186354>.
4. Kim JY, Kang SJ. Natural course of gastric subepithelial tumours. *Korean J Helicobacter Up Gastrointest Res.* 2025;25(3):224-33. <https://doi.org/10.7704/kjhugr.2025.0039>.
5. Gerson LB, Fidler JL, Cave DR, Leighton JA. ACG clinical guideline: Diagnosis and management of small bowel bleeding. *Am J Gastroenterol.* 2015;110(9):1265-87. <https://doi.org/10.1038/ajg.2015.246>.
6. Gralnek IM, Stanley AJ, Morris AJ, et al. Endoscopic diagnosis and management of nonvariceal upper gastrointestinal haemorrhage (NVUGIH): European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Update 2021. *Endoscopy.* 2021;53(3):300-32. <https://doi.org/10.1055/a-1369-5274>.
7. Laine L, Barkun AN, Saltzman JR, Martel M, Leontiadis GI. ACG clinical guideline: Upper gastrointestinal and ulcer bleeding. *Am J Gastroenterol.* 2021;116(5):899-917. <https://doi.org/10.14309/ajg.0000000000001245>.
8. National Comprehensive Cancer Network (NCCN). NCCN clinical practice guidelines in oncology: Gastrointestinal stromal tumours. Version 1.2025. Plymouth Meeting (PA): National Comprehensive Cancer Network; 2025. Available from: https://www.nccn.org/professionals/physician_gls/pdf/gist.pdf. Accessed 17 January 2026.
9. Nishida T, Kawai N, Yamaguchi S, Nishida Y. Submucosal tumours: Comprehensive guide for the diagnosis and therapy of gastrointestinal submucosal tumours. *Dig Endosc.* 2013;25(5):479-89. <https://doi.org/10.1111/den.12149>.

Blue rubber bleb nevus syndrome: Balancing bleeding and thrombosis

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Summary

Blue rubber bleb nevus syndrome (BRBNS) is a rare venous malformation syndrome characterised by chronic gastrointestinal bleeding and iron-deficiency anaemia. We report a 79-year-old woman with known BRBNS who presented with overt gastrointestinal bleeding requiring blood transfusion and intravenous iron replacement. Upper and lower gastrointestinal endoscopy failed to reveal a bleeding source while capsule endoscopy demonstrated actively bleeding small-bowel venous malformations. During ongoing evaluation, she developed an ischaemic stroke despite the absence of an identifiable embolic source or inherited thrombophilia. The competing risks of haemorrhage and thrombosis created a significant therapeutic dilemma, necessitating prioritisation of haemorrhage control, with anticoagulation withheld because of the risk of recurrent gastrointestinal bleeding. This case highlights that patients with BRBNS may present with simultaneous thrombotic and haemorrhagic challenges, requiring individualised multidisciplinary management when standard antithrombotic strategies are contraindicated.

Keywords: blue rubber bleb nevus syndrome, venous malformations, gastrointestinal bleeding, venous thromboembolism, capsule endoscopy

Case report

A 79-year-old Caucasian woman with blue rubber bleb nevus syndrome (BRBNS) diagnosed by video capsule endoscopy (VCE) in 2014, without associated cutaneous manifestations, presented in June 2025 with a two-week history of symptomatic anaemia following 3 episodes of haematochezia. She was receiving low-dose aspirin following a myocardial infarction in 2005 and had metabolic syndrome (hypertension and type 2 diabetes mellitus). She had sustained a pulmonary embolism in 2007, for which warfarin was discontinued after a GIT bleed in 2014; aspirin was, however, continued.

On examination, she was tachycardic but normotensive, with marked pallor. The remainder of the systemic examination, including digital rectal examination, was unremarkable. Laboratory investigations revealed a haemoglobin concentration of 7.8 g/dL (reference range 12.0–15.5 g/dL) with microcytic hypochromic indices and a ferritin level of 16 µg/L (reference range 13–150 µg/L), consistent with an iron-deficiency anaemia. Renal and liver function tests, coagulation parameters, and inflammatory markers were normal.

She required multiple blood transfusions and 3 doses of intravenous iron. Upper endoscopy and colonoscopy were unremarkable, with no visible BRBNS lesions. Subsequent video capsule endoscopy revealed multiple venous blebs and

ectatic lesions in the distal jejunum and proximal ileum with active bleeding, consistent with BRBNS lesions (Figure 1).

In August 2025, she represented with an acute cerebrovascular accident. Computed tomography angiography confirmed a subacute left posterior cerebral artery infarction without carotid stenosis or cerebral arteriovenous malformations. Electrocardiography, Holter monitoring, transthoracic echocardiography, and a comprehensive thrombophilia screen including antiphospholipid antibodies, lupus anticoagulant, protein C and S, antithrombin, homocysteine, and factor V Leiden mutation, were negative. Additionally, there was no evidence of atrial fibrillation or another definite cardioembolic source. No radiological features suggested cerebral involvement by BRBNS. Although the aetiology of the stroke remained uncertain following inpatient evaluation, further outpatient investigation for occult cardioembolic sources, including prolonged cardiac rhythm monitoring, was planned.

The coexistence of active GIT bleeding and ischaemic stroke posed a therapeutic challenge. Given the diffuse distribution of multiple bleeding lesions throughout the distal jejunum and proximal ileum, focal endoscopic therapy such as argon plasma coagulation was not considered feasible, as treatment would have required extensive endoscopic intervention with a high likelihood of residual untreated lesions. Surgical resection was likewise inappropriate

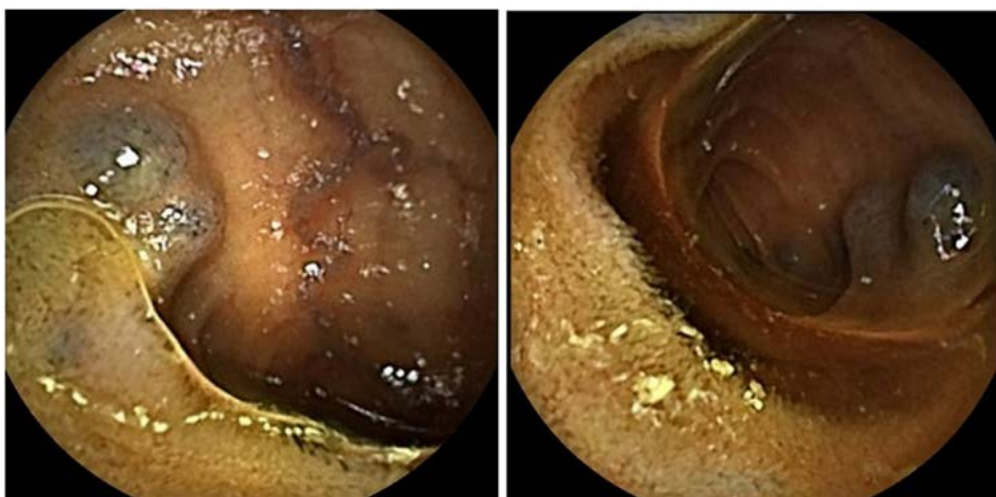


Figure 1: Video capsule endoscopy images demonstrating multiple BRBNS lesions within the small bowel. More than 20 lesions were identified throughout the examination

because of the multifocal disease. Anticoagulation was therefore withheld because of the high risk of recurrent gastrointestinal bleeding. Low-dose aspirin was continued with optimisation of cardiovascular risk factors and iron replacement.

At the most recent follow-up, the patient had experienced no further episodes of gastrointestinal bleeding or transfusion requirements. She remained under outpatient follow-up and was undergoing neurological rehabilitation with gradual recovery following her stroke.

Discussion

BRBNS is a rare vascular disorder characterised by multifocal venous malformations of the skin and visceral organs, most notably the gastrointestinal tract (GIT).¹ The condition was first described by William Bennett Bean in 1958 and earlier by George Gascoyen² in 1860 and still has the eponym Bean syndrome. Only 200 cases have been reported in the literature.¹ The descriptive term reflects its clinical appearance: “blue” denotes the colour imparted by deoxygenated venous blood; “rubber bleb” describes the soft, compressible nature of the lesions; and “nevus” reflects the congenital origin of the disorder.³

Cutaneous lesions are often the most visible manifestation; however, gastrointestinal involvement has the greatest clinical impact. Lesions may occur throughout the GIT but occur most commonly in the small intestine and colon and are associated with chronic occult or overt bleeding resulting in iron-deficiency anaemia.³ In a European multicentre cohort, gastrointestinal involvement was reported in 80% of patients, with clinically significant bleeding in 50% and intervention required in 30%.⁴ Lesions have also been described in the liver, spleen, central nervous system (CNS), and musculoskeletal system.¹

At a molecular level, BRBNS is postulated to be the result of somatic activating mutations in the TEK gene which encodes the endothelial tyrosine kinase receptor TIE2, a regulator of vascular stability and angiogenesis.⁵ These mutations result in ligand-independent receptor activation with unregulated downstream PI3K/AKT/mTOR signalling, leading to abnormal endothelial proliferation, survival, and migration.⁵ Rare variants in non-TEK loci may further modulate signalling and extracellular matrix remodelling,

contributing to phenotypic heterogeneity.⁵ The resulting malformed venous channels are dilated and fragile.

Although BRBNS is classically associated with bleeding, increasing evidence from venous malformation syndromes suggests a paradoxical predisposition to thrombosis.⁶ Localised intravascular coagulopathy, venous stasis within ectatic vascular channels and chronic activation of coagulation pathways have been proposed as potential mechanisms.⁶ However, the true incidence and clinical significance of thrombotic events in BRBNS remain poorly defined.

In this context, we report a South African patient with BRBNS complicated by recurrent bleeding and thrombotic events, highlighting the clinical complexity of managing the coexistence of haemorrhagic and thrombotic conditions. Whether these thrombotic events represent a direct manifestation of BRBNS, an association, or coexisting vascular pathology remains uncertain. Although the pathobiology, driven by TEK mutations and resultant abnormal venous architecture, has been hypothesised to promote thrombosis through structural fragility and venous stasis, this remains a proposed rather than proven mechanism.⁵

From a management perspective, this challenging bleeding-thrombosis phenotype creates significant therapeutic dilemmas. Management remains individualised, largely informed by sparse case report literature, with anticoagulation carefully balanced against bleeding risk, particularly where lesions are diffuse and inaccessible.⁷⁻⁹ In the present case, the coexistence of active gastrointestinal bleeding and ischaemic stroke necessitated prioritisation of haemorrhage control, with anticoagulation withheld due to ongoing bleeding. Anticoagulation was therefore not re-initiated because the risk of recurrent gastrointestinal bleeding was considered to outweigh the potential benefit of anticoagulation. Management therefore focused on supportive care, including transfusion support, iron replacement and optimisation of cardiovascular risk factors. Beyond supportive care, targeted therapies such as sirolimus show promise in reducing bleeding burden and may modify disease manifestations, although evidence remains limited.¹⁰

It is clear that the absence of robust epidemiological data underscores the need for collaborative registries and prospective studies to better define thrombotic risk and

guide management in this rare and complex condition. Overall, this case highlights the diagnostic and therapeutic challenges posed by the sequence of bleeding and thrombosis in BRBNS, and emphasises the need for careful, individualised, multidisciplinary management in the absence of clear evidence-based guidelines.

Conflict of interest

The authors declare no conflict of interest.

Funding source

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Ethical approval

Ethical approval for publication of this case report was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (HREC reference number: M251089).

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REFERENCES

1. Kozai L, Nishimura Y. Clinical characteristics of blue rubber bleb nevus syndrome in adults: Systematic scoping review. *Scand J Gastroenterol*. 2023;58(10):1108-14. <https://doi.org/10.1080/00365521.2023.2214263>.
2. Gascoyen GG. Case of naevus involving the parotid gland and causing death from suffocation: Naevi of the viscera. *Trans Pathol Soc Lond*. 1860;11(1):267-9.
3. Nahm WK, Moise S, Eichenfield LF, et al. Venous malformations in blue rubber bleb nevus syndrome: Variable onset of presentation. *J Am Acad Dermatol*. 2004;50(5 Suppl):S101-S106. [https://doi.org/10.1016/S0190-9622\(03\)02468-X](https://doi.org/10.1016/S0190-9622(03)02468-X).
4. Becq A, Bisdorff A, Riccioni ME, et al. Blue rubber bleb nevus syndrome: A European multicentre cohort study. *Dig Liver Dis*. 2025;57(2):603-8. <https://doi.org/10.1016/j.dld.2024.10.001>.
5. Limaye N, Wouters V, Uebelhoer M, et al. Somatic mutations in angiopoietin receptor gene TEK cause solitary and multiple sporadic venous malformations. *Nat Genet*. 2009;41(1):118-24. <https://doi.org/10.1038/ng.272>.
6. Martinez-Lopez A, Salvador-Rodriguez L, Montero-Vilchez T, et al. Vascular malformation syndromes: An update. *Curr Opin Pediatr*. 2019;31(6):747-53. <https://doi.org/10.1097/MOP.0000000000000812>.
7. Mithanthaya R, Ismail AGM, Muwanwella N, Venugopal K. Blue rubber bleb nevus syndrome in a patient on anticoagulation: A management challenge. *BMJ Case Rep*. 2023;16(11):e256702. <https://doi.org/10.1136/bcr-2023-256702>.
8. Liu YL, Jiang YP, Du J. Pulmonary embolism during pregnancy in a case of blue rubber bleb nevus syndrome. *Chin Med J (Engl)*. 2019;132(12):1499-501. <https://doi.org/10.1097/CM9.0000000000000268>.
9. Giordano C, Battaglia E, Di Gioia CRT, et al. Blue rubber bleb nevus syndrome and pulmonary hypertension: An unusual association. *Cardiovasc Pathol*. 2004;13(6):317-22. <https://doi.org/10.1016/j.carpath.2004.07.004>.
10. Yuksekkaya H, Ozbek O, Keser M, Toy H. Blue rubber bleb nevus syndrome: Successful treatment with sirolimus. *Paediatrics*. 2012;129(4):e1080-e1084. <https://doi.org/10.1542/peds.2010-3611>.

Wits University Liver Transplant Programme

Wits University liver transplant programme reaches 1 000th transplant milestone



The Wits University Liver Transplant Programme has reached its 1 000th liver transplant, marking a defining milestone for South African medicine and for one of Africa's most comprehensive transplant programmes.

A collaboration between Wits Donald Gordon Medical Centre and Charlotte Maxeke Johannesburg Academic Hospital, the liver transplant programme has become a national and regional referral hub for patients across the healthcare system.

Of the 1 000 liver transplants, 637 were performed in adults and 363 in children.

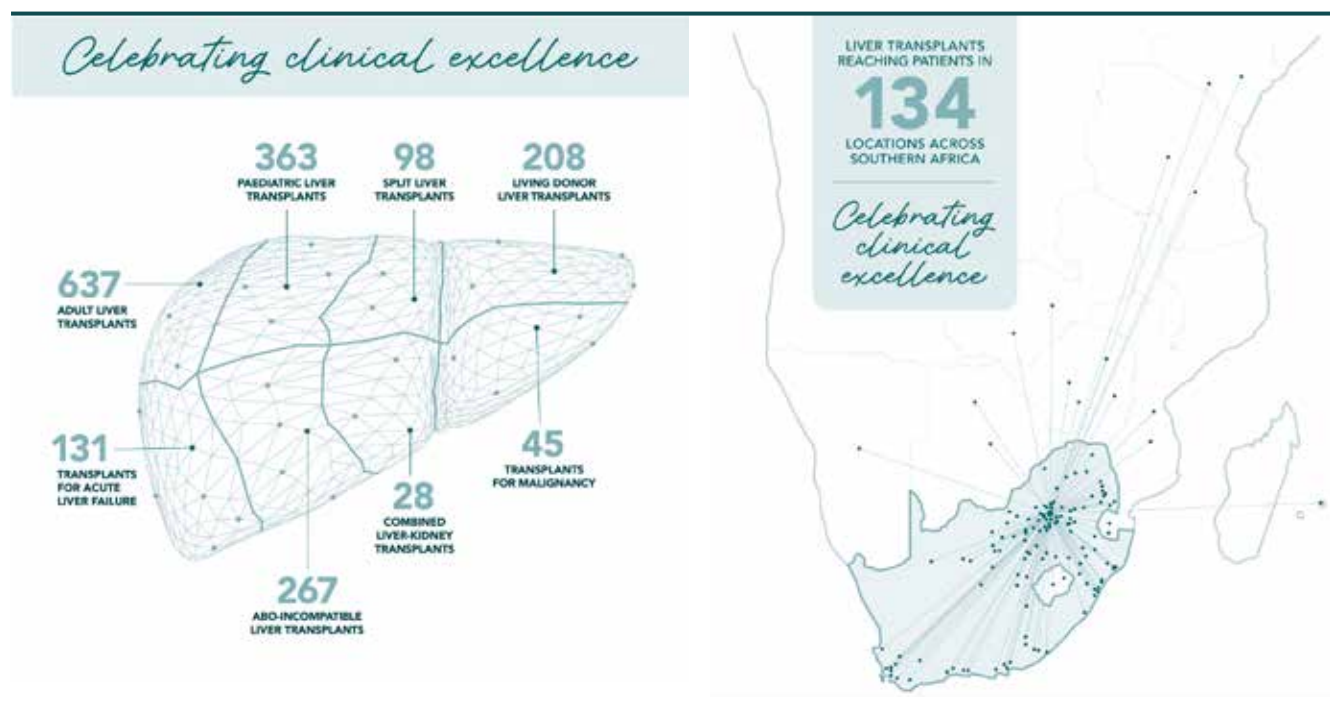
Since performing its first liver transplant in 2004, the programme has introduced living donor liver transplantation for both adults and children, expanded expertise in split liver transplantation and ABO (blood group)-incompatible transplantation, pioneered HIV-positive donor liver transplantation, performed monosegment liver transplantation and, most recently, introduced liver machine perfusion technology to help maximise the use of scarce donor organs.

The 1 000th transplant milestone demonstrates what is possible when academic medicine, scientific research, education and healthcare partners work together in pursuit of a common purpose, increasing access to healthcare for all.

Professor Jerome Loveland, Academic Head of Transplantation at Wits, says the programme has continually expanded the boundaries of what is possible through clinical innovation, multidisciplinary expertise, research and academic training in a country facing a severe shortage of donor organs.

"People often see the transplant operation as the defining moment. In reality, it is the culmination of years of expertise and systems development across highly specialised teams. The 1 000th transplants reflect the legacy handed to us by those who built the programme, past and present, the extraordinary multidisciplinary expertise that sustains it today and our responsibility to train the people who will carry it forward."

While the programme celebrates its 1 000th transplant, it also highlights one of South Africa's greatest ongoing healthcare challenges. Many patients continue to wait for life-saving donor organs. Advances such as living donor transplantation, split liver transplantation and liver machine perfusion are helping to expand access to transplantation, but increasing awareness of organ donation remains essential if more patients are to receive the chance of a longer, healthier life.





SAJS CPD QUESTIONS

- Please submit online before 31 March 2027 -

Colonoscopy quality indicators in a South African district hospital: a baseline assessment using international quality standards

1. According to the study, which colonoscopy quality indicator represented the principal modifiable quality deficit at Victoria Hospital Wynberg?

- a. Caecal intubation rate
- b. Adenoma detection rate
- c. Bowel preparation quality
- d. Polyp detection rate

Beyond the scope: endoscopic approach for the definitive management of major bile duct injuries

2. What was the authors' main conclusion regarding endoscopic management of MBDIs?

- a. It is a safe and durable alternative with outcomes comparable to surgical reconstruction.
- b. It should only be used as a bridge to surgery.
- c. It is inferior to hepaticojejunostomy.
- d. It should be reserved only for partial bile duct injuries.

Single-use duodenoscope for ERCP: a prospective feasibility study

3. According to the study, what was the technical outcome of ERCP procedures performed using the single-use duodenoscope?

- a. Most of the procedures required crossover to a reusable duodenoscope.
- b. The single-use duodenoscope was only successful for stone extraction procedures.
- c. Technical failure occurred primarily during higher-complexity procedures.
- d. All the procedures were completed successfully without crossover to a reusable duodenoscope.

Why some peptic oesophageal strictures persist: risk factors of recalcitrancy from a South African cohort

4. Which interventional treatment modality is considered first-line management in oesophageal peptic reflux strictures?

- a. Oesophageal dilatation with either bougienage or balloon dilatation
- b. Placement of self-expanding metal stents
- c. Intralesional steroid injections or incisional therapy
- d. Strictureplasty via thoracotomy

Predictors of intermediate and long-term survival in gastric variceal bleeding

5. Which prognostic score provides the best prediction of long-term survival in acute gastric variceal bleeding?

- a. Child-Pugh ≥ 10
- b. MELD ≥ 20
- c. MELD-Na ≥ 25
- d. APACHE II ≤ 20

Clinical presentation and spectrum of comorbidity in a South African achalasia cohort

6. While oesophagogastrroduodenoscopy, timed barium swallow and high-resolution oesophageal manometry are deemed essential in the work-up of suspected achalasia, what has been determined to be very useful in a resource-constrained environment in raising the suspicion of an oesophageal dysmotility?

- a. Oesophagogastrroduodenoscopy
- b. Simple contrast swallow
- c. Eckardt scoring
- d. Oesophageal impedance

Small-bowel video capsule endoscopy: a 4-year experience

7. Which statement is correct?

- a. VCE is the first-line investigation before bidirectional endoscopy when investigating iron-deficiency anaemia.
- b. Small bowel angiodysplasia is an uncommon finding on VCE.
- c. Double balloon enteroscopy and argon plasma coagulation is a therapeutic modality used to treat angiodysplasia.
- d. VCE is associated with a significant complication rate.

Diagnostic yield and appropriate use of an endoscopy service in a resource-constrained setting

8. Which of the following clinical indications for oesophagogastrroduodenoscopy (OGD) is the best predictor for finding malignancy during endoscopy?

- a. Epigastric pain
- b. Loss of weight
- c. Dysphagia
- d. Dyspepsia

Gastroduodenal intussusception in an adult: a rare case of a bleeding gastrointestinal stromal tumour with biliary dilatation

9. Which of the following is the most common underlying cause of gastroduodenal intussusception in adults?

- a. Gastric adenocarcinoma
- b. Gastrointestinal stromal tumour (GIST)
- c. Lymphoma
- d. Sarcoma

Blue rubber bleb nevus syndrome: balancing bleeding and thrombosis

10. Blue rubber bleb nevus syndrome is most commonly caused by somatic activating mutations in which gene?

- a. KRAS
- b. TEK (TIE2)
- c. APC
- d. VEGFA

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