

Esophageal Stenting Using Laparogastroscopy Compared With Esophageal Endoscopic Stenting: Retrospective Analysis

NOOR HASSAN¹ , SABAU DAN² , VĂLEAN DAN⁴ , NOOR CRISTINA³ 

¹Department of surgical oncology, Medlife-Polisano Hospital of Sibiu

²Department of general surgery, County Hospital of Sibiu

³Department of Haematology, Medlife Polisano Hospital of Sibiu

⁴University of Medicine and Pharmacy "Iuliu Hatieganu" Cluj-Napoca

ABSTRACT: Esophageal stenosis is a debilitating condition that impairs swallowing and markedly reduces quality of life. Its etiology is multifactorial, including gastroesophageal reflux, radiation, caustic and surgical injuries, benign and malignant tumors. Endoscopic stenting represents a modern, minimally invasive treatment, yet some cases remain refractory to such approaches. Surgical options in benign strictures are limited, often leading to feeding enterostomies that compromise patient outcomes. Laparo-gastroscopic esophageal endoprosthesis, introduced in 1997, bridges endoscopy and surgery, reducing morbidity. This hybrid technique offers a reliable alternative for patients unfit for conventional surgical repair. Our study evaluates its role compared to standard endoscopic stenting, focusing on patient selection, outcomes, and dysphagia improvement.

KEYWORDS: Endoscopic stenting, esophageal stenosis, esophageal stenting, laparogastroscopic stenting.

Introduction

Esophageal stenosis is a severe condition that limits the patient's ability to swallow and significantly affects quality of life.

These strictures can have multiple causes, including gastroesophageal reflux, radiation, ingestion of caustic substances, or previous surgery.

The treatment of these strictures has evolved considerably, and esophageal endoscopic stenting has become a modern and effective solution, offering a minimally invasive alternative to dilate and maintain esophageal patency [1-3].

Despite the advances in endoscopy, some cases are refractory to endoscopic treatment, raising concerns about palliation and long-term management of benign strictures.

While surgery can be effective, it often plays a limited role and is typically reserved for the placement of feeding gastrostomies or jejunostomies.

These approaches, particularly in benign cases, negatively impact the patient's quality of life [4-6].

Furthermore, surgical resolution of endoscopy-refractory cases is often challenging due to patients' poor preoperative nutritional status and the potential for significant postoperative complications that affect survival and recovery [7,8].

The laparo-gastroscopic approach for esophageal endoprosthesis, first introduced in

1997 by Prof. Dr. Dan Sabău [4], has since been refined and is now considered a reliable method for treating esophageal stenosis while preserving the minimally invasive nature of care.

Positioned between purely endoscopic and traditional surgical techniques, this hybrid procedure offers the benefits of both, with reduced morbidity [9,10].

The aim of this study is to evaluate laparogastroscopic esophageal endoprosthesis in comparison with standard endoscopic stenting, with regard to patient selection, pre-and postprocedural parameters, follow-up, and improvement in dysphagia [11-13].

Materials and Methods

Data were retrospectively collected at Sibiu County Hospital over a five-year period between 2017 and 2021. A total of 108 patients were included in the study based on specific selection criteria.

The inclusion criteria consisted of patients with benign or malignant esophageal strictures that were not amenable to surgical resection, those diagnosed with terminal-stage esophageal cancer, and individuals aged over 18 years.

Patients were excluded if they opted for primary surgical intervention or jejunostomy, if they had not provided informed consent, or if they were diagnosed with Siewert type II or III adenocarcinoma.

Additional exclusion criteria included any contraindications to surgery that would

compromise the safety or feasibility of the procedures involved.

This study was approved by the Ethics Committee of Lucian Blaga University of Sibiu.

Written informed consent was obtained from all participants or, where necessary, from their legal representatives, ensuring compliance with ethical standards.

The patients were categorized into two distinct groups according to the type of procedure performed. Group 1 consisted of 67 patients who underwent laparo-gastrosopic stenting, while Group 2 included 41 patients who received endoscopic stenting.

In the laparoscopic group, the stent was placed using a traction technique, which involved the introduction of either a plastic or flexo-metallic prosthesis.

This method allowed for controlled navigation through the stenotic segment, minimizing complications and enhancing procedural accuracy, as illustrated in Figure 1.

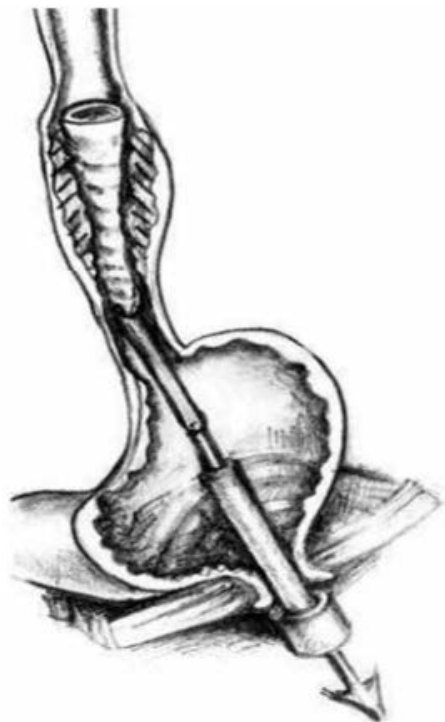


Figure 1. Esophageal stenting using traction (Prof. Dr. Dan Sabau's Collection).

Following peritoneal exploration and staging, the stomach was fixed to the anterior abdominal wall, and a laparoscopic trocar was inserted.

Subsequent laparogastroscopy allowed direct visualization and retrograde access to the cardia when oral access failed.



Figure 2. Gastric fixation and laparoscopic trocar insertion (Original image).

Cardial or subcardial lesions with extension to the gastric fundus necessitate precise alignment of the gastrostomy site for the introduction of the telescopic trocar. This ensures optimal axis orientation between the gastric wall and the infiltrated, fixed, irregular, and often poorly visualized cardiac sphincter (Figure 2).

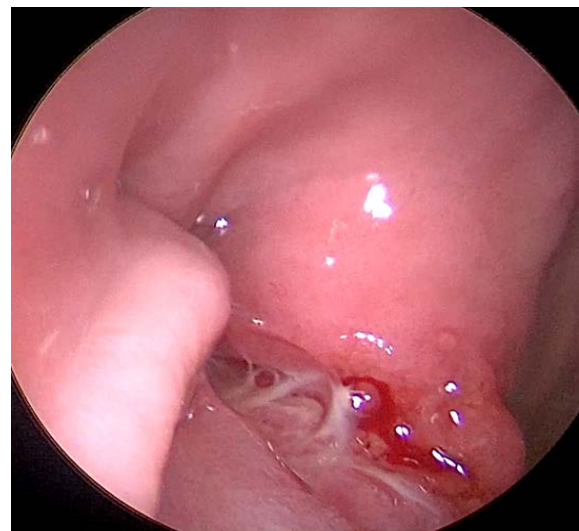


Figure 3. Laparogastroscopy and gastroesophageal sphincter view.

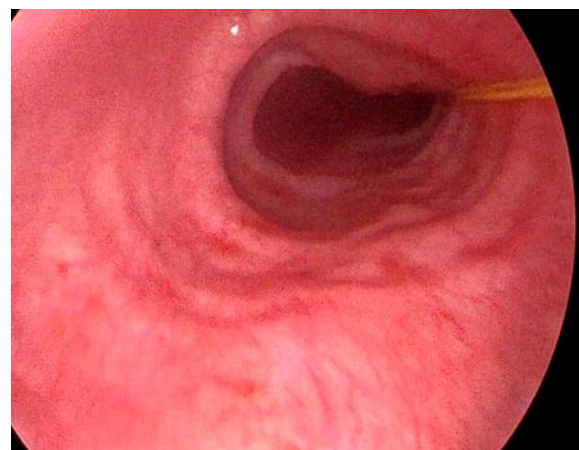


Figure 4. Laparoesophagoscopy.

This allows exploration of the gastric cavity (Figures 3,4) and retrograde catheterization of the cardia with probes with or without guidewire (Figure 5), if anterograde catheterization (oral not nasal) fails.



Figure 5. Retrograde esophageal stenting.

For endoscopic stenting, self-expanding metal or plastic stents were used. A guidewire was placed through the stricture under endoscopic and fluoroscopic guidance, and the stent was deployed to maintain patency.

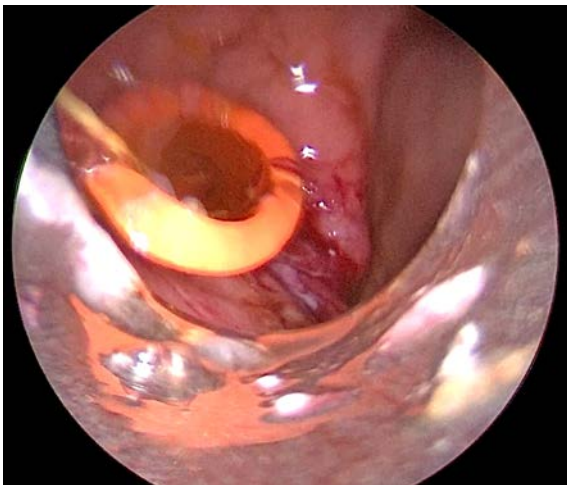


Figure 6. Visualization of the lower end of the esophageal stent.

Endoscopic stenting provides immediate symptom relief with minimal recovery time compared to surgical interventions (Figures 6, 7).

However, potential complications include stent migration, perforation, reflux, and tumor overgrowth in malignant cases. Regular follow-ups with endoscopy and imaging ensure proper stent function and address any complications. This procedure is effective and well-tolerated that significantly improves the quality of life for patients with esophageal obstruction.



Figure 7. Double-channel telescope used (Original image).

Data were collected retrospectively using a standardized form containing information on patient demographics (gender, age, urban or rural residence), diagnostic methods (imaging, endoscopic), medical history (comorbidities, ASA score, history of neoadjuvant treatment), smoking status, type of pathology, symptomatology, onset of symptoms, frequency of symptoms. Patients were assessed for dysphagia score in the form of a questionnaire, both pre-procedural and post-procedural.

Data about post-procedural complications, in-hospital death, nature of death and other associated post-procedural comorbidities were also gathered.

The data were collected in a spreadsheet created with Microsoft Excel 2021 and the results were interpreted using IBM SPSS v26.0.

Normality of distribution of values was performed using the Kolmogorov-Smirnov test. Mean values were compared using independent samples t-test. Median values were compared using Mann-Whitney U test.

Quantitative variables were compared using Fisher and Pearson Chi-Squared tests. A p-value of <0.05 was considered statistically significant.

Continuous variables are presented as mean \pm standard deviation (SD), unless otherwise specified.

Results

Demographic data are presented in Table 1. The mean age of the patients was 61.22 (± 12.43) years in the laparogastrostomy patient group and 64.47 (± 10.71) in the endoscopic prosthetic group ($p=0.21$). There were no statistically significant differences in environment and gender.

There were statistically significant differences in the incidence of patients with cardiovascular disease (31.3% vs. 46.3%, $p=0.03$).

There were also statistically significant differences in the frequency of tumors in the cervical third (10.7% vs. 34.1%, $p=0.002$) and middle third (77.6% vs. 39.0%, $p=0.001$), respectively. The use of endoscopy in the

treatment of benign pathology was significantly higher (4.5% vs. 17.1%, $p=0.02$). Dysphonia was more frequent in endoscopic stenting compared to endoprosthesis (26.8% vs. 13.4%, $p=0.03$) (Table 2).

Table 1. General details and preoperative characteristics of patients. Data revealed that most symptoms were similar across groups, except for dysphonia, which was more common in the endoscopic group ($p=0.03$). A higher frequency of neoadjuvant radiotherapy was also observed in this group ($p=0.03$).

| Parameters | Esophageal endoprosthesis (n=67) | Endoscopic stenting (n=41) | P value | |
|----------------------------|----------------------------------|----------------------------|------------|-------|
| Environment | Rural | 26 (38.8%) | 0.44 | |
| | Urban | 41 (61.2%) | | |
| Gender | Male | 54 (80.6%) | 0.23 | |
| | Female | 13 (19.4%) | | |
| Medium age | 61.22 ($\pm 12.43\%$) | 64.47 ($\pm 10.71\%$) | 0.21 | |
| Frequency of comorbidities | Diabetes mellitus | 10 (14.9%) | 6 (14.6%) | 0.97 |
| | Cardiovascular disease | 21 (31.3%) | 19 (46.3%) | 0.03 |
| Location of the stricture | Neoplasm in the antecedents | 5 (7.4%) | 3 (7.3%) | 0.97 |
| | Cervical esophagus | 7 (10.7%) | 14 (34.1%) | 0.002 |
| Pathology type | Middle esophagus | 52 (77.6%) | 16 (39.0%) | 0.001 |
| | Lower esophagus | 19 (28.3%) | 11 (26.9%) | 0.63 |
| Pathology type | Benign | 3 (4.5%) | 7 (17.1%) | 0.02 |
| | Malignant | 64 (95.5%) | 34 (82.9%) | |

Values are expressed as number (percentage) or mean \pm standard deviation (SD).

Table 2. Frequency of symptoms and oncologic history of patients.

| Parameters | Esophageal endoprosthesis (n=67) | Endoscopic stenting (n=41) | P value |
|-------------------------|----------------------------------|----------------------------|-------------|
| Frequency of dysphonia | 9 (13.4%) | 11 (26.8%) | 0.03 |
| Weight loss | 60 (89.5%) | 33 (80.4%) | 0.16 |
| Pyorrhea | 34 (50.7%) | 22 (53.6%) | 0.31 |
| Loss of appetite | 35 (52.2%) | 24 (58.5%) | 0.41 |
| Asthenia/Fatigue | 39 (58.2%) | 26 (63.4%) | 0.49 |
| History of radiotherapy | 11 (16.4%) | 18 (43.9%) | 0.03 |
| History of chemotherapy | 23 (34.3%) | 18 (43.1%) | 0.19 |

Table 3 presents preprocedural and postprocedural parameters. There were statistically significant differences in the preprocedural dysphagia score (3.11 vs. 2.98, $p=0.02$) and the difference in score (1.79 vs. 1.28, $p=0.001$), and differences in the median length of

hospitalization between the two groups (8 (4-13) days vs. 11 (5-17) days, $p=0.03$). There were no statistically significant differences in complication rate (22.4% vs. 21.9%, $p=0.21$) and post-procedural dysphagia score (1.52 vs. 1.70, $p=0.14$).

Table 3. Preprocedural and postprocedural parameters.

| Parameters | Esophageal endoprosthesis (n=67) | Endoscopic stenting (n=41) | P value |
|---------------------------------|----------------------------------|----------------------------|--------------|
| Pre-procedural dysphagia score | 3.11 ($\pm 0.12\%$) | 2.98 ($\pm 0.08\%$) | 0.02 |
| Post-procedural dysphagia score | 1.52 ($\pm 0.22\%$) | 1.70 ($\pm 0.14\%$) | 0.14 |
| Dysphagia score difference | 1.79 ($\pm 0.17\%$) | 1.28 ($\pm 0.11\%$) | 0.001 |
| Median hospitalization (days) | 8 (4-13%) | 11 (5-17%) | 0.3 |
| Complication rate | 15 (22.4%) | 9 (21.9%) | 0.21 |

Values are expressed as mean \pm standard deviation (SD) or median (range), as appropriate.

The comparative analysis of procedural and postoperative complications between the laparogastroscopic and endoscopic stenting groups reveals important safety considerations. Although the overall incidence of complications remained relatively low in both cohorts, a statistically significant difference was observed in procedural complications, which were more frequent in the laparo-gastroscopic group (5.9% vs. 0%, $p=0.04$). This likely reflects the inherently more invasive nature of the laparoscopic approach, which involves abdominal access and manipulation, potentially increasing the risk of intraoperative events such as bleeding, perforation, or anesthetic-related incidents.

The fistula rates were comparable between the two techniques (7.4% vs. 7.3%, $p=0.56$), suggesting that the choice of approach does not significantly influence the risk of fistulization, which is more likely related to tumor stage, location, or previous radiotherapy. Similarly, the incidence of cardiopulmonary complications

showed no statistically significant difference, although a trend toward higher rates was noted in the endoscopic group (14.6% vs. 8.9%, $p=0.07$). This may reflect the poorer baseline cardiopulmonary status of patients selected for endoscopic stenting, rather than the procedural technique itself.

In-hospital mortality did not differ significantly between groups (10.4% vs. 7.3%, $p=0.23$), supporting the overall safety of both interventions in a high-risk, predominantly oncologic population. Notably, there was no mortality reported among patients with benign pathology in the laparo-gastroscopic group, while a single death occurred in the endoscopic group (2.4%, $p=0.73$). Although this difference is not statistically significant, it underscores the importance of careful patient selection and perioperative optimization, particularly in nonmalignant cases where procedural risks must be balanced against potential long-term benefits. (Table 4).

Table 4. Rate of post-procedural complications.

| Parameters | Esophageal endoprosthesis (n=67) | Endoscopic stenting (n=41) | P value |
|---|----------------------------------|----------------------------|-------------|
| Procedural complications | 4 (5.9%) | 0 (0%) | 0.04 |
| Fistula rate | 5 (7.4%) | 3 (7.3%) | 0.56 |
| Cardiovascular and bronchopulmonary complications | 6 (8.9%) | 6 (14.6%) | 0.07 |
| In-hospital death | 7 (10.4%) | 3 (7.3%) | 0.23 |
| Death in patients with benign pathology | 0 (0%) | 1 (2.4%) | 0.73 |

The median follow-up of patients is 9 months (1-12 months). There were no differences in the median duration of patients' length of stay or last followed dysphagia score. Statistically

significant differences were found regarding the need for reprocessing at the last reassessment (8.9% vs. 26.8%, $p=0.03$) (Table 5).

Table 5. Long-term follow-up and reprocessing needs.

| Parameters | Esophageal endoprosthesis (n=67) | Endoscopic stenting (n=41) | P value |
|---|----------------------------------|----------------------------|-------------|
| Previous stenting | 11 (16.4%) | 8 (19.5%) | 0.21 |
| Median follow-up duration | 8 (1-11) | 9 (1-12) | 0.56 |
| Mean dysphagia score at last reassessment | 2.01 (± 0.34) | 2.27 (± 0.19) | 0.11 |
| Restenting necessity at last reassessment | 6 (8.9%) | 11 (26.8%) | 0.03 |

Values are expressed as number (percentage) or mean \pm standard deviation (SD), as appropriate.

Discussions

To our knowledge, this study represents the first comparative analysis between laparogastroscopic and purely endoscopic esophageal stenting techniques conducted within a single tertiary care institution. The retrospective nature of the study and the lack of randomization

inherently introduce a degree of selection bias, which must be acknowledged when interpreting the results. Specifically, patients allocated to the endoscopic stenting group presented with a higher incidence of significant cardiac comorbidities and a greater proportion of proximal (cervical) esophageal lesions, likely influencing the choice of a less invasive, transoral

approach. Conversely, patients undergoing laparo-gastroscopic stenting more frequently harbored mid-thoracic esophageal tumors, which are often less accessible via standard endoscopy, thereby necessitating a more tailored surgical approach [14].

In terms of anatomical distribution, no significant difference was observed between groups for lesions located in the distal third of the esophagus. This observation may be explained by the relatively comparable technical feasibility of both methods in accessing the lower esophagus and gastroesophageal junction, regardless of the entry route. However, the unique anatomical and pathological considerations of upper esophageal tumors may limit the efficacy or safety of certain approaches, underscoring the importance of individualized procedural planning.

Although the laparoscopic-assisted technique is inherently more invasive due to the requirement for abdominal access and trocar insertion, it demonstrated notable clinical advantages. Patients in this group experienced superior symptom palliation, particularly regarding dysphagia, as well as a statistically significant reduction in the need for repeat interventions. The enhanced durability of the prosthetic effect in this group is likely attributable to the precise placement facilitated by the traction-based technique. By achieving controlled stent deployment under combined laparoscopic and gastroscopic visualization, improved prosthesis expansion and alignment within the stenotic segment may be realized, reducing the incidence of early stent migration or inadequate decompression [15,16].

Interestingly, while patients in the endoscopic group demonstrated marginally better immediate postprocedural dysphagia scores, these differences were not maintained over time. This transient benefit may reflect the less traumatic nature of the procedure in the early postoperative period rather than a true difference in therapeutic efficacy. Long-term outcomes, including nutritional status and quality of life, appeared broadly equivalent between the two cohorts.

Importantly, the overall complication rate did not differ significantly between the two groups, supporting the relative safety of both techniques when performed by experienced multidisciplinary teams. However, the need for stent re-insertion—a surrogate marker of treatment durability—was lower in the laparo-gastroscopic group. This finding suggests a potential mechanical and technical advantage associated with this method, particularly in anatomically

challenging or rigid strictures where conventional endoscopic manipulation may prove suboptimal [17,18].

This study has several limitations that must be considered. First, its retrospective and single-center design limits the generalizability of the findings. Second, the absence of randomization introduces confounding factors related to baseline patient characteristics and tumor distribution. Third, the cohort was predominantly composed of patients with advanced oncologic disease, which may limit extrapolation to benign or palliative indications in different clinical contexts. Finally, follow-up duration and the assessment of quality-of-life outcomes were variable and not uniformly documented.

Future prospective, randomized, and multicentric trials are warranted to validate these preliminary observations. Further research should aim to standardize technique selection criteria, optimize stent design for each approach, and more comprehensively assess patient-reported outcomes to better guide clinical decision-making in the management of complex esophageal strictures.

Conclusion

Laparogastroscopic stenting is a feasible and effective hybrid procedure offering significant improvement in dysphagia and lower reintervention rates, with the added advantage of shorter hospitalization. While endoscopic stenting remains a minimally invasive standard, the laparoscopic method presents an excellent alternative in selected patients, especially those with complex or inaccessible stenoses. Future multicentric studies are essential to further define the role of this approach in esophageal stricture management.

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All authors have read and approved the final manuscript.

Author Contributions

Conceptualization, N.H and N.C; Methodology, N.H and V.D; Investigation, N.H, N.C and V.D; Western Blot analysis, V.D; Data analysis, N.H and V.D; Manuscript writing and initial draft preparation, N.H, C.N and V.D; Manuscript review and editing, S.D and N.H; Supervision, D.S; All authors read and approved the final manuscript.

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Conflicts of interest

The authors declare no competing interests and have no financial, commercial, legal, or professional relationship with other organizations, or with the people working with them, that could have influenced our research.

Institutional Review Board

The study was conducted according to the guidelines of the Declaration of Helsinki; the study and the protocols utilized therein were approved by the Institutional Review Board (Ethics Committee) of Lucian Blaga University of Sibiu institution.

Consent Statement

All human subjects involved in this study provided a written informed consent prior to participation, including the consent of publishing their anonymized data.

Data availability

All data presented in the manuscript are available from the authors upon request.

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Corresponding Author: Noor Hassan, Department of surgical oncology, Medlife-Polisano Hospital of Sibiu, e-mail: nmfhasan@gmail.com