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The Analysis Study of Comparison of EUS-Guided Gastroenterostomy, Surgical Gastrojejunostomy, and Enteral Stenting for Managing Malignant Gastric Outlet Obstruction : A Comprehensive Systematic Review

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ABSTRACT

Background: This study aims to provide a comprehensive systematic review to evaluate the efficacy and safety of EUS-GE in comparison to both ES and SGJ for treating malignant GOO. **Methods:** Following PRISMA 2020 guidelines, this systematic review focused exclusively on full-text articles published in English between 2014 and 2024. **Result:** The study conducted a comprehensive review of over 100 publications sourced from reputable databases, including ScienceDirect, SagePub, and PubMed. Following an initial screening, eight publications were identified as warranting more in-depth analysis. Consequently, a thorough review of these selected studies was performed to ensure a detailed and rigorous evaluation. **Conclusion:** EUS-GE shows promise for treating malignant GOO with higher success rates and fewer complications compared to traditional methods. However, further development of specialized devices and standardization of the technique, along with more robust randomized trials, are necessary to better understand and establish its role in clinical practice.

Keyword: EUS-Guided Gastroenterostomy, Surgical Gastrojejunostomy, Enteral Stenting, Malignant Gastric Outlet Obstruction

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INTRODUCTION

Gastric outlet obstruction (GOO) occurs when a mechanical malignant blockage affects the upper digestive tract at the distal stomach, pylorus, or duodenum. Commonly seen in advanced malignancies, GOO leads to severe symptoms such as persistent nausea and vomiting, inability to tolerate oral nutrition, abdominal pain, and a decreased quality of life. These symptoms often result in malnutrition and reduced functional status, which can increase hospitalizations and delay chemotherapy treatments.[1–4]

Traditionally, surgical gastrojejunostomy (SGJ) has been used to bypass the obstruction effectively, but it is invasive and can result in high morbidity. Endoscopic stenting (ES) offers a less invasive option with a lower risk of adverse events and shorter hospital stays, though it has a significant risk of stent obstruction and frequent need for reintervention.[5,6]

Endoscopic ultrasound-guided gastroenterostomy (EUS-GE) is an innovative technique that uses endoscopy to bypass the obstruction by connecting the stomach to the small intestine downstream of the blockage with a lumen-apposing metal stent (LAMS). This approach aims to reduce the morbidity associated with surgery while providing a durable solution. Initial data suggest that EUS-GE is effective and safe, but there is limited comparative data with traditional methods due to small sample sizes.[7,8]

This study aims to provide a comprehensive systematic review to evaluate the efficacy and safety of EUS-GE in comparison to both ES and SGJ for treating malignant GOO.

METHODS

Protocol

The investigation was carried out with scrupulous conformity to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 criteria, guaranteeing strict respect to accepted methodological principles.

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Strictly following PRISMA 2020 standards demonstrates a dedication to improving the clarity, replicability, and systematic thoroughness of the review process. The study incorporated thorough methodologies for conducting literature searches, extracting data, and synthesizing findings. These methods were well implemented to minimize biases and guarantee the strength of the conclusions.

Criteria for Eligibility

The present study offers a comprehensive examination of the studies undertaken throughout the last ten years. Through the methodical examination and integration of data from other studies, this research seeks to clarify patterns and guide the improvement of patient care approaches for this group with multiple health conditions.

The main aim of this thesis is to highlight important themes that arise from a wide range of scholarly literature. In order to guarantee the thoroughness and precision of the study, strict criteria for inclusion and exclusion were implemented. Only English-language peer-reviewed papers published from 2014 to 2024 were considered suitable for inclusion. Materials eligible for inclusion must also possess a DOI for the purpose of confirming their authenticity. In order to preserve the focus and integrity of the dataset, the analysis in question deliberately omitted non-research materials, including reviews, editorials, and duplicate entries from the same publication.

The systematic methodology employed in this study guarantees that the data used is both pertinent and trustworthy, therefore establishing a strong basis for deriving significant findings and progressing clinical practice.

Search Strategy

We used "(((EUS-Guided Gastroenterostomy) OR (Surgical Gastrojejunostomy)) OR (Enteral Stenting)) AND (Malignant Gastric Outlet Obstruction)" as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases.

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Data retrieval

The authors conducted a thorough preliminary review of each article by examining its abstract and title to assess relevance before proceeding with a more detailed investigation. Only studies that aligned with the study's objectives and met the predefined inclusion criteria were considered for further review. This method allowed for the identification of a clear and consistent pattern across the research.

Full-text articles were restricted to those published in English to maintain consistency in the language of the studies. A rigorous screening process was applied to select content that was directly relevant to the study's focus and adhered to all established inclusion criteria. Articles not meeting these criteria were systematically excluded from further analysis and not included in the final evaluation.

The evaluation process included a comprehensive review of various factors such as study design, titles, authors, publication dates, research locations, and methodologies. This meticulous approach ensured that the content analyzed was of the highest relevance and quality, thereby strengthening the overall findings of the study.

Quality Assessment and Data Synthesis

The authors performed a meticulous review of each article's abstract and title to identify those deserving further investigation. After this initial screening, all relevant documents underwent a comprehensive examination. The results of this evaluation guided the selection of review papers, ensuring that only the most pertinent studies advanced to detailed analysis. This rigorous approach streamlined the selection process and facilitated a thorough and nuanced assessment of the existing research and its context.

Table 1. Search Strategy

Database	**Search Strategy**	***Hits***
Pubmed	(((EUS-Guided Gastroenterostomy) OR (Surgical Gastrojejunostomy)) OR (Enteral Stenting)) AND (Malignant Gastric Outlet Obstruction)	7

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Science Direct	(((EUS-Guided Gastroenterostomy) OR (Surgical Gastrojejunostomy)) OR (Enteral Stenting)) AND (Malignant Gastric Outlet Obstruction)	79
Sagepub	(((EUS-Guided Gastroenterostomy) OR (Surgical Gastrojejunostomy)) OR (Enteral Stenting)) AND (Malignant Gastric Outlet Obstruction)	17

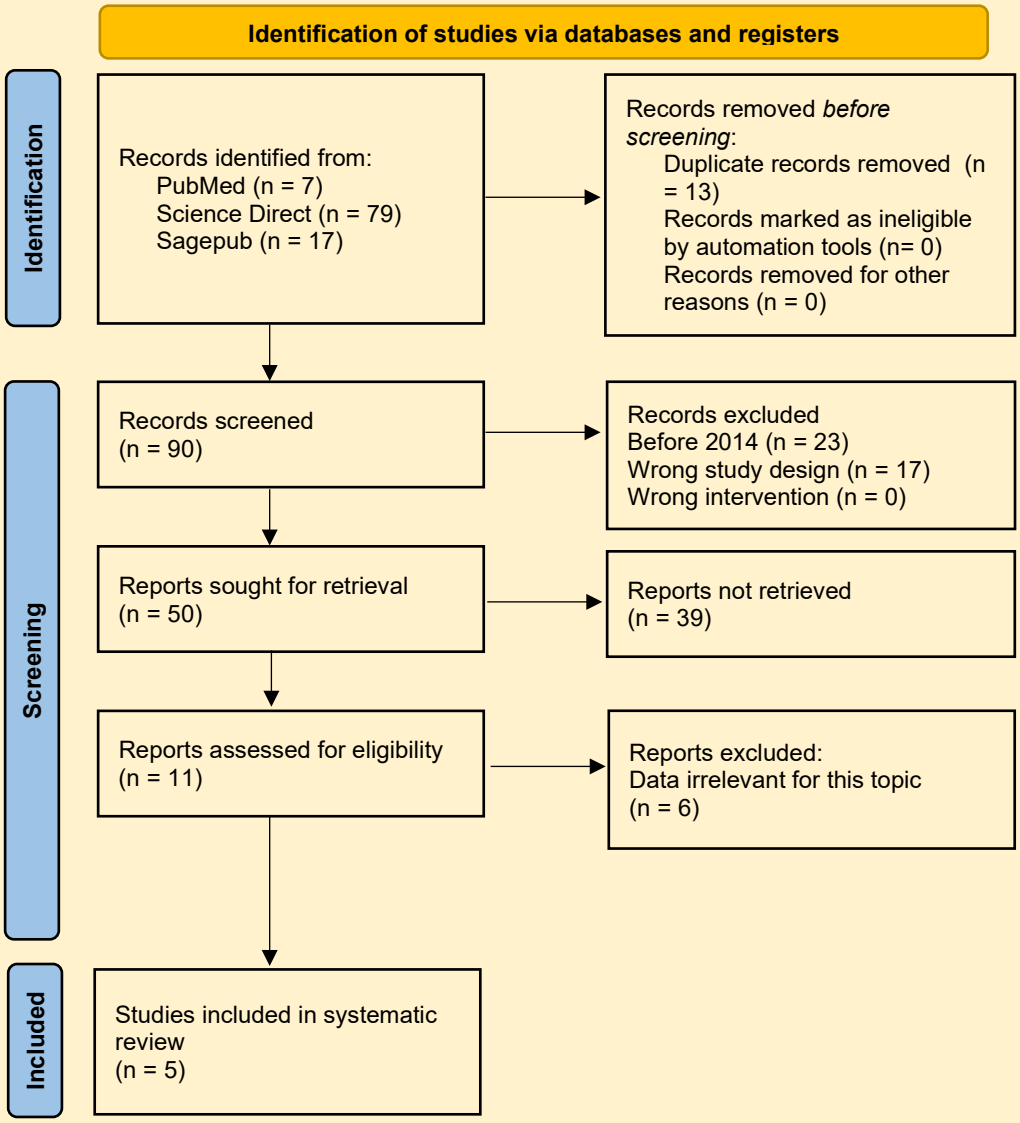


Figure 1. Article search flow chart

Table 2. Critical appraisal of Study

Parameters
1. Bias related to temporal precedence

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Is it clear in the study what is the "cause" and what is the "effect" (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation					
Was there a control group?	No	Yes	No	No	No
3. Bias related to confounding factors					
Were participants included in any comparisons similar?	No	No	No	No	No
4. Bias related to administration of intervention/exposure					
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes.	Yes.	Yes.	Yes.	Yes.
5. Bias related to assessment, detection, and measurement of the outcome					
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	No	No	No	No	No
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention					
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	No	Yes	No	No	No
7. Statistical conclusion validity					
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes

RESULT

We initiated the investigation by systematically gathering a significant assortment of papers from reputable sources such as Science Direct, PubMed, and SagePub. After a thorough three-stage screening process, we selected eight papers that were considered very pertinent to our ongoing systematic inquiry. Subsequently, we selected certain topics for further examination and meticulously

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evaluated each report. In order to expedite our study, we have included a concise summary of the evaluated information in Table 3.

Table 3. The literature included in this study

Author	Origin	Method	Sample	Result
Bronswijk, et al.[9] (2021)	Belgium	Retrospective cohort study	74 patients	Overall, 77 patients were treated with EUS-GE and 48 patients with L-GE. By means of propensity score matching, 37 patients were allocated to both groups, resulting in 74 (1:1) matched patients. Technical success was achieved in 35 of 37 EUS-GE-treated patients (94.6%) versus 100% in the L-GE group (P = .493). Clinical success, defined as eating without vomiting or GOO Scoring System ≥2, was achieved in 97.1% and 89.2%, respectively (P = .358). Median time to oral intake (1 [interquartile range {IQR}, .3-1.0] vs 3 [IQR, 1.0-5.0] days, P < .001) and median hospital stay (4 [IQR, 2-8] vs 8 [IQR, 5.5-20] days, P < .001) were significantly shorter in the EUS-GE group. Overall (2.7% vs 27.0%, P = .007) and severe (.0% vs 16.2%, P = .025) adverse events were identified more frequently in the L-GE group.
Khashab, et al.[10] (2017)	USA	Retrospective cohort study	93 patients	A total of 93 patients with malignant GOO treated with either EUS-GE (n = 30) or SGJ (n = 63) were identified. Peritoneal carcinomatosis was present in 13 (43 %) patients in the EUS-GE group and 7 (11 %) patients in the SGJ group (P < 0.001). Although the technical

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				success rate was significantly higher in the SGJ group as compared to the EUS-GE group (100 % vs. 87 %, P = 0.009), the clinical success rate was not different (90 % vs. 87 %, P = 0.18, OR 0.8, 95 %CI 0.44 - 7.07). The rate of AEs was lower in the EUS-GE group, but the difference was not statistically significant (16 % vs 25 %, P = 0.3). The mean LOHS was similar in the EUS-GE group compared to SGJ (P = 0.35). The rate of recurrent GOO was not different between the two groups (3 % vs. 14 %, P = 0.08). Similarly, the mean time to reintervention was similar (88 days vs. 121 days, P = 0.83).
Iqbal, et al.[11] (2019)	USA	Retrospective cohort study	60 patients	Out 428 charts reviewed, 60 patients met are our inclusion criteria. 8 patients underwent EUS-GE and 52 patients underwent ES. Pancreatic adenocarcinoma was the most common etiology of GOO (58%) followed by gastric adenocarcinoma (13%). Chronic pancreatitis was the most common benign etiology of GOO (8%) requiring intervention. Technical success was 100% in both the groups. There was no significant difference in the clinical success (87.5% in EUS-GE vs 90.4% ES; P = 1.00) and rate of adverse events (12.5% EUS-GE vs 3.8% ES; P = 0.35) between the two groups. One patient in EUS-GE group did not achieve clinical success

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				and underwent surgical gastrojejunostomy 23 days later which was also not clinically successful. The need for reintervention in clinically successful patients was 17% in the ES group due to tumor in-growth as compared to 0% in EUS-GE. Median time for re-intervention in the ES group was 94 days, (IQR: 43, 112). Two patients in an ES group required EUS-GE for the palliation of recurrence of symptoms.
Bondi, et al.[12] (2020)	USA	Retrospective cohort study	52 patients	Both groups had high technical and clinical success rates with 97%-100% for the SGJ as compared to 94% for the EUS-GE (p=not significant, Table 1). The EUS-GE had a numerically lower rate of post procedural complication (22% versus 44%), recurrent obstruction (33% versus 35%) and all-cause mortality (56% versus 66%) as compared to SGJ. These did not reach statistical significance, likely due to limited sample size. The length of stay was also numerically lower with EUS-GE as compared to SGJ (10 versus 13 days, p=0.40)
Dhir, et al.[13] (2021)	India	Retrospective cohort study	34 patients	16 patients underwent enteral stent placement(median age 67 yrs,13 males, mean GOOSS 1, 10 uncovered, 6 covered), while 18 patients

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				underwent EUS-guided GJ(median age 62, males 11, mean GOOSS 1). All patients had malignant obstruction. Technical success was achieved in all patients in enteral stent group and in 17/18 patients in EUS-GJ group. There was one perforation in the EUS-GJ group requiring emergency exploration. There were no other adverse events in either group. The improvement in GOOSS was significantly higher in the EUS-GJ group at discharge (mean score 3.0 versus 2.35±0.49, p=0.0001), and at 16 weeks (mean score 3.0 versus 2±0.79, p=0.0001). At 6 months 9 patients in enteral stent group, and 6 patients in the EUS-GJ had died. Re-intervention was required in 7 patients by 4 months of follow up compared to none in EUS-GJ group (p=0.002).

DISCUSSION

Endoscopic ultrasound-guided gastroenterostomy (EUS-GE) has emerged as a promising option for treating malignant gastric outlet obstruction (GOO). This technique offers two significant advantages over traditional treatments. First, EUS-GE creates a complete bypass of the obstruction, potentially providing a more durable solution compared to enteral stenting, which can be prone to recurrent blockages. Second, the endoscopic nature of EUS-GE, despite being extraluminal, may offer notable safety benefits compared to conventional surgical methods.[9]

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Early data suggest that EUS-GE is associated with higher clinical success rates and fewer adverse events compared to traditional treatments. It appears to have a better performance than enteral stenting in avoiding re-obstruction, though it shows comparable results to surgical bypass in this regard. Additionally, EUS-GE seems to have fewer complications compared to surgical gastrojejunostomy, with outcomes similar to those of enteral stenting.[10]

Despite these promising findings, EUS-GE is not widely used, likely due to its technical complexity and the lack of standardized techniques, which have limited training and dissemination.[14] Concerns also remain about potential complications, such as stent misdeployment, which occurs in about 10% of cases. Most complications are mild, but there have been severe cases and one fatality.[11,15]

The success of EUS-GE is often influenced by the experience of the endoscopist, with a higher rate of misdeployment observed in early procedures. To fully assess the benefits and risks of EUS-GE compared to traditional treatments, high-quality, prospective studies with longer follow-up are needed. Current research is limited by mostly retrospective data, small sample sizes, and a lack of standardization in EUS-GE techniques. The studies included were mostly from high-volume centers, which may affect the generalizability of the results.[12,13]

CONCLUSION

EUS-GE shows promise for treating malignant GOO with higher success rates and fewer complications compared to traditional methods. However, further development of specialized devices and standardization of the technique, along with more robust randomized trials, are necessary to better understand and establish its role in clinical practice.

DISCLOSURE STATEMENT

Disclosure Statement : The authors have no conflicts of Interest to declare.

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