



Research Article

EUS-Directed Transgastric ERCP (EDGE) Versus Laparoscopy-Assisted ERCP (LA-ERCP) For Roux-En-Y Gastric Bypass (RYGB) Anatomy: Systemic Review and Metanalysis

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Abstract

Objective: Laparoscopic-assisted endoscopic retrograde cholangiopancreatography (LA-ERCP) has gained popularity and was considered the preferred therapeutic option across multiple institutions in managing choledocholithiasis after bariatric surgery. As of recent, a novel procedure, endoscopic ultrasound directed transgastric ERCP (EDGE), has gained popularity across the USA and Europe. We sought to assess and compare the safety and technical success of both procedures.

Methods: We conducted a systematic review following the PRISMA guidelines. A total of 925 articles were screened and assessed for inclusions. Two authors independently screened abstracts and titles followed up full-text screening. Articles comparing outcomes between both surgical techniques were included in this study. A meta-analysis was conducted to compare peri-operative outcomes between both procedures.

Results: A total of four articles met the inclusion criteria. All four articles were retrospective reviews. The mean age was 52 and the majority were females. When comparing outcomes between both procedures, no difference in adverse events, technical success rates and pancreatitis was detected. Compared to the LA-ERCP cohort, the EDGE cohort had a shorter hospital Length of Stay (LOS) and operative time. Using the Ottawa scale, a moderate risk of bias was assessed across all four articles.

Conclusion: Based on the results of this meta-analysis, EDGE was associated with a shorter LOS and operative time with no increased risk of adverse events. Additionally, based procedures had a high technical success rate.

Keywords: Choledocholithiasis; Bariatric Surgery; Laparoscopic-Assisted Endoscopic Retrograde Cholangiopancreatography (LA-ERCP); Endoscopic Ultrasound Directed Transgastric ERCP; Technical Success Rates, Hospital Length of Stay; Operative Time

Introduction

Besides the established benefits of bariatric surgery, the development of gallstones is a common complication in patients undergoing weight reduction surgery. It is estimated that up to 50% of patients who underwent Roux-en-Y Gastric Bypass (RYGB) develop gallstone disease. This in turn can lead to the onset of choledocholithiasis and its associated complications [1]. Due to the lack of per-oral access to the stomach, the traditional Endoscopic Retrograde (ERCP) pose a unique challenge in diagnosing and managing gallstone disease in those with a past surgical history of RYGB. As such, Laparoscopic-Assisted Endoscopic Retrograde Cholangiopancreatography (LA-ERCP) has gained popularity and was considered the preferred therapeutic option across multiple institutions. This technique is a laborious and an intrusive process necessitating significant

collaboration across surgeons and gastroenterologists [2]. As of recent, a novel procedure, endoscopic ultrasound directed transgastric ERCP (EDGE), has gained popularity across the USA and Europe. This technique involves the utilization of a lumen-apposing metal stent under the guidance of an endoscopic ultrasound and fluoroscopy. Multiple institutional studies were conducted to compare and assess the technical and clinical outcomes of EDGE compare to LA-ERCP. Accordingly, we sought to systematically assess the current literature to compare outcomes of gallstone disease in patients who underwent RYGB across both techniques.

Methods

Search Strategy

A systematic review was conducted using Medline, PubMed and google scholar databases on June 2023 following the PRISMA guidelines. Supplementary Fig. 1 depicts the PRISMA guideline checklist. Supplementary Table 1 portrays the search strategy used. Studies that assessed and compared technical success and/or medical outcomes between LA-ERCP and EDGE were included in this systematic review. Exclusion criteria included meeting abstracts, unpublished articles and non-comparative studies (including case reports, case series, editorials). Two researchers (KA, AA) independently removed duplicate articles and reviewed title and abstract of each publication for inclusion. This was followed by a thorough full-text reviews of eligible articles. Overlapping articles were included in the study. Non-overlapping articles were assessed by a third researcher.

Data Extraction

Data extraction was carried out by two researchers (KA, AA), who ensured data validity by consensual agreements. Data extracted included demographics (age, gender, BMI), surgical characteristics (operative, technical success) and hospital outcomes (ERCP-induced pancreatitis, length of hospital, in-hospital complications).

Statistical Analysis

When assessing for categorical variables, Odds Ratio (OR) and the 95% Confidence Interval (95% CI) were derived utilizing the random-effects model (Mantel-Haenszel statistical method). Continuous outcomes were assessed by identifying the Weighted Mean Difference (WMD) and its 95% CI with random-effects (inverse variance statistical method) models. In instances where WMD <0, the values in the LAERCP group were increased. The Cochrane Collaboration RevMan version 5.3 was employed for data analysis.

Quality Assessment

Risk of bias was assessed using the Ottawa scale. The studies were assessed for ascertainment of exposure, outcome of interest, assessment of outcome, comparability, length of follow-up and adequacy of follow-up. The studies were labelled as low, moderate or high risk based on the total score.

Results

A total of 925 studies were identified from the initial search of which XX duplicates were automatically and manually reviewed. The titles and abstracts of XXX articles were assessed for inclusion. A total of xx were screened by full-text review of which four retrospective studies met the inclusion criteria and were included in the study (Fig. 1). All four studies were published between 2018 and 2020.

A total of 192 patients were included in the analysis, of whom 117 underwent LA-ERCP and 75 underwent EDGE. The mean age was 55 years and the majority were females (N=158, 82%). Table 1 depicts and compares baseline characteristics across both therapeutic groups.

An overall technical success rate of 98% was observed in LA-ERCP compared to 96% in the EDGE group. With regards to technical success, all four studies compared rates between both techniques. No significant difference was detected (OR: 0.65, $p=0.62$). A low level of heterogeneity existed across all four studies ($I^2=0\%$). Likewise, all four studies reported adverse events. The overall adverse events in those who underwent LA-ERCP and EDGE were 23% and 17%, respectively. No significant difference was detected between both therapeutic techniques (mean difference = 95 minutes, $p<0.001$), with a low level of heterogeneity ($I^2=24\%$). Compared to those who underwent LA-ERCP, those who underwent EDGE had a statistically significant shorter operative time (mean difference = 95 minutes, $p<0.001$) and hospital LOS (mean difference = 1.2 days, $p<0.001$). Overall

quality assessment of all four retrospective reviews represents a moderate risk of bias. A summary of Ottawa scale quality assessment is depicted in Table 2.

Study ID	Type of Study	Journal	Date Published	Patients		Female Patients		Mean Age	
				LAERCP	EDGE	LAERCP	EDGE	LAERCP	EDGE
Wang, et al., [7]	Retrospective	Surgical endoscopy	Jun 2020	42	18	38	16	50.6 (15.9)	59.3 (6.5)
Kedia, et al., [5]	Retrospective	Journal of gastroenterology	March 2018	43	29	36	25	55 (33-80)	56 (35-82)
Kochlar, et al., [2]	Retrospective	International endoscopy	March 2020	18	26	12	20	60.78 ± 12.67	60.77 ± 11.44
Kroll, et al., [6]	Retrospective	Surgical endoscopy	May 2019	14	2	11	0	45.5 (72-28)	50.5 (49- 52)

Table 1: Demographics of articles included in the meta-analysis.

Study	Exposed Cohort	Non-Exposed Cohort	Ascertainment of Exposure	Outcome of Interest	Comparability	Assessment of Outcome	Length of Follow-up	Adequacy of Follow-up	Total Score
Wang	*	*	*	*		*	*	*	7
Kedia	*	*	*	*	**	*	*	*	9
Kochlar	*	*	*	*	**	*	*	*	9
Kroll	*	*	*	*		*	*	*	7

Table 2: Ottawa scale.

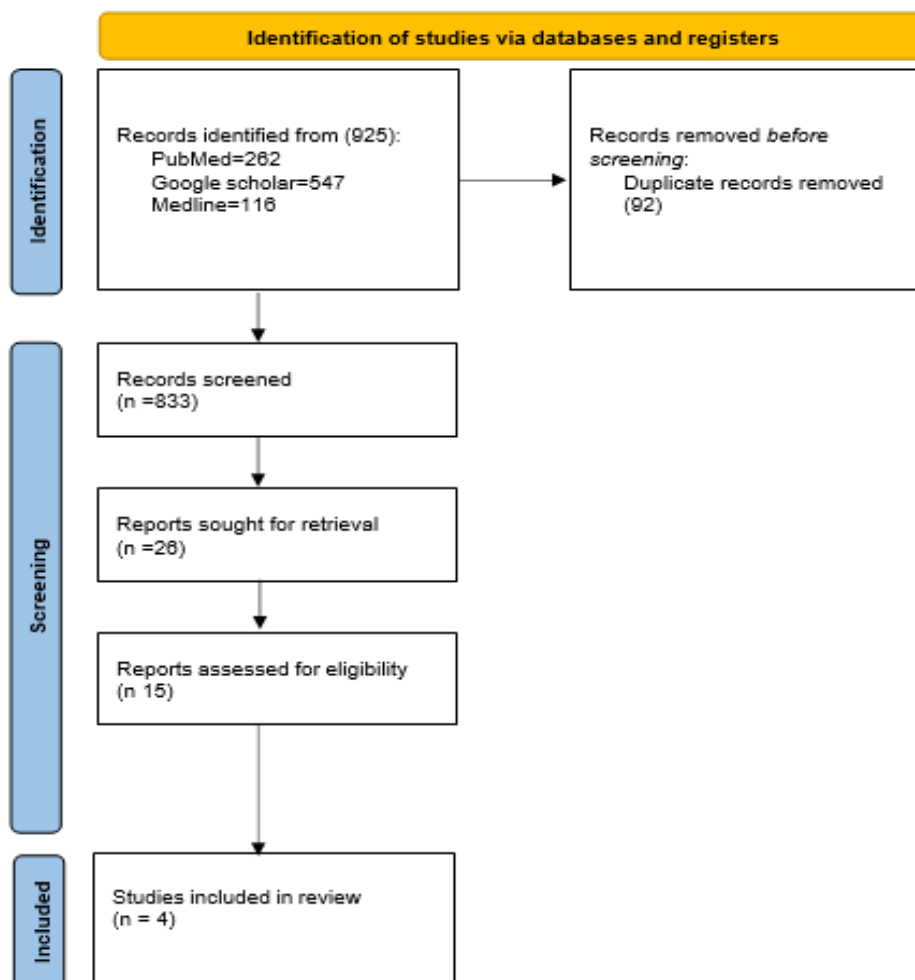


Figure 1: PRISMA flow chart.

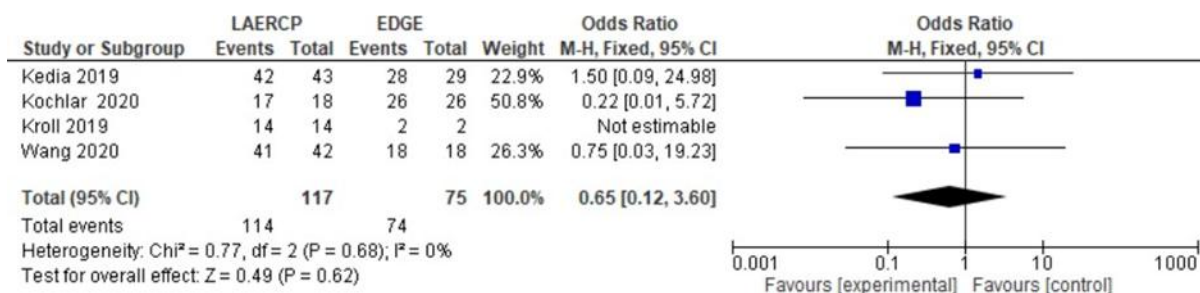


Figure 2: Technical success rates across both groups.

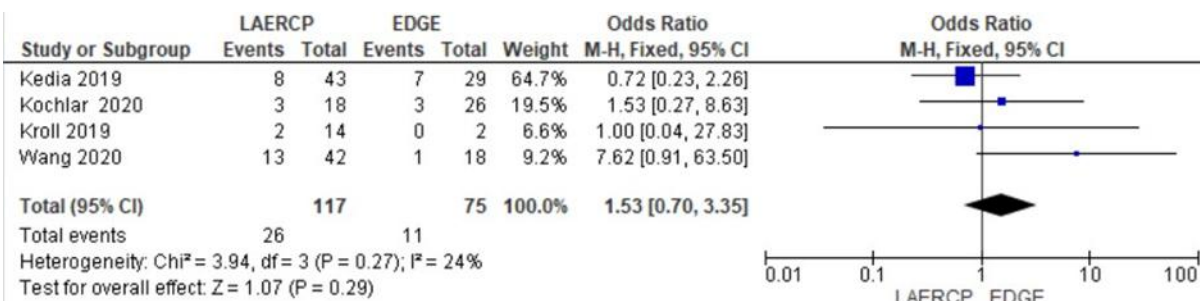


Figure 3: Adverse event comparison between both surgical techniques.

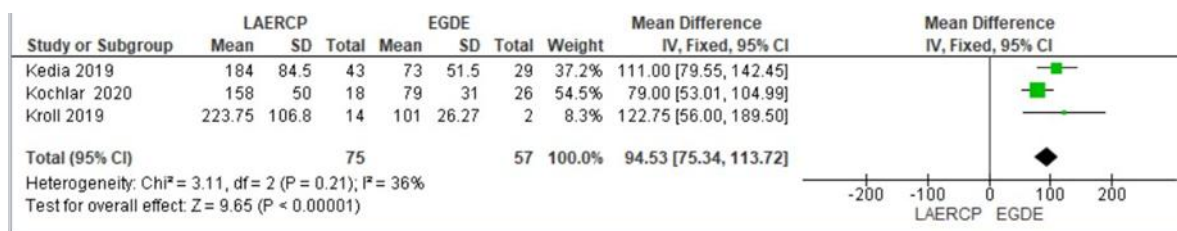


Figure 4: Comparison of operative time across both cohorts.

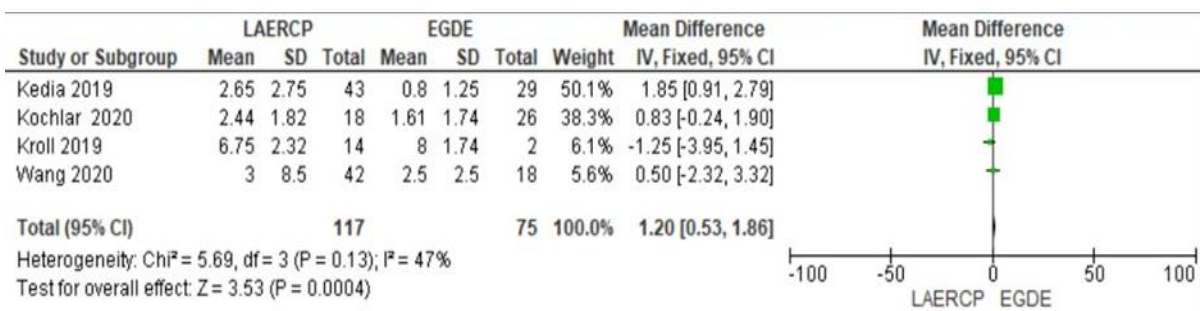


Figure 5: Forest plot comparing hospital length of stay.

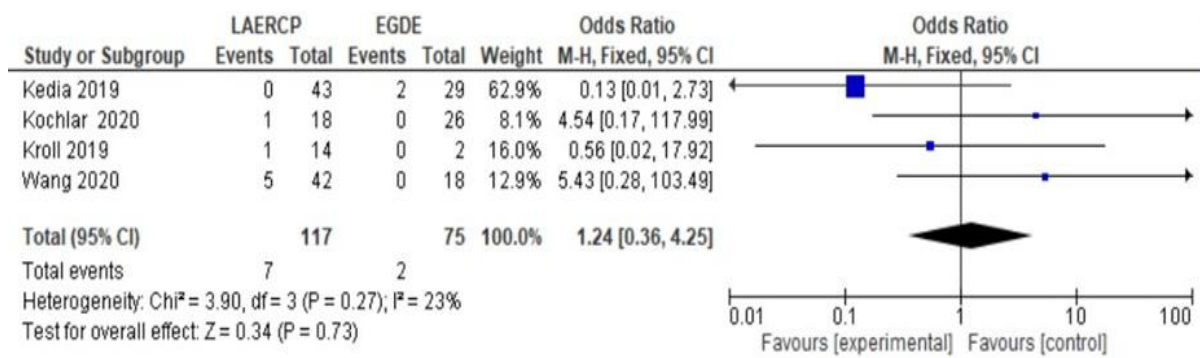


Figure 6: Comparison of ERCP-induced pancreatitis between both groups.

Discussion

This systematic review and meta-analysis assess and compare technical and hospital outcomes of the management of gallstones across two techniques (LA-ERCP vs EDGE) in patients with a history of RYGB. The results of this study have shown similar outcomes across both procedures. However, EDGE was associated with shorter operative time and hospital stay.

Although the conventional LA-ERCP has been the gold standard in managing biliary pathologies in bariatric surgery patients, the advancement in non-invasive ultrasound guided techniques was considered a promising approach and was adopted as the primary option across multiple institutions. Multiple case series and reports highlighting outcomes in patients who underwent EDGE have been published across the literature. However, only four retrospective studies compared technical success and hospital outcomes across both procedures.

This meta-analysis aimed at assessing and strengthening the benefit of a novel EDGE technique in comparison to the traditional approaches. Unlike what was reported by Dhindsa, et al., the overall adverse events rates in the current study were relatively low [3]. According to this study, EDGE is not associated with worse adverse events and hospital outcomes, in addition to being non-inferior in technical success and operative rates. This is in accordance with prior work done by Shaurya, et al., which demonstrated a 99% success rate of transgastric ERCP approach [4]. Additionally, EDGE was associated with a shorter operative time and decreased hospital stay. This could be attributed to the less invasive and technically difficult nature of the ultrasound guided procedure in managing biliary pathologies. Results of this study are in accordance with the current trend in surgical practice favouring the adoption of EDGE.

The EDGE procedure has been subject to speculation regarding of weight gain when temporarily reversing a bariatric bypass procedure using a LAMS and the potential for chronic fistula formation. However, this hypothesis lacks empirical data to back it up. In the largest study of its kind, examining weight alterations following the EDGE procedure for a period of 28 weeks, reassuringly, no instances of weight regain were observed [5]. however further studies needed to elaborate more about this aspect of the procedure as this in addition this adverse effect can be used in the future in the endoscopic field of bariatric surgery as a less invasive reversal of gastric bypass and other techniques.

To ensure excellent outcomes for a patient, it is crucial to carefully assess all available options, including surgical and interventional expertise and engage in interdisciplinary collaboration when selecting the best procedure. The most suitable approach may vary from one center to another depending on the local situation. Additionally, when deciding on the best procedure for a particular patient, it is essential to consider factors such as the type of bariatric procedure, the need for cholecystectomy and potential adhesions [6,7].

This systematic review and meta-analysis was constrained by several limitations. First, a limited number of articles compared outcomes across both procedures. As such, the total sample size of patients included in this analysis was low. Hence, significant differences (if want truly exists) could not be detected in terms of hospital outcomes and complications. Second, all four studies were retrospective reviews, which increases the risk of inherent and selection biases. Third, non-English and non-indexed articles were not assessed for inclusion. As such, we might have missed out on other articles.

Conclusion

This systematic review and meta-analysis have shown similar adverse events and technical success rates across both surgical procedures. EDGE was associated with a shorter hospital LOS and operative time. Further prospective studies are warranted to validate these results.

Conflict of Interest

The authors have no conflict of interest to declare.

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