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REVIEW

Extended versus limited mesenteric excision in bowel resection for Crohn's disease: a meta-analysis and systematic review

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Abstract

Background There is ongoing debate regarding the benefits of extended mesenteric excision (EME) versus limited mesenteric excision (LME) in intestinal resection for Crohn's disease (CD). Some studies suggest that EME may reduce surgical recurrence, which is defined as the need for reoperation due to disease complications or insufficient response to therapy, when compared with LME. This systematic review and meta-analysis aims to compare postoperative complications, surgical recurrence, and endoscopic recurrence in patients undergoing EME versus LME for CD.

Methods MEDLINE, Cochrane, the Central Register of Clinical Trials, Scopus and Web of Science databases were searched for studies published through April 2024. Odds ratios (OR) with 95% confidence intervals (CIs) were pooled using a random-effects model. Heterogeneity was assessed with Cochran's Q test and I^2 statistics, with p-values < 0.10 and $I^2 > 25\%$ considered significant. Statistical analyses were performed using R software, version 4.4.1.

Results One randomized controlled trial (RCT) and five observational studies were included, totaling 4498 patients, of whom 1059 (23.5%) underwent EME and 3439 (76.5%) LME. EME was associated with a lower surgical recurrence rate (5% versus 15%; OR 0.31; 95% CI 0.12–0.84; $p = 0.021$; $I^2 = 47\%$). No significant differences were observed between EME and LME for overall complications, Clavien–Dindo ≥ 3 events, bleeding requiring transfusion, anastomotic leaks, intraabdominal abscesses, surgical site infections (SSIs), reoperations, readmissions, ileus, endoscopic recurrences, operative times, or hospital stays.

Conclusions EME was associated with a significant reduction in surgical recurrence compared with LME, without differences in endoscopic recurrence or postoperative complication rates.

Keywords Crohn's disease · Extended mesenteric excision · Limited mesenteric excision · Surgical recurrence

Introduction

Crohn's disease (CD) affects more than 1.5 million people in Europe and 2 million in North America [1]. There is also a growing incidence of CD in developing countries [2]. The standard treatment of CD revolves around pharmacological therapies aimed at controlling intestinal inflammation [3]. Surgical intervention is considered when medical therapy proves ineffective or in the presence of intraabdominal complications such as stenosis, abscesses, and fistulas, as well as in cases of recurrent disease [3–5].

Notably, there is a high reoperation rate for patients with CD who undergo surgical treatment, reported at 11–32% at 5 years and 46–55% at 20 years [6–8]. Several factors may influence recurrence rates, including disease penetration, smoking, perianal involvement, and a history of previous resections [3, 6, 7]. The introduction of biological and

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immunomodulatory agents has decreased the need for surgery [5]. However, approximately 80% of patients with CD will need at least one surgery during their lifetime, while 40% will require multiple surgeries [3, 5, 9, 10]. This highlights the concept of surgical recurrence, defined as the need for reoperation due to disease complications or insufficient response to therapy [11, 12].

The standard surgical approach, in which the mesentery is usually managed with limited mesenteric resection, is advised by the European Crohn's and Colitis Organisation (ECCO) guidelines [13, 14]. However, while this technique minimizes surgical risk and preserves healthy tissue, it may be associated with higher recurrence rates due to residual mesenteric disease [3, 11, 15]. Emerging evidence suggests the mesentery may play a role in disease progression, and some studies have indicated that extended mesenteric excision (EME), although more technically challenging and associated with a higher risk of complications, could reduce recurrence rates by addressing the underlying inflammation more comprehensively [3, 4, 6, 11, 12, 15–20]. To further investigate these aspects, we conducted a systematic review and meta-analysis comparing postoperative complications (within 30 days), as well as surgical and endoscopic recurrence rates in patients with Crohn's disease undergoing extended mesenteric excision (EME) versus limited mesenteric excision (LME).

Materials and methods

We conducted this systematic review and meta-analysis according to the Cochrane Collaboration Handbook for Systematic Review of Interventions and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement guidelines [21]. The PRISMA checklist is shown in Fig. S1. The review protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) under protocol CRD42023483923 [22]. As this study is based on a systematic review and meta-analysis of previously published data, it is exempt from ethical clearance.

Search strategy

We systematically searched PubMed, Scopus, Web of Science, and the Cochrane Central Register of Controlled Trials from inception to September 2024 with the following search terms: (Crohn OR "Crohn's disease" OR "Crohn disease" OR "Crohn's Colitis" OR "Crohn Colitis" OR "inflammatory bowel disease" OR "Granulomatous colitis" OR "Granulomatous ileitis" OR ileitis OR recurrence OR "postoperative recurrence" OR "post-operative recurrence") AND ("Surgery in Crohn's disease" OR "colorectal surgery" OR "ileocolic resection" OR "ileo-colic" OR ileocolectomy OR "ileo-colectomy" OR "ileocecal resection" OR "ileo-cecal") AND (Mesentery OR mesenteric OR "mesentery excision" OR "mesenteric excision" OR "mesenteric resection" OR "mesentery resection" OR "mesentery sparing" OR Mesenterectomy OR "Extended Mesenteric" OR "Extended mesenterectomy" OR "Extended Mesenteric").

Eligibility criteria

Inclusion in this meta-analysis was limited to studies comparing EME and LME in patients undergoing bowel resection for CD. In the included studies, extended mesenteric excision (EME) consistently involved mesenteric mobilization and vascular ligation near the ileocolic trunk, while limited mesenteric excision (LME) was defined by mesenteric resection close to the bowel wall. Additional technical details of each surgical approach are provided in Table 1. We excluded studies that (1) only compared Kono-S anastomosis with other anastomosis techniques without considering mesenteric excision; (2) included patients with ulcerative colitis without stratification of patients with CD; (3) did not perform bowel resection; (4) included more than 5% of cases of perianal disease; (5) were published prior to 1998, before approval and use of biologic agents for the treatment of CD; (6) lacked a control group; (7) were case reports, conference abstracts, reviews, or animal experiments.

Data extraction and endpoints

Two authors (B.F.P. and F.I.L.C.B.) independently screened the articles for inclusion criteria using Rayyan software and extracted data from the selected studies, which were then formatted into a Microsoft Excel 365 spreadsheet. Any disagreements were resolved by consensus or, if necessary, by consulting a third author (F.B.F.). The outcomes evaluated included: (1) overall complications, (2) Clavien–Dindo ≥ 3, (3) bleeding requiring transfusion, (4) anastomotic leak, (5) intraabdominal abscess, (6) ileus, (7) surgical site infection (SSI), (8) reoperation, (9) hospitalization readmission, (10) operative time, (11) hospital stay, (12) surgical, and (13) endoscopic recurrence.

Quality assessment

The observational studies were evaluated using the Cochrane Collaboration tool to assess the risk of bias in nonrandomized studies (ROBINS-I) [19]. In this assessment, each study was categorized as critical, serious, moderate, or low risk in the seven domains: confounding, selection, classification, deviations from intended interventions, missing data, measurement of outcomes and selection of reported results. The evaluation of randomized studies followed the

Table 1 Baseline characteristics of included randomized and observational studies

Study	Country	Design	LME/EME	Male, *n* (%) LME/EME	Surgery, *n* (%)	Operative time LME/EME (min)	Hospital stay LME/EME (days)	LME technique	EME technique	Anastomosis and stoma *n* (%) LME/EME
Abdulkarim 2023	Canada	R-nRCT	3087/622	1408 (45.6)/299 (48.0)	RC: 2165 (70.1)/416 (66.9) Other 922 (29.9)/206 (33.1)	166.5 ± 4097.0/170.1 ± 1951.5	7.02 ± 422.2/7.07 ± 223.1	Lymph node harvest < 12 ACS-NSQIP database	Lymph node harvest > 12 ACS-NSQIP database	Stoma: 218 (7.1)/42 (6.8)
Coffey 2018	Ireland	P-nRCT	30/34	14 (47)/14 (41)	Ileocolic resection (100)	NA	NA	The mesentery divided flush with the resected intestine	The mesentery fully mobilized and partially excised at a level of normal appearance	NA
Holubar 2024	USA	R-nRCT	74/66	36 (48.6)/33 (50)	Ileocolic resection (100)	172.9 ± 34.9/154.1 ± 35.6	9.5 ± 8.5/11 ± 10	Kono-S—the mesentery preserved by excising it close to the bowel wall	Acute angle toward the apex of the ileocolic pedicle	LME: Kono-S 74 (100) EME: stapled S–S 28 (42.4) Handsewn E-E 22 (33.3) Stapled E-S 16 (24.2) Stoma: 8 (10.8)/11 (16.6)
Mineccia 2022	Italy	R-nRCT	122/204	70 (57.4)/121 (59.3)	Ileocolic resection (100)	146 ± 55/150 ± 54	9 ± 4/8.5 ± 5	The mesentery divided flush with the resected intestine	Mesentery is fully mobilized, and vessel ligation is at the oncological D2 level	Manual: 122 (100)/59 (28.9) Stapled: 0 (0)/145 (71.1)
SPICY 2024	The Netherlands and Italy	RCT	66/67	28 (42)/29 (43)	Ileocolic resection (100)	177.5 ± 28.5/168.5 ± 26.5	5 ± 2/5.5 ± 1.5	The mesentery was divided close to the bowel wall	The mesenteric resection followed the lower border of the ileocolic artery to preserve these vessels	Stapled S–S 66 (100)/66 (99) Functional E-E 41 (62)/46 (69)

Table 1 (continued)

Study	Country	Design	LME/EME	Male, *n* (%) LME/EME	Surgery, *n* (%)	Operative time LME/EME (min)	Hospital stay LME/EME (days)	LME technique	EME technique	Anastomosis and stoma *n* (%) LME/EME
Zhu 2021	China	R-nRCT	60/66	47 (78.3)/42 (63.6)	RC 26 (43.3)/32 (48.5) TC 4 (6.7)/3 (4.5) LC 21 (35.0)/14 (21.2) PTC: 2 (3.3)/1 (1.5)	NA	12.6 ± 8.5/10.4 ± 5.1	The mesentery was divided close to the bowel wall	The mesentery was divided 1 cm away from the origin of the arterial trunks	Anastomosis: 46 (45.5)/55 (54) Stoma: 14(56)/11(44)

LME limited mesenteric excision, *EME* extended mesenteric excision, *R-nRCT* retrospective nonrandomized control trial, *P-nRCT* prospective nonrandomized control trial, *RC* right colectomy, *TC* transverse colectomy, *LC* left colectomy, *PTC* proctectomy, *NA* not available

Cochrane Collaboration tool for assessing the risk of bias in randomized trials (Rob-2), in which studies are categorized as low risk, high risk, or may express some concerns in five domains: randomization, deviations from intended intervention, missing outcome data, measurement of the outcome, and selection of the reported result [20]. Two authors (B.F.P. and P.M.) independently assessed the risk of bias, and disagreements were resolved by consensus.

Statistical analysis

We pooled odds ratios (OR) for binary outcomes and mean differences (MD) for continuous endpoints, with 95% confidence intervals (CI). A random-effects model was used for all outcomes. Statistical significance was defined as $p < 0.05$. Heterogeneity was assessed using Cochran's Q test and I^2 statistics, with p-values lower than 0.10 and $I^2 > 25\%$ being considered significant for heterogeneity. For outcomes with substantial heterogeneity, we used Baujat plots to assess each study's contribution to the overall effect and heterogeneity. Furthermore, we also performed leave-one-out sensitivity analyses by systematically removing each study from the pooled estimates to ensure the robustness of the results. R software (R Foundation for Statistical Computing), version 4.4.1, was used for the statistical analysis.

Results

Study selection and characteristics

As detailed in Fig. 1, the initial search yielded 1255 results. After removing duplicate records and ineligible studies, 11 were reviewed in full. A total of 1 RCT and 5 observational studies were included, comprising 4498 patients, of whom 1059 (23.5%) underwent EME and 3439 (76.5%) LME [3, 11, 12, 14, 15, 20]. Age at diagnosis was categorized as under 16 years (A1), 17–40 years (A2), and older than 40 years (A3). Most patients fell into the 17–40 years age group (A2), representing 90.5% in LME and 98.5% in EME. Male patients accounted for 47.5% of the total cohort. The most common location of Crohn's disease, when specified, was the ileocolic segment (L3) at 41.29%, followed by the terminal ileum (L1) at 40.40%, the colon (L2) at 16.74%, and the upper GI tract (L4) at 1.56%. Notably, one study analyzed the ACS-NSQIP database, applying a threshold of twelve or more lymph nodes to define EME and LME [15], while all other studies stratified patients on the basis of surgical techniques [3, 11, 12, 14, 20]. Only one study in the meta-analysis directly compared Kono-S anastomosis with EME [20]. Two defined endoscopic recurrence at 6 months postoperatively as a modified Rutgeerts score of at least i2b [12, 14]. Similarly,

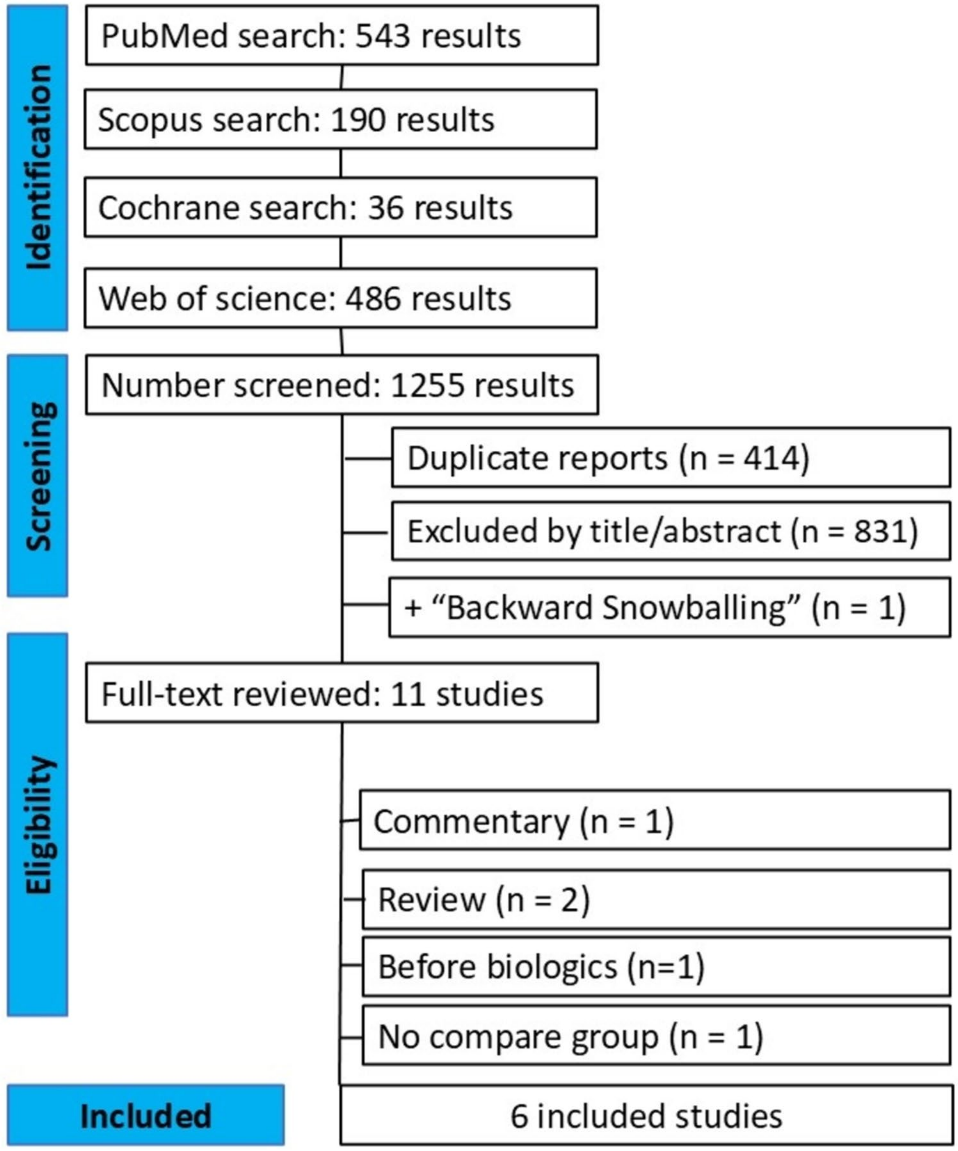

Fig. 1 Flow diagram of study screening and selection

three studies in the meta-analysis evaluated surgical recurrence and defined it as the need for a subsequent surgical procedure due to complicated CD in the same or another intestinal segment [3, 11, 12]. The criteria included obstruction, perforation, fistulation, or failure of medical therapy, with the decision guided by a multidisciplinary team [3, 11, 12]. Studies with only a 30-day follow-up reported postoperative complications, whereas one study provided a minimum follow-up of 6 months specifically to identify endoscopic recurrence [14, 15, 20]. For studies with longer-term follow-up, which assessed both postoperative complications and surgical recurrence, the mean follow-up period was calculated at 58.34 ± 38.16 months on the basis of the data available [3, 11, 12]. The baseline characteristics of the included studies are presented in Tables 1 and 2, and Fig. 2 illustrates the EME and LME techniques.

Pooled analysis of all studies

Postoperative complications

There were no statistically significant differences in overall postoperative complication rates between EME and LME (OR 0.93; 95% CI 0.79–1.10; $p = 0.429$; $I^2 = 0\%$; Fig. 3A) [3, 12, 15, 20], Clavien–Dindo ≥ 3 (OR 1.17; 95% CI 0.84–1.63; $p = 0.345$; $I^2 = 0\%$; Fig. 3B) [3, 12, 14, 15, 20], bleeding that required transfusion (OR 1.18; 95% CI 0.86–1.62; $p = 0.29$; $I^2 = 0\%$; Fig. 3C) [3, 15, 20], anastomotic leak (OR 0.95; 95% CI 0.61–1.46;

Table 2 Baseline characteristics of patient's disease of included studies

Study	Age at diagnosis, *n* (%) LME/EME	Disease phenotype, *n* (%) LME/EME	Disease location, *n* (%) LME/EME	Medications at the time of index surgery LME/EME, *n* (%)	Prophylactic medication after index surgery, *n* (%) LME/EME	Follow-up
Abdulkarim 2023	42.3 ± 16.76/41.0 ± 15.78**	NA	NA	NA	NA	30 days
Coffey 2018	A1 23 (77)/26 (76) A2 6 (20)/6 (18) Data unavailable 1 (3)/2 (6)	B1 16 (53)/8 (24) B2 6 (20)/14 (41) B3 8 (27)/12 (35)	L1 23 (77)/26 (76) L2 2 (6)/0 (0) L3 5 (17)/6 (18) L4 0 (0)/2 (6)	AI 15 (50)/9 (27) Steroid 13 (43)/12 (35) ISP 11 (37)/10 (29) Biol 5 (17)/15 (44) None 5 (17)/5 (15) Data unavailable 1 (3)/2 (6)	ImuranR 4 (13)/3 (9) 6MP 0 (0)/1 (3) Anti-TNF 2 (7)/4 (12) None 19 (63)/26 (76) Data unavailable 5 (7)/1 (3)	69.9 ± 48.47** months
Holubar 2024	A1 < 40 years 67 (90.5)/65 (98.5) A2 ≥40 years 7 (9.5)/1 (1.5)	B1 7 (9.5)/10 (15) B2 49 (66)/33 (50) B3 18 (39)/18 (24.3) Perianal 7 (9.5)/3 (4.5)	L1 23 (31.1)/25 (37.9) L3 51 (68.9)/21 (62.1))	Bio 46 (62.2 0)/37 (56.1) Steroids 18 (24.3)/14 (21.2) Thiopurines 6 (8.1)/3 (4.6) ATB 24 (32.4)/29 (43.9 0) Budesonide 13 (17.6)/11 (16.7) 5-aminos 3 (4.1)/14 (21.2)	NA	30 days
Mineccia 2022	A1 15 (12.3)/12 (5.9) A2 68 (55.7)/140 (68.6) A3 39 (32)/52 (25.5)	B2 40 (32.8)/67 (32.8) B3 82 (67.2)/137 (67.2)	NA	Washout/5-ASA 46 (37.7)/114 (55.9) Steroids 34 (27.9)/28 (13.7) ISP 13 (10.6)/21 (10.3) Bio 16 (13.1)/32 (15.7)	NA	60 ± 36** months
SPICY 2024	A1 8 (12)/4 (6) A2 40 (61)/338 (57) A3 18 (27)/25 (37)	B1 15 (23)/22 (33) B2 29 (44)/28 (42) B3 22 (33)/17 (25) Perianal 12 (18)/5 (7)	L1 40 (61)/44 (66) L3 26 (39)/23 (34)	None 28 (42)/24 (36) Mesalazine 1 (2)/0 (0) Thiopurines 10 (15)/8 (12) Bio 25 (38)/35 (52) Small molecules 2 (3)/0 (0)	Mesalazine 0 (0)/1 (2) Thiopurines 2 (3)/1 (2) Biologics 9 (14)/18 (27) Small molecules 1 (2)/0 (0)	6 months (no SD given)
Zhu 2021	A1 7 (11.7)/4 (6.1) A2 44 (73.3)/50 (75.8) A3 12 (15.0)/12 (18.2)	B1 0 (0)/3 (4.5) B2 20 (33.3)/39 (59.1) B3 40 (66.7)/24 (36.4) Perianal 25 (41.7)/22 (33.3)	L2 32 (53.3)/41 (62.1) L3 28 (46.7)/25 (37.9) L4 1 (1.7)/4 (6.1)	ISP 19 (31.7)/23 (34.8) Infliximab 4 (7.1)/4 (6.3) Steroids 21 (35.0)/25 (37.9	ISP 29 (48.3)/38 (57.6) Biologics 2 (3.3)/4 (6.1)	45.12 ± 25.45** months

Disease phenotype: B1—non-stricturing, non-penetrating; B2—stricturing; and B3—penetrating

Disease location: L1 terminal ileum, L2 colonic, L3 ileocolic, and L4 upper GI

Age at diagnosis: A1 < 16 years; A2 17–40 years; A3 > 40 years

**Mean ± standard deviation

LME limited mesenteric excision, *EME* extensive mesenteric excision, *AI* anitinflammatory, *ISP* immunosuppressor, *Bio* biological, *ATB* antibiotic

$p = 0.808$; $I^2 = 32\%$; Fig. 3D) [3, 14, 15, 20], intraabdominal abscesses (OR 1.12; 95% CI 0.52–2.41; $p = 0.76$; $I^2 = 0\%$; Fig. 4A) [3, 15, 20], SSIs (OR 0.95; 95% CI 0.62–1.48; $p = 0.82$; $I^2 = 0\%$; Fig. 4B) [3, 15, 20], reoperations (OR 1.02; 95% CI 0.42–2.52; $p = 0.96$; $I^2 = 4\%$; Fig. 4C) [3, 15, 20], hospital readmissions (OR 1.02; 95% CI 0.42–2.52; $p = 0.95$; $I^2 = 4\%$; Fig. 4D) [3, 12, 20], or ileus (OR 0.96; 95% CI 0.51–1.81; $p = 0.90$; $I^2 = 36\%$; Fig. 5A) [3, 15, 20].

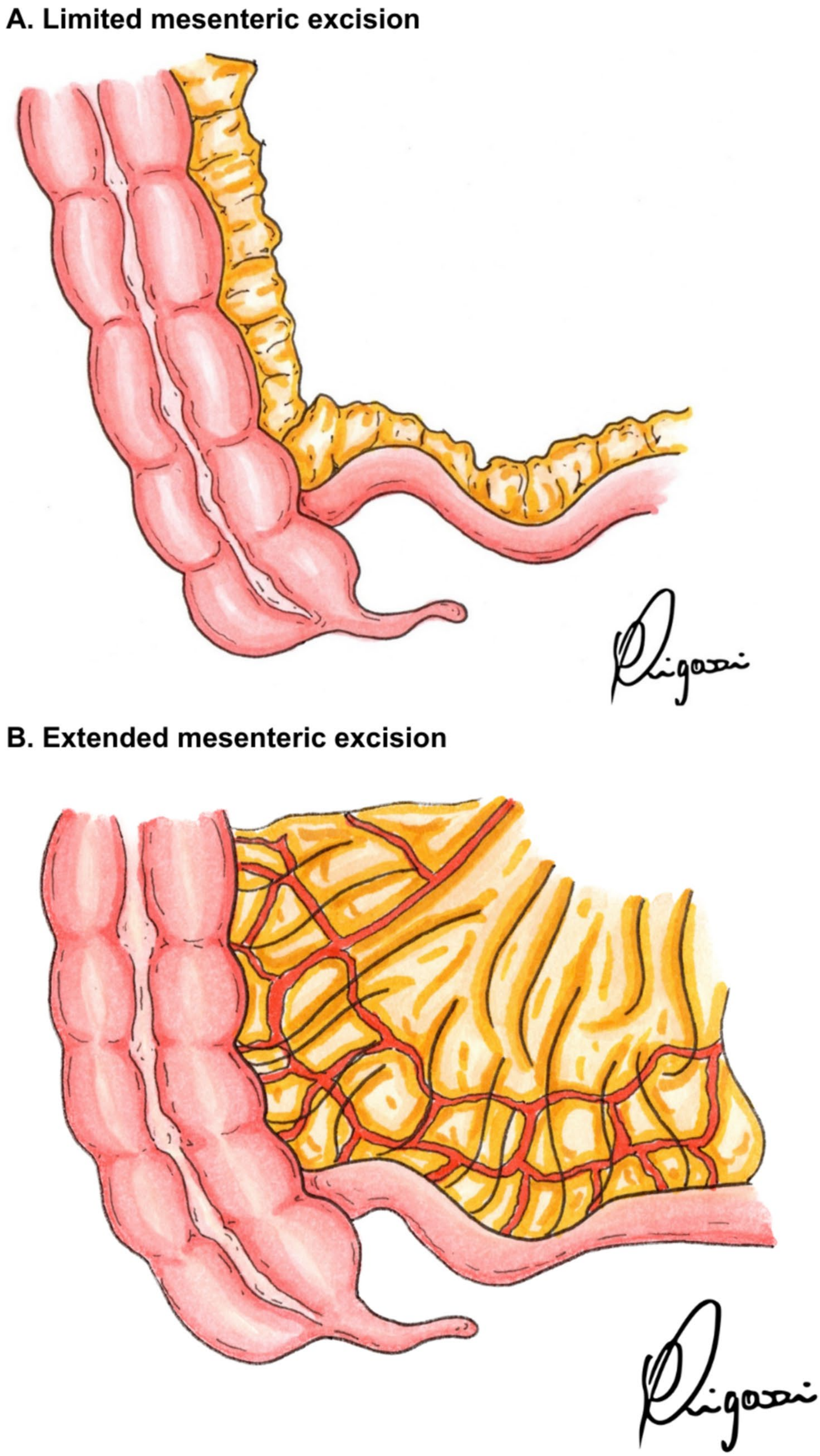

Fig. 2 Surgical technique. **A** Limited mesenteric excision. **B** Extended mesenteric excision

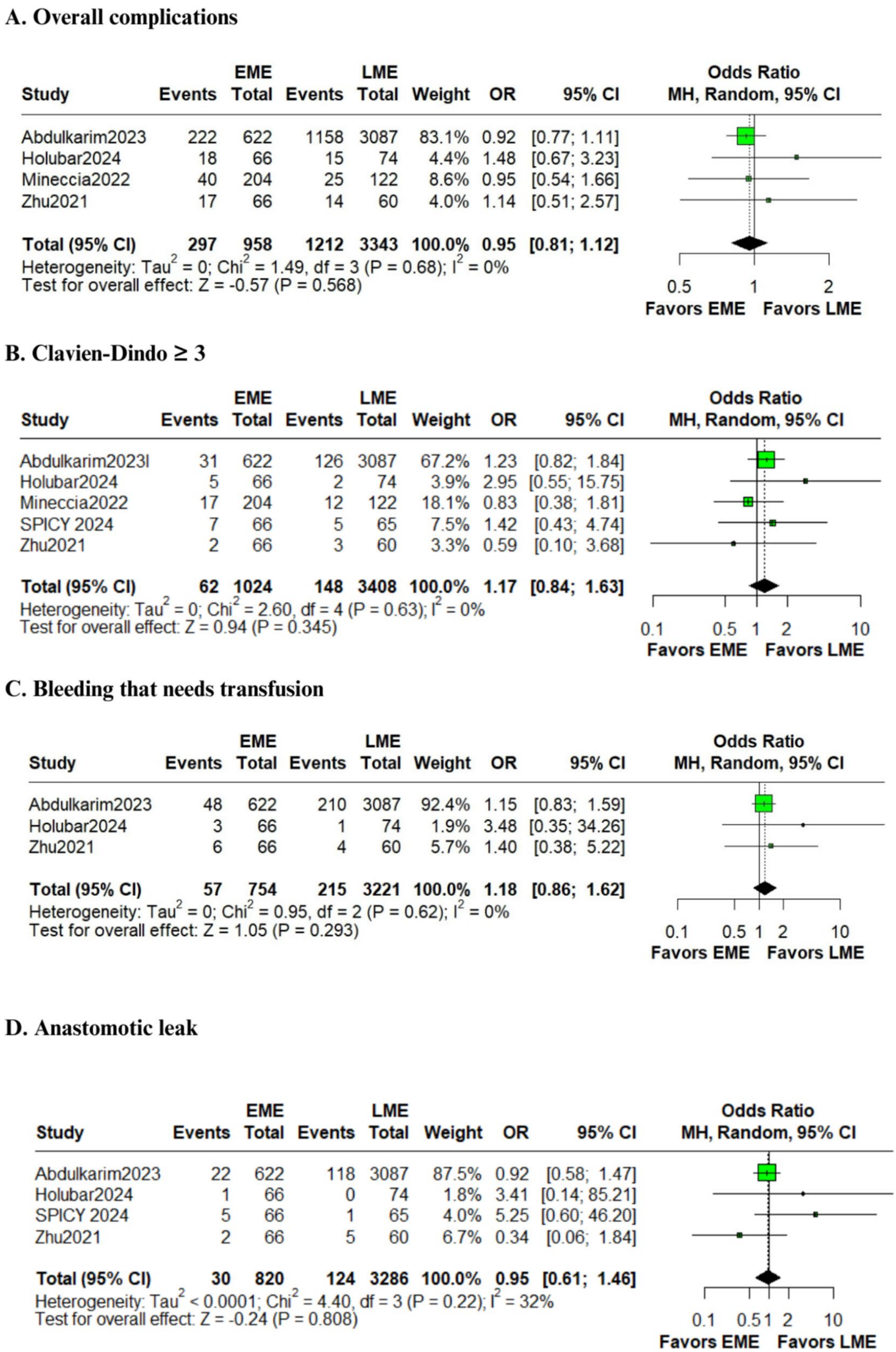

Fig. 3 Forest plots of comparisons between EME and LME for CD. **A** Overall survival. **B** Clavien–Dindo ≥ 3. **C** Bleeding that needed transfusion. **D** Anastomotic leak

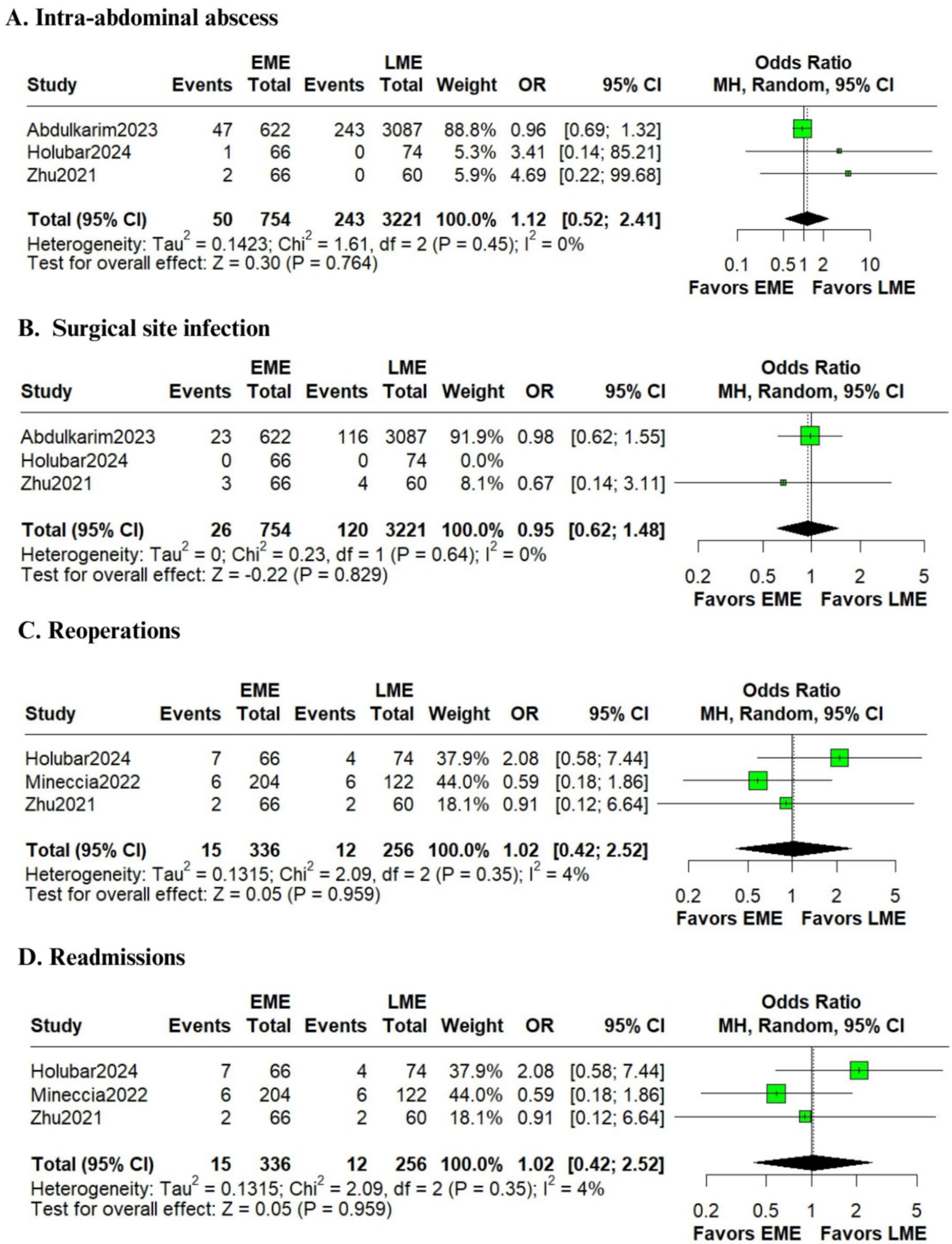

Fig. 4 Forest plots of comparisons between EME and LME for CD. **A** Intraabdominal abscesses. **B** Surgical site infections. **C** Reparations. **D** Readmissions

Operative time, hospital stay, surgical and endoscopic recurrence

In our pooled analysis, among the subset of 425 patients with available data on recurrence, EME was associated with a decrease in surgical recurrence compared with LME, with a recurrence rate of 5% for EME versus 15% for LME (OR 0.31; 95% CI 0.12–0.84; $p = 0.021$; $I^2 = 47\%$;

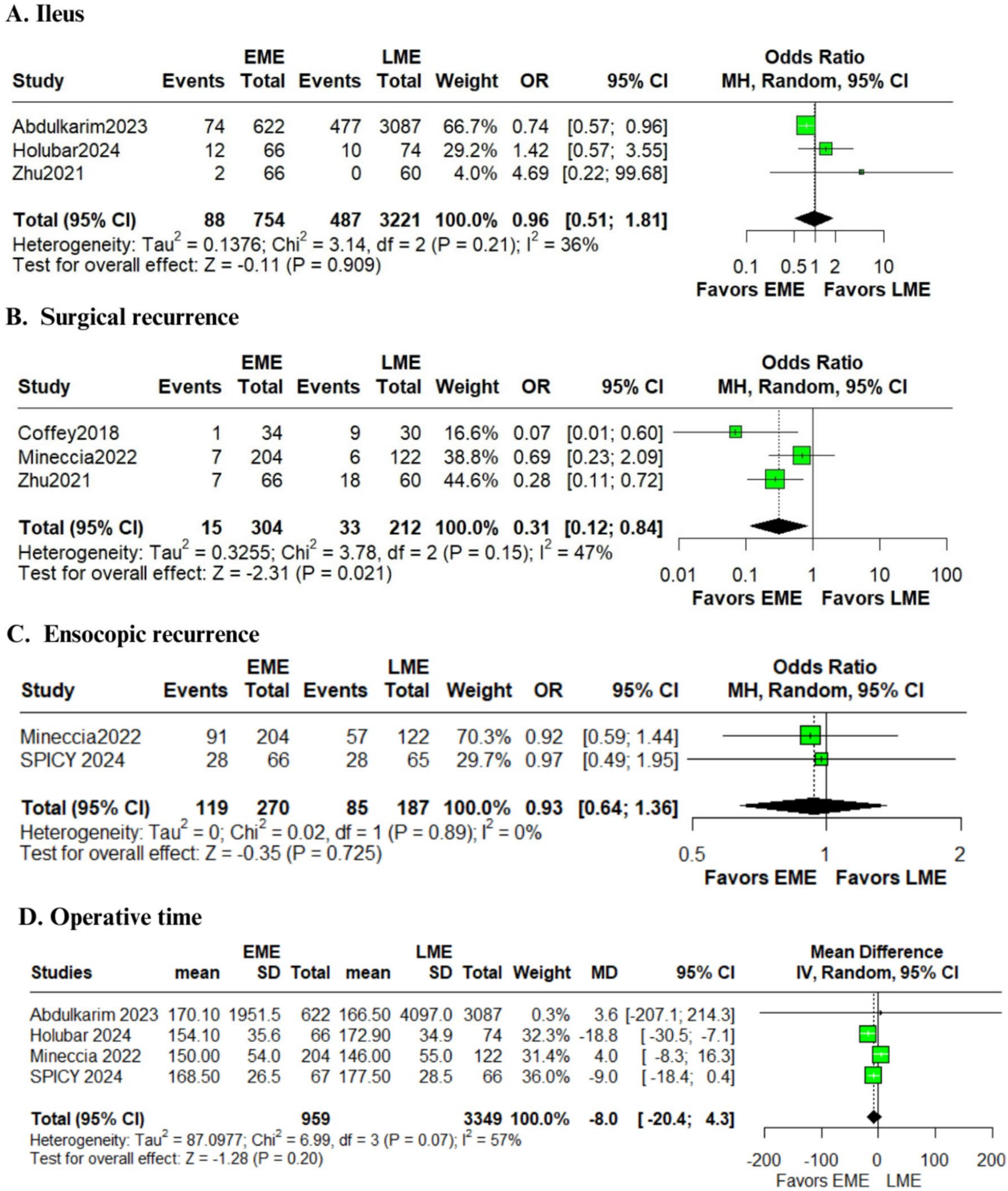

Fig. 5 Forest plots of comparisons between EME and LME for CD. **A** Ileus. **B** Surgical recurrence. **C** Endoscopic recurrence. **D** Operative time

Fig. 5B) [3, 11, 12]. There were no statistically significant differences in endoscopic recurrence (OR 0.93; 95% CI 0.64–1.36; $p = 0.725$; $I^2 = 0\%$; Fig. 5C) [12, 14] or operative time (MD −8.0; 95% CI −20.4 to 4.3; $p = 0.20$; $I^2 = 57\%$; Fig. 5D) [12, 15, 20]. Similarly, no statistically significant difference was observed for hospital stay (MD −0.1; 95% CI −1.1 to 0.9; $p = 0.85$; $I^2 = 44\%$; Fig. 6A) [3, 12, 14, 15, 20].

Sensitivity analyses

In the Baujat plot analysis, it was noted that certain studies contributed substantially to the heterogeneity in various outcomes. For anastomotic leak, the Baujat plot indicated that SPICY 2024 was the key contributor to the observed heterogeneity (Fig. S1) [14]. However, when this study was excluded from the leave-one-out sensitivity analysis,

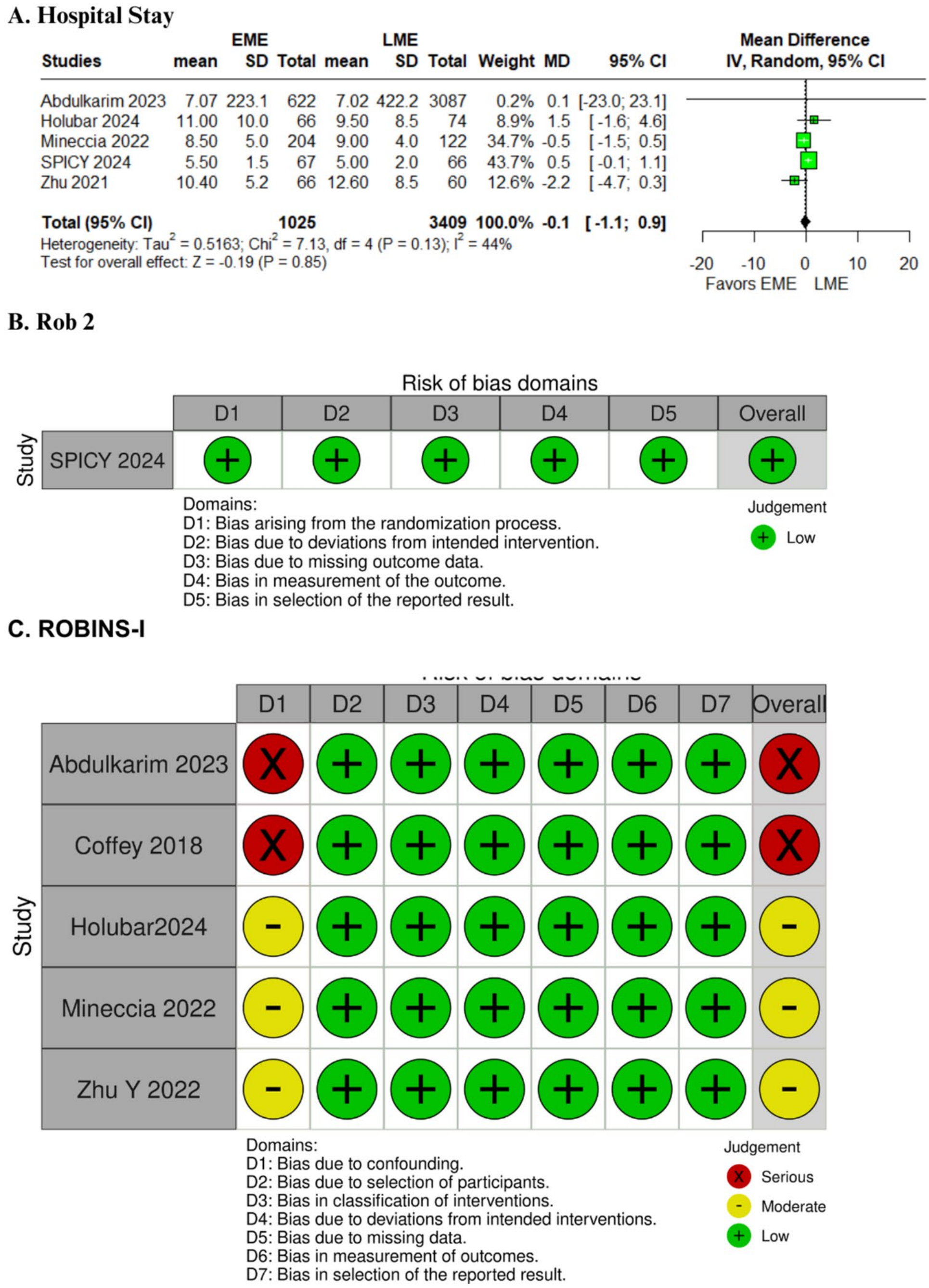

Fig. 6 Forest plots of comparisons between EME and LME for CD. **A** Hospital stay. **B** Rob2. **C** RIBINS-I

the results remained consistent, with reduced heterogeneity (Fig. S2). For postoperative ileus, Abdulkarim 2023 contributed most to the heterogeneity (Fig. S3) [15]. Still, its exclusion did not change the overall significance (Fig. S4). For surgical recurrence, the Baujat plot highlighted Mineccia 2022 as the main contributor (Fig. S5) [12], and after its removal in the sensitivity analysis, the results remained consistent (Fig. S6). In the case of operative time, Mineccia 2022 contributed significantly to heterogeneity (Fig. S7) [12], and its removal resulted in consistent findings with no change in the overall significance (Fig. S8). For hospital stay, SPICY 2024 was pinpointed as the primary source of heterogeneity (Fig. S9) [14], and after its exclusion, the results remained consistent (Fig. S10). The sensitivity analysis of the included studies is presented in the supplementary appendix.

Quality assessment

The individual assessment of each study included in the meta-analysis is presented in Fig. 6. The RCT was classified as having a low risk of bias [14]. Two observational studies showed a serious risk of bias [11, 15], while three studies were classified as having a moderate risk of bias [3, 12, 20]. The primary factor contributing to the risk of bias in the included studies was the domain of bias due to confounding. Funnel plot analysis and Egger's test for assessment of publication bias were not performed due to the number of included studies. As per recommendations from the Cochrane Collaboration, these tests are only indicated with a minimum of ten studies [23].

Discussion

In this systematic review and meta-analysis of 1 RCT and 5 observational studies [3, 8, 13–15], totaling 4498 patients who underwent surgical treatment for CD, EME was associated with a lower rate of surgical recurrence among the 425 patients with recurrence data available, showing rates of 5% for EME and 15% for LME (OR 0.31; 95% CI 0.12–0.84; $p=0.021$; $I^2=47\%$; Fig. 5B). There were no significant differences between EME and LME in overall complications, Clavien–Dindo ≥ 3, transfusion-requiring bleeding, anastomotic leak, intraabdominal abscesses, ileus, reoperations, SSIs, hospital readmissions, endoscopic recurrence, operative time, or hospital stay.

It is known that CD recurrence initially occurs in the mesenteric border [24]. However, the precise significance of the mesentery in CD recurrence is not yet fully elucidated. A prior meta-analysis, which primarily drew from retrospective cohorts, showed that the Kono-S anastomosis diminished both endoscopic and surgical recurrence [24, 25]. The Kono-S technique, although a mesenteric-sparing procedure, performs an anastomosis in the anti-mesenteric border. Similar to an EME, Kono-S aims to isolate the anastomosis from the inflamed mesentery [24]. Holubar et al. recently performed the first study that compared the short-term results of Kono-S anastomosis with EME and Kono-S plus EME. It was a retrospective, single arm of consecutive patients with CD undergoing primary or redo surgery. No significant difference was observed in lengths of stay, readmissions, major postoperative complications, or anastomotic leak. They concluded that the mesenteric surgical approach as a treatment for the ileocolic CD was feasible for short-term follow-up [20]. For now, we have to wait for the publication of long-term results.

A retrospective study of patients with CD who underwent EME and LME, with a follow-up of 70 months, found that the cumulative surgical recurrence rate at 5 years was 2.9% and 40%, respectively [11]. This result was also replicated in another study with a follow-up of 48 months, which found that LME was an independent predictor of postoperative surgical recurrence (HR 2.67; 95% CI 1.04–6.85; $p=0.04$) [3]. Overall, these findings are consistent with our meta-analysis results.

Beyond surgical recurrence, some studies employed additional methods to assess disease recurrence, such as endoscopic and ultrasonographic evaluations [12, 14, 26]. These measures can indicate early disease activity, potentially capturing subclinical recurrence that might not require surgical intervention [12, 14, 27]. Mineccia et al. reported similar endoscopic and ultrasonographic recurrence rates between groups with different mesenteric approaches, suggesting that the choice of mesenteric treatment may not significantly impact subclinical disease activity as detected by nonsurgical methods [12]. Similarly, the first RCT by the SPICY collaborator group supported these findings, showing no significant difference in endoscopic recurrence between EME and LME (42% versus 42% after 6 months of follow-up; RR 0.985; 95% CI 0.663–1.464; $p=1.0$) [14]. This study underscores that endoscopic recurrence rates are generally much higher than surgical recurrence rates, as they capture early inflammatory changes that may not yet present clinical symptoms [14, 26, 27]. Together, these findings highlight the value of endoscopic monitoring in detecting disease recurrence at an earlier subclinical stage, offering a broader perspective on recurrence that goes beyond the need for additional surgical intervention [12, 14, 27]. Our meta-analysis results corroborate these findings, demonstrating no statistically significant difference in recurrence rates across our pooled analyses.

Although EME could reduce recurrence, there has been clinical concern regarding the potential for increased perioperative complications [13–15]. Since the bowel in CD can be inflamed and friable, it may be more prone to bleeding and anastomotic leak. Our meta-analysis, however, showed no difference in overall complications when comparing EME with LME. A recent study evaluated the ACS-NSQIP colectomy-specific database, including 3709 patients surgically treated for CD, of whom 83.2% underwent LME and 16.7% underwent EME, using a cutoff of 12 or more lymph nodes to define EME [15]. On multivariate logistic regression, EME was not associated with increased major morbidity (OR 1.1; 95% CI 0.84–1.43), major abdominal complications (OR 0.95; 95% CI 0.76–1.19), or bleeding complications (OR 1.08; 95% CI 0.75–1.53), similar to our findings. It is important to note the potential risk of overlapping complications owing to the lack of standardized nomenclature across the included studies. We tried to achieve homogeneity by applying classifications, such as the Clavien–Dindo system, to mitigate interpretation risks.

Our study has limitations. First, as a meta-analysis of one RCT and five observational studies, our findings may be subject to confounding, and causality cannot be inferred. More RCTs are necessary for definitive conclusions, and several are currently ongoing to evaluate the role of EME in the surgical management of CD (NCT06324838 and NCT04266600). Additionally, definitions of complications may vary across studies, which could introduce overlap in categorizing events such as intraabdominal abscesses, anastomotic leaks, and SSIs, despite our efforts to apply consistent classifications (e.g., Clavien–Dindo grading). Finally, our evaluation of ultrasonographic and endoscopic recurrence was limited, as only two studies assessed these outcomes and found no significant difference between EME and LME [12].

Conclusions

Our meta-analysis, which included one RCT and five observational studies, found that EME was associated with a significant reduction in surgical recurrence compared with LME, with moderate certainty. Additionally, EME did not result in increased overall complications, Clavien–Dindo grade ≥ 3, bleeding requiring transfusion, anastomotic leaks, intraabdominal abscesses, ileus, reoperations, SSIs, hospital readmissions, operative time, hospital stay, or endoscopic recurrence. These findings suggest that EME may offer benefits in the surgical management of CD without elevating the risk of postoperative complications. However, more RCTs are warranted to draw definitive conclusions about the potential advantages of EME in this context.

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Declarations

Conflict of interest The authors declare no competing interests.

Ethical approval As this study is based on a systematic review and meta-analysis of previously published data, it is exempt from ethical clearance.

Informed Consent This study is a systematic review and meta-analysis based on previously published data. No new human participants were directly involved, and no additional informed consent was required.

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