

Review

A systematic review and meta-analysis of mesh vs suture cruroplasty in laparoscopic large hiatal hernia repair



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Fundoplication;
Recurrence;
Symptom assessment

Abstract

BACKGROUND: Equipoise exists regarding whether mesh cruroplasty during laparoscopic large hiatal hernia repair improves symptomatic outcomes compared with suture repair.

DATA SOURCE: Systematic literature review (MEDLINE and EMBASE) identified 13 studies (1,194 patients; 521 suture and 673 mesh) comparing mesh versus suture cruroplasty during laparoscopic repair of large hiatal hernia. We abstracted data regarding symptom assessment, objective recurrence, and reoperation and performed meta-analysis.

CONCLUSIONS: The majority of studies reported significant symptom improvement. Data were insufficient to evaluate symptomatic versus asymptomatic recurrence. Time to evaluation was skewed toward longer follow-up after suture cruroplasty. Odds of recurrence (odds ratio .51, 95% confidence interval .30 to .87; overall $P = .014$) but not need for reoperation (odds ratio .42, 95% confidence interval .13 to 1.37; overall $P = .149$) were less after mesh cruroplasty. Quality of evidence supporting routine use of mesh cruroplasty is low. Mesh should be used at surgeon discretion until additional studies evaluating symptomatic outcomes, quality of life, and long-term recurrence are available.

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Laparoscopic repair of large hiatal hernia is a technically demanding procedure requiring significant experience in advanced foregut surgery. The tenets of repair shared by most high-volume surgeons include complete mediastinal sac reduction, mobilization of at least 2 to 3 cm of tension-free intra-abdominal esophagus, and tension-free hiatal

closure.¹ Difficulty achieving tension-free closure and unacceptably high recurrence rates with a laparoscopic approach prompted exploration of mesh reinforcement to improve hiatal closure durability. Several early studies, including 3 randomized controlled trials, reported reduced objective recurrence rates with mesh cruroplasty.²⁻⁴ More recent reports, however, suggest that long-term durability comparing mesh with suture cruroplasty does not differ significantly.⁵ In addition, though rare, major complications and deaths from mesh cruroplasty have been reported.^{6,7}

Thus, equipoise exists regarding routine use of mesh for crural reinforcement during laparoscopic repair of large hiatal hernia. Additionally, a critical and unanswered

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question is whether objective recurrences (ie, identified on routine barium esophagram) influence symptomatic relief and need for reintervention, which are the outcomes of interest when examined from the patient perspective. Therefore, the aim of our study was to determine whether mesh cruroplasty was associated with differential outcome compared with suture cruroplasty in the operative management of large hiatal hernia using systematic literature review and meta-analysis. The study population consisted of patients with large hiatal hernia who underwent laparoscopic repair. Outcomes included symptoms, rates of recurrence and reoperation, and symptoms associated with objective recurrence.

Methods

Systematic literature review was performed using MEDLINE and EMBASE to identify studies addressing the repair of large hiatal hernias with synthetic reinforcement. Reference lists of eligible studies were reviewed for additional studies meeting inclusion criteria. The final query date was October 12, 2013. Data were independently abstracted by 2 reviewers. Operative details, including the number and location of sutures for suture cruroplasty, and the type and shape of mesh used for reinforcement were extracted. Surgical quality metrics were assessed, including documentation of sac reduction, esophageal mobilization, and tension-free crural closure. Symptom assessment methods, such as scheduled time to evaluation, use of standardized scales, symptom outcomes, and reporting of long-term adverse outcomes, were recorded. Primary outcomes for meta-analysis were rates of objective recurrence and need for reoperation for recurrent hernia or symptoms. The Grading of Recommendations Assessment, Development and Evaluation system was used to assess study quality^{8–10}; systematic review and meta-analysis was performed according to PRISMA statement guidelines.¹¹

Statistical analysis

Statistical analysis consisted of meta-analysis applied to rates of hiatal hernia recurrence and rates of reoperation from all included studies. These rates were calculated by technique (mesh vs suture cruroplasty) and summarized as an odds ratio. Because of concerns about variations between study characteristics such as hernia definition and approach to repair, a random effects meta-analysis model was selected to adjust the meta-analytic weights for possible effect size heterogeneity. I^2 heterogeneity statistic was computed for each meta-analysis, with predefined determinations of low, moderate, and high heterogeneity at $I^2 = 25\%$, 50% , and 75% , respectively.¹² P value less than .05 was set for statistical significance, corresponding to 95% confidence intervals (CIs) for the summarized meta-analysis odds ratio (OD) estimate. All analysis was

performed in Stata 13.1, with the assistance of the user-written “metan” command for meta-analysis.^{13,14}

Results

Identification, screening, eligibility, and inclusion details are shown in Fig. 1. Articles were included if (1) they focused on large hiatal hernia repair in adults and/or provided data for the subsets of adult patients with large hiatal hernia; (2) they compared mesh with nonmesh repair; and (3) they examined differences in hernia recurrence. If 2 manuscripts reported on the same cohort of patients, the manuscript with the longest clinical follow-up time was included. Review of references for additional manuscripts was performed. Thirteen publications meeting inclusion criteria were identified: 3 randomized controlled trials^{2,3,5} and 10 observational studies (4 prospective,^{15–18} 4 retrospective,^{19–22} and 2 with design not specified^{23,24}). Study quality using the Grading of Recommendations Assessment, Development and Evaluation Working Group approach was performed (Table 1). Objective definition of large hiatal hernia varied between studies and was not specified in 3; 6 studies defined a minimum defect size ranging from 5 to 8 cm or greater. Three studies used percent of gastric herniation (range 30% to 50% or greater). One study used a hiatal surface area of greater than 10 cm² (Table 2).

Approach to laparoscopic large hiatal hernia repair

Twelve of the 13 studies specifically described hernia sac reduction and 9 studies described extensive esophageal mobilization. The described length of necessary intra-abdominal esophagus ranged from 2.5 to 5 cm. Gouvas et al²³ described esophageal mobilization carried to the inferior pulmonary veins without a specified length of intra-abdominal esophagus. Oelschlager et al⁵ reported the use of Collis gastroplasty at the discretion of the surgeon, while Goers et al¹⁶ elected to exclude these patients. Nine studies reported posterior placement of cruroplasty sutures, and 63% (5 of 8) reported the use of 2 to 3 sutures (range 2 to 8) (Table 2). Three studies placed an additional anterior suture if the crura remained splayed after posterior cruroplasty.^{5,18,23} The types of mesh and mesh shape varied widely within and across studies (Table 2).

Symptom assessment after laparoscopic repair of large hiatal hernia

Symptom assessment, outcomes, and assessment metrics from individual studies were reviewed (Table 3). Symptom assessment before and following laparoscopic repair was reported in only 1 of the 3 randomized controlled trials. Among the observational studies, only 5 (50%) reported pre- and postoperative symptoms stratified by repair type. In the Oelschlager et al⁵ randomized trial, a standardized

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