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Review

Is hand-sewn anastomosis superior to stapled anastomosis following oesophagectomy?



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ABSTRACT

A best evidence topic was written according to a structured protocol. The question addressed was: In patients undergoing oesophagectomy is stapled anastomosis (STA) superior to hand-sewn anastomosis (HSA) with respect to post-operative outcomes. In total, 82 papers were found suitable using the reported search and 14 of these represented the best evidence to answer the clinical question. The authors, date, journal, study type, population, main outcome measures and results are tabulated. Existing evidence shows that STA is associated with reduced time to anastomotic construction and decreased intra-operative blood loss but increased risk of benign stricture formation compared to HSA. There is no difference between HSA and STA with respect to cardiac or respiratory complications, anastomotic leakage, duration of hospital admission or 30-day mortality. In HSA, increasing surgical experience and intra-operative air leakage testing after anastomotic creation are associated with reduced risk of anastomotic leakage. Further adequately powered studies will enable identification of other local and systemic factors influencing anastomotic healing, which will lead to improved patient and anastomotic technique selection for optimal surgical outcomes.

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1. Introduction

A best evidence topic was constructed according to a structured protocol. The protocol is fully described in the International Journal of Surgery.¹

2. Three-part question

In [patients undergoing oesophagectomy] is [stapled anastomosis] superior to [hand-sewn anastomosis] with respect to [post-operative outcomes].

3. Clinical scenario

A patient is referred to your clinic with a T2N0M0 tumour of the distal oesophagus, which requires you to perform an open oesophagectomy. During the multi-disciplinary planning meeting, a visiting Japanese professor cites the propensity of hand-sewn

anastomosis to leak and asks whether or not you would consider performing a stapled anastomosis to reduce post-operative complications. You decide to search the literature to determine if there are any significant differences in post-operative outcomes between hand-sewn (HSA) and stapled anastomosis (STA).

4. Search strategy

A Medline search from January 1950 to September 2013 was performed using the OVIDSP interface (exp stapledOR mechanical.mp OR exp hand – sewn/OR manual.mp) AND (exp oesophageal anastomosisOR oesophagus.mp). References were also retrieved from key articles and reviewed.

5. Search outcome

The described literature search identified 82 articles. Of these, 26 articles were excluded after review of the title and abstract and 16 new articles were selected from the “related search” option and references. The remaining 72 articles were reviewed in full and a further 47 articles were excluded as they did not directly compare outcomes between HSA and STA. Six studies were excluded as they pooled results for gastrectomy and oesophagectomy, and a further four studies were excluded as resections were performed

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laparoscopically or clinical outcomes were not presented in full. A total of 14 studies were identified that provided the best answer to the clinical question (Table 1).

Marker et al.² conducted a meta-analysis using nine randomized trials^{3–11} published between 1974 and September 2010 comparing outcomes between HSA ($n = 381$) and STA ($n = 381$) following oesophagectomy. Primary outcome measures were 30-day mortality, anastomotic leakage, and stricture formation within six months of surgery. Secondary outcome measures were operating time, cardiac and respiratory complications. This study showed increased risk of stricture formation in STA compared to HSA (pooled odds ratio = 1.76; 95% CI = 1.09 to 2.86; $P = 0.02$) but no difference relating to anastomotic stricture formation or 30-day mortality between the two groups. Analysis of secondary outcome measures showed increased operating time in HSA (weighted mean difference = -1.56 ; 95% CI = -3.14 to 0.05 ; $P = 0.04$) but no difference with respect to cardiac or respiratory complications. In this study, limited results on other post-operative complications were displayed, follow-up time for strictures was limited to six months, surgical approach was not specified and no long-term outcomes were presented.

Luechakietisak et al.³ conducted a prospective, randomized study on 117 patients with oesophageal squamous cell carcinoma undergoing transthoracic oesophagectomy. Patients were stratified according to tumour size based on oesophageal diameter (<30 mm or ≥ 30 mm) following oesophageal resection and then randomized to undergo HSA ($n = 59$) or STA ($n = 58$). All HSA were fashioned using a single-layer of continuous absorbable suture whilst the STA were created with the intraluminal circular stapling (ILS) device. Patients were assessed for anastomotic leakage with gastrografin contrast study performed on day seven after surgery. HSA was associated with increased operating time ($218.1 + 47.8$ min vs $203.7 + 23.4$ min, respectively, $p = <0.001$) and greater intra-operative blood loss ($864 + 346.6$ mls vs $803 + 301.2$ mls, respectively, $p = 0.02$) compared to STA. Overall there was no difference between the two groups relating to stricture formation but in patients with small oesophageal tumour size (<30 mm), oesophageal stricture formation was significantly greater in the STA group compared to the HSA group (38.8% vs 15.2% respectively, $p = 0.03$). There was no significant difference between the groups relating to anastomotic leakage, cardiorespiratory complications or 30-day mortality. In this study, limited data was presented on comorbidities, adequacy of resection margins and use of neoadjuvant therapy.

Okuyama et al.⁴ conducted a prospective randomized study comparing outcomes between cervical HSA ($n = 18$) and thoracic STA ($n = 14$). HSA were formed via the three-stage approach and the anastomoses fashioned using two-layers of interrupted absorbable sutures. STA were formed using the transthoracic approach with a standardized end-to-end (EEA) circular stapling device. All patients were followed up with routine bronchoscopy for detection of recurrent laryngeal nerve palsy and water-soluble contrast at day nine or ten for anastomotic leakage. Assessment of quality of life at six months included a series of questions based on upper gastrointestinal symptoms. This study showed the incidence of recurrent laryngeal nerve palsy was significantly increased in cervical HSA compared to thoracic STA (38.8% versus 7.1%, respectively, $P < 0.05$) but there was no difference with respect to anastomotic leak, stricture formation, respiratory complications or hospital mortality. There was also no significant difference between the groups relating to symptoms at six months or overall 5-year survival rates. In this study, there was a small study population and anastomoses were created at different sites using different surgical approaches.

Walther et al.⁵ conducted a prospective randomized study comparing outcomes between cervical HSA ($n = 41$) and thoracic

STA ($n = 42$) following oesophagectomy and gastric tube construction. All HSA were created through the three-stage approach using single-layer continuous absorbable sutures whilst all thoracic anastomoses were formed via the transthoracic approach using EEA circular stapling devices. To evaluate selection bias, a further 29 patients undergoing oesophagectomy without randomization were followed up and compared to the randomized group. Objective measurements of anastomotic diameter and size were made at three, six and 12 months using endoscopy. In this study, there was no significant difference between the two groups relating to stricture formation, anastomotic leakage, cardiorespiratory complications, hospital mortality or post-operative weight gain. A major limitation of this study was variation in surgical approaches and sites of anastomotic construction between the two groups.

Law et al.⁶ conducted a prospective randomised trial comparing outcomes between HSA ($n = 61$) and STA ($n = 61$) following oesophagectomy for squamous cell carcinoma. All patients underwent a transthoracic approach with intra-thoracic anastomosis. Patients with positive proximal resection margins underwent adjuvant radiotherapy treatment. HSA were created using a single-layer of continuous absorbable sutures whilst the STA were constructed with EEA or ILS stapling devices. All patients underwent gastrografin contrast swallow at day seven to exclude anastomotic leakage. There was no significant difference between the groups relating to operating time, anastomotic leakage, cardiac or respiratory complications, and 30-day mortality. After exclusion of hospital deaths, patients receiving adjuvant therapy or having anastomotic leakage, the risk of anastomotic stricture formation was significantly greater in STA than HSA (40% vs 9.1%, $p = 0.0003$). In this study, the size and type of staplers employed varied considerably, some patients received adjuvant therapy and limited data is presented on comorbidities that may have impacted anastomotic healing.

George et al.⁷ conducted a prospective randomized study on 1004 patients from three different hospitals comparing HSA and STA following various types of gastrointestinal surgery. Of these patients, 52 patients underwent oesophageal resection with HSA ($n = 25$) or STA ($n = 27$). A further 20 patients underwent oesophagectomy without randomization and were compared to the randomized group. HSA were fashioned using both one and two-layered techniques with continuous absorbable sutures depending on the surgeons preference. STA were constructed using double-layered staples using the circular stapling devices. Oesophageal anastomotic integrity was assessed using contrast radiography in patients between four and 14 days following surgery. This study showed STA following oesophagectomy were associated with reduced mean anastomosis time compared to HSA (32.1 vs 56.2 respectively, $p < 0.001$) but there was no difference between the two groups relating to anastomotic leakage, infective complications, recovery of gastrointestinal function and hospital stay. Limited data was presented on other complications, surgical approach and site of anastomosis for each group.

Saluja et al.⁸ conducted a prospective randomized trial comparing outcomes between HSA ($n = 87$) and side-to-side STA ($n = 87$) in the neck following oesophagectomy. Oesophagectomy was performed via transhiatal ($n = 145$) and transthoracic ($n = 29$) approaches. HSA were constructed using a double-layer interrupted absorbable suture and the STA formed using a side-to-side stapling device. A gastrografin swallow was performed on post-operative day seven unless there was clinical evidence of anastomotic leak. The overall anastomotic leakage rate was 17.2% and there was no difference between the two groups with respect to incidence of anastomotic leakage. Anastomotic construction was significantly quicker in the STA group (25 ± 6.5 min vs. 27 ± 5.5 min; $p = 0.02$) but associated with increased risk of

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