

# Novel double-stapling technique for distal oesophageal resection and oesophago-jejunal anastomosis



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## Novel double-stapling technique for distal oesophageal resection and oesophago-jejunal anastomosis

**AIM:** The restoration of the digestive tract by performing an esophago-jejunal anastomosis (EJA) is a crucial step of the total gastric and distal esophagus surgical resection for esophago-gastric junction (EGJ) cancer. We have already ideated and tested on a cadaver model an innovative technique which could be useful to minimize the risk of complications related to the phase of securing the anvil of the circular stapler prior to perform the EJA. This surgical technique was derived from the well-known "double-stapling Knight and Griffen" one that was described for the rectal resection. We used the following described technique in 20 patients with EGJ cancer and it is efficient, reliable, safe, easy to learn and easy to perform.

**MATERIALS AND METHODS:** From August 2014 to May 2015, 20 patients (14 male and 6 female) underwent surgery for esophagogastric junction cancer: In all patients a distal esophageal resection and total gastrectomy was performed. Through the trans-hiatal access, the free margins of the esophageal stump were suspended and the anvil of a circular stapler on a new dedicated and registered support bar was inserted into the lumen. Subsequently, the linear suturing stapler is closed over the bar and then fired to suture the distal stump of the esophagus; after the confirmation of a negative margin, the bar is retracted and the push-rod of the anvil is pulled out through the linear suture. Finally, the anastomosis is performed with the classic technique by using a circular stapler.

**RESULTS:** No postoperative mortality occurred; postoperative course has been uneventful for 18 patients. One patient developed anastomotic fistula that has been treated conservatively with endoscopic prosthesis, removed after 20 days. One patient developed in 3 POD myocardial infarction Mean Hospital stay has been 14 days (range 7-20 days).

**CONCLUSIONS:** The aim of our new procedure is the insertion the anvil of a common circular stapler without hand-sewn securing; this is to reduce the technical difficulties related to the hand-sewn securing into a deep and narrow anatomic location, typical of the trans-hiatal approach.

**KEY WORDS:** Anastomosis, Oesophago-gastric junction cancer, Stapler, Trans-hiatal

## Introduction

The restoration of the digestive tract by performing an oesophago-jejunal anastomosis (EJA) is a crucial step of

the total gastric and distal esophagus surgical resection for oesophago-gastric junction (EGJ) cancer.

Stapled EJA is a well-known and standardized technique: the anvil of the stapler is placed into the esophageal stump and secured; the body of the stapler is inserted into the lumen of the viscera selected for the canalization recovery and then the anastomosis is performed by firing the stapler. The step of securing the anvil of the stapler has been historically made by various techniques: hand-sewn pouch, purse string, rake; all the reported ones require to be performed before the insertion of the anvil into the esophageal lumen. Anyway, the previous

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cited procedures of anvil securing sometimes are not easy to be carried out; complications occurring at this step may influence subsequent dehiscence or stricture of the anastomosis with significant post-operative morbidity and mortality <sup>1</sup>.

We have already ideated and tested on a cadaver model an innovative technique which could be useful to minimize the risk of complications related to the phase of securing the anvil of the circular stapler prior to perform the EJA <sup>2</sup>. This surgical technique was derived from the well-known “double-stapling Knight and Griffen” one that was described for the rectal resection <sup>3</sup>.

We used the following described technique in 20 patients with oesophagogastric junction cancer in order to verify if it would be efficient, reliable, safe, easy to learn and to perform.

## Material and methods

From August 2014 to May 2015, 20 patients (14 male and 6 female) with biopsy-proven diagnosis of adenocarcinoma of oesophagogastric junction (EGJ) underwent

surgery: In all patients a distal esophageal resection and total gastrectomy was performed.

Tumor staging has been accomplished with standard protocol (CT neck, thorax, abdomen, EUS and positron emission tomography PET).

Total gastric resection enlarged to the distal esophagus and D2 extended lymphadenectomy was accomplished for EGJ cancer. The distal esophagus was mobilized and sectioned through a trans-hiatal approach at least 5 centimeters cranially to the macroscopic limit of the cancer.

Through the trans-hiatal access, the free margins of the esophageal stump were suspended and the anvil of a circular stapler (EEA<sup>TM</sup> Auto Suture<sup>TM</sup> 29 mm-4.8 mm – Covidien LLC – Mansfield, MA – USA) on a new dedicated and registered support bar (CEATEC Medizintechnik GmbH – Würlingen – Deutschland) was inserted into the lumen (Fig. 1). The support bar (Fig. 2) has two main features: 1) it is characterized by a push-rod that make possible to hook-unhook the anvil of the circular stapler; 2) it is stainless steel made in order to be not perforated or broken by the stitches of a standard linear suturing stapler (Proximate® THL60 – Ethicon endo-Surgery, LLC – Guayanabo, Puerto Rico – USA).

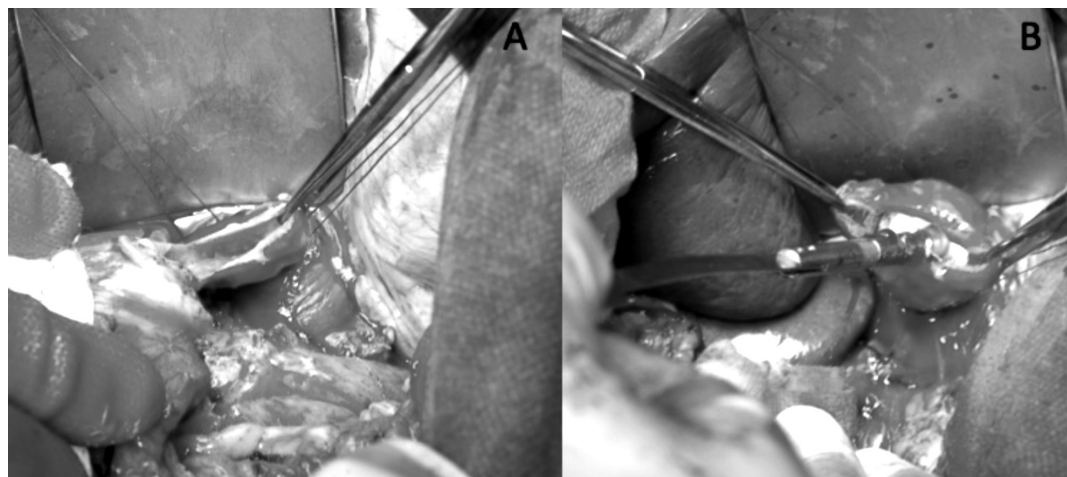


Fig. 1: A) the distal oesophagus is transected by a blade; B) the support bar anchored to the anvil of the EEA<sup>TM</sup> circular stapler is inserted into the esophageal stump.

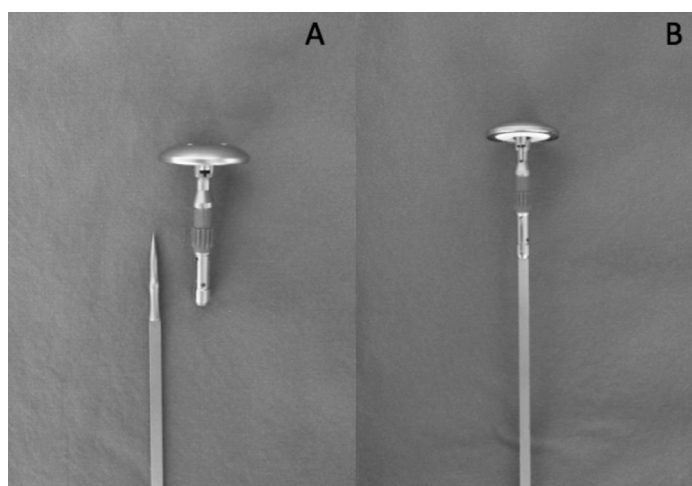


Fig. 2: A) the support bar for the anvil of the EEA<sup>TM</sup> stapler; B) the support bar anchored to the anvil.

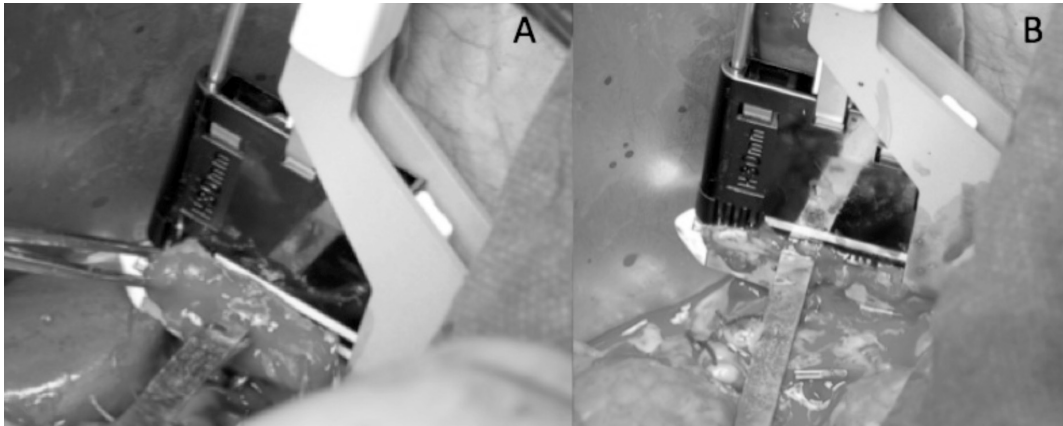


Fig. 3: A) the Proximate® linear stapler is fired over the support bar to symmetrically suture the oesophageal stump; B) the distal ring of the esophagus is sent for intraoperative histological examination.

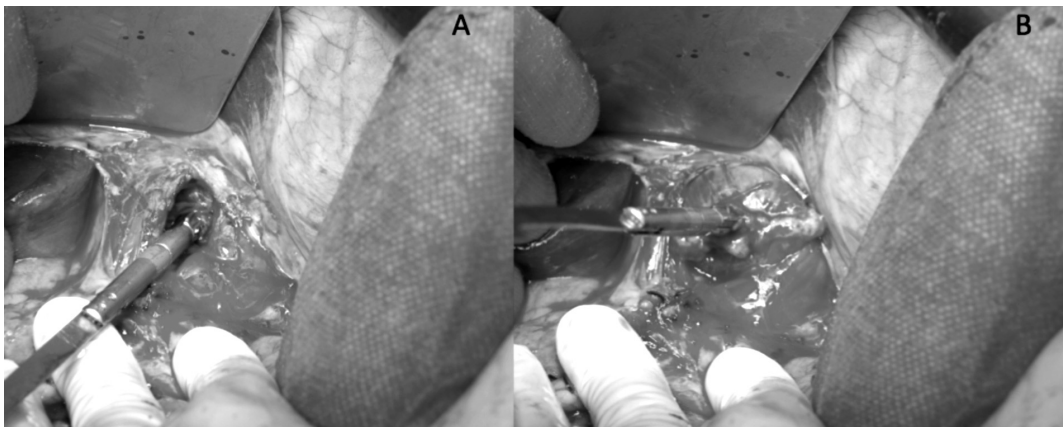


Fig. 4: A) the support bar locked to the anvil is retracted and; B) the push-rod of the anvil exits through the suture of the oesophageal stump just in the middle of it.

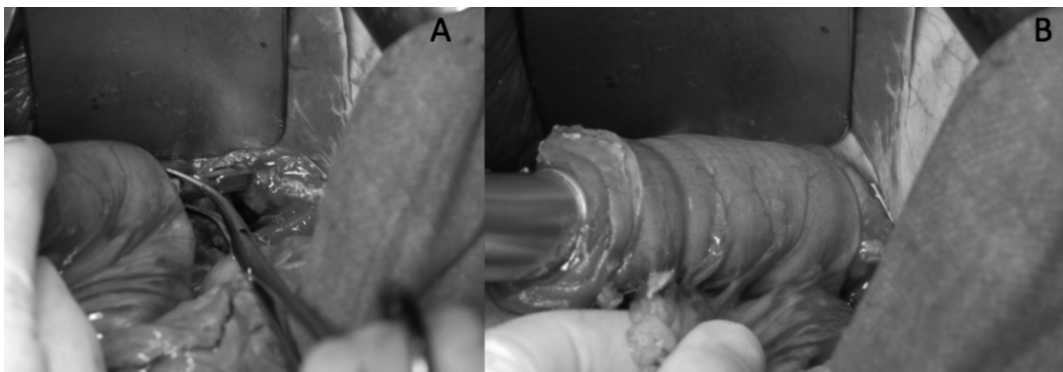


Fig. 5: A) the EEATM™ circular stapler is locked to the anvil; B) fired.

Subsequently, the linear suturing stapler is closed over the bar and then fired to suture the distal stump of the esophagus (Fig. 3); the distal ring of the esophagus is cut and sent for intraoperative frozen section histological confirmation. In the case of positive resection margin, the bar with the looked anvil are pushed more proximally into the esophagus and a new section is performed. After the confirmation of a negative margin, the bar is retracted and the push-rod of the anvil is pulled out through the linear suture (Fig. 4). Finally, the anastomosis is performed with the classic technique by using a circular stapler (Fig. 5).

The caudal reconstruction of the digestive tract has always been completed by performing an antecolic “Roux en Y”

jejunal anastomosis. A final oesophago-jejunal endoscopy was carried out to check the integrity of the EJA.

## Results

No perioperative mortality occurred; mean patient age and BMI (body mass index) were respectively 69,4 years and  $25.15 \pm 2.7 \text{ kg/m}^2$ .

Mean operating time was  $210 \pm 88$  minutes and, mean blood loss was  $190 \pm 50$  ml. there were no intraoperative complications and R0 resection has been achieved in all cases.

Postoperative course has been uneventful for 18 patients. One patient in 5 POD (postoperative day) developed anastomotic fistula that has been treated conservatively with endoscopic prosthesis, removed after 20 days. One patient developed in 3 POD myocardial infarction that required an admission in ICU (Intensive care unit). Mean Hospital stay has been 14 days (range 7-20 days). Pathological examination of the specimens confirmed the diagnosis of adenocarcinoma in all patients. All resection margins were negative. An upper-digestive tract X-ray with oral contrast medium and a digestive endoscopy were carried out 30 days after surgery and the anastomosis integrity and patency was confirmed in all cases.

## Discussion

Oesophagogastric junction carcinoma incidence is reported to be rapidly increasing in developed country during the last decades and according to the National Cancer Institute there have been approximately 17,990 new cases and 15,210 deaths in the United States in 2013; about 60% of these cases have been represented by EGJ cancer<sup>4</sup>. Long-term outcome regardless of disease stage of resected patients is reported to be about 30% at 5-years<sup>5</sup> and one of the primary end-points of the surgical treatment is to minimize the postoperative complications, in particular the anastomosis dehiscence or stricture that may have a fundamental impact in the quality of residual life of these patients<sup>6</sup>.

Risk of anastomotic failure may be related to many factors including the technical difficulty of making a safe hand-sewn pouch or a purse string round the anvil of the stapler.

The aim of our new procedure is the insertion the anvil of a common circular stapler without hand-sewn securing; this is to reduce the technical difficulties related to the hand-sewn securing into a deep and narrow anatomic location, typical of the trans-hiatal approach.

The use of the linear stapler to secure then anvil into the esophageal lumen could reduce, in our opinion, the operator dependent error with lower risks of stricture or dehiscence.

The only critical point seem to be represented by the careful placement of the anvil over the support bar in the middle of the oesophagel lumen just before the linear stapler closure. To reduce further the operator depending error, it would be possible the building of a dedicated linear stapler just thought for this surgical technique.

Our experience, even if conducted on 20 patients, demonstrates a 5% incidence of anastomotic leakage, slightly lower than what observed in Literature on the basis of very large series of patients undergoing total gastrectomy<sup>7</sup>.

## Conclusions

We have developed a novel double-stapling technique for EJA that could reduce the anastomotic complications in digestive surgery.

Our preliminary clinical experience suggests that this technique is efficient, reliable and easy to learn and to perform.

This procedure may serve as an alternative anastomotic option for trans-hiatal EJA. Nevertheless, large randomized controlled clinical trial are necessary to definitively demonstrate the safety and efficacy of this procedure.

## Riassunto

Nel presente studio è stata testata una tecnica innovativa per il confezionamento dell'anastomosi esofago-digiunale in 20 pazienti oncologici sottoposti a gastrectomia totale ed esofagectomia distale.

L'anastomosi è stata confezionata ancorando la testina di una suturatrice circolare fissata ad una barra di supporto inserita nel lume esofageo, chiudendo successivamente il margine distale con una stapler lineare ed impiegando quindi una suturatrice circolare.

È stato registrato un solo caso di fistola, trattata conservativamente.

La tecnica presentata potrebbe ridurre le difficoltà correlate al confezionamento della borsa di tabacco manuale in una sede anatomicamente complessa.

## References

1. Paul S, Bueno R: *Complications following esophagectomy: Early detection, treatment, and prevention*. Sem Thorac Cardiovasc Surg, 2003; 15:210-15.
2. Gentili S, Davoli F, Portigliotti L, Boldorini R, Casadio C, Garavoglia M: *Double-stapling technique for transhiatal distal esophageal resection: Feasibility test in a cadaver model*. Int J Surg, 2014; 12:353-56.
3. Griffen FD, Knight CD Sr, Knight CD Jr: *Results of the double stapling procedure in pelvic surgery*. World J Surg, 1992; 16:866-71.
4. Surveillance Epidemiology and End-Results program. SEER Stat Fact Sheets: Esophageal cancer. Available at: <http://SEER.cancer.gov/statfacts/html/esoph.html>. Accessed November 9, 2013.
5. Barbour AP, Rizk NP, Gonen M, Tang L, Bains MS, Rusch VW, et al.: *Adenocarcinoma of the gastroesophageal junction. Influence of esophageal resection margin and operative approach outcome*. Ann Surg, 2007; 246:1-8.
6. Kim RH, Takabe K: *Methods of esophago-gastric anastomoses following esophagectomy for cancer: A systematic review*. J Surg Oncol 2010; 101:527-33.
7. Laug H, Piso P, Stukenborg C, Raab R, Jahne J: *Management and results of proximal anastomotic leaks in a series of 1114 total gastrectomies*. Eur J Surg Oncol, 2000; 26(2):168-71.