



Letter to the Editor

Pyloroplasty and Esophageal Surgery: The Sunset Has Come

 **Mirko Barone**,¹  **Massimo Ippoliti**,²  **Decio Di Nuzzo**,^{2,3}  **Giuseppe Cipollone**,^{2,3}  **Felice Mucilli**^{2,3}

¹Department of General and Oncological Surgery, SS. Annunziata Hospital, Chieti, Italy

²Department of General and Thoracic Surgery, SS. Annunziata Hospital, Chieti, Italy

³University Department of Medical, Oral and Biotechnological Sciences, Gabriele d'Annunzio University of Chieti-Pescara, Chieti, Italy

Cite This Article: Barone M, Ippoliti M, Di Nuzzo D, Cipollone G, Mucilli F. Pyloroplasty and Esophageal Surgery: The Sunset Has Come. *EJMO* 2021;5(1):88–90.

Upfront or interval esophagectomy after adjuvant chemotherapy is the gold standard of treatment for resectable esophageal cancer patients up to stage III.^[1] Notwithstanding minimally invasive approaches as far as several reconstruction techniques have been described, gastrointestinal continuity is usually achieved by the transposition and anastomosis of a gastric conduit into the posterior mediastinum or the left latero-cervical compartment. Patients' complexity, technical difficulties as well as the need for a restoration of digestive physiology have somehow mitigated the undeniable ameliorative effects of minimally invasive strategies and still today esophagectomies are associated with significant morbidity and mortality in the range of 39% and 11%, respectively.^[2] Considering the undeniable lymphatic tropism of esophageal cancer, lymphadenectomy (more or less extensive according to histology and tumor location) remains a priority in order to achieve oncological radicality, in face of an augmented risk for specific postoperative complications, such as vascular lesions, the onset of chylothorax and of an early or delayed denervations. The need to conduct a bilateral truncular vagotomy in the course of total esophagectomy remains a long-standing and debated issue today.

In fact, the dissection of the lesser gastric curve (stations 3 and 5) as well as of the pericardial region (stations 1 and 2) or the preparation of the gastric tubule, do not allow the preservation of both Latarjet's and Grassi's communicantes

branches, possibly leading to an autonomic impairment characterized by pyloric hypertonus with subsequent postoperative functional clinical manifestations, such as gastric outlet obstruction (GOO) and delayed gastric emptying (DGE),^[3] with an overall reported incidence ranging from 2.2-47%.^[4] A broad and sometimes overlapping spectrum of symptoms have been reported leading, in this endeavour, an obvious difficulty in a uniform definition. However, patients usually experience early satiety, regurgitation, orthodox dysphagia, nausea, bloating, pain and sitophobia as far as autonomous signs such as heart burn, chest pain, tachycardia^[5] with a putative association with short term adverse outcomes such as pneumonia, longer hospital admission, nutritional problems and not negligible effects on overall quality of life.^[6]

Given the complex pathophysiology of the motility denervation of gastric conduit, surgeons have argued a putative prophylactic role of both surgical and endoscopic pyloric drainage techniques on the basis of ancillary evidences in the surgical management of gastric ulcers, especially on the role of pyloroplasty as a complementary procedure to vagotomies.

Controversies and Pitfalls About Pyloroplasties

Pyloroplasties remain controversial aspects in esophageal surgery with often conflicting evidences. Proponent of pyloric drainage assert a protective factor for postoperative

Address for correspondence: Mirko Barone, MD. Department of General and Oncological Surgery, SS. Annunziata Hospital, Chieti, Italy

Phone: +39 0871 358326 **E-mail:** mir87mb@libero.it

Submitted Date: September 24, 2020 **Accepted Date:** December 18, 2020 **Available Online Date:** February 25, 2021

©Copyright 2021 by Eurasian Journal of Medicine and Oncology - Available online at www.ejmo.org

OPEN ACCESS This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



dysautonomisms, thereby lowering the risk of anastomotic leakages, pneumonia and thus postoperative morbidity.^[7] Opponents argue a significant functional worsening, such as alkaline reflux and dumping syndrome, secondary to the reduction of the gastro-duodenal pressure gradient following a pyloroplasty.^[8]

Urschel et al.^[9] performed a meta-analysis of randomized controlled trials in order to speculate about a putative role of pyloroplasty in postoperative early outcomes. Enrolling 347 patients from three RCTs (172 pyloroplasty vs 175 control) undergoing esophagectomies with gastric conduit reconstruction, the Authors reported a relative risk for operative mortality of 0.92 (95%CI: 0.34 – 2.44, $p=0.86$), for anastomotic leaks of 0.90 (95%CI: 0.47 – 1.76, $p=0.77$), for pulmonary morbidity of 0.69 (95%CI: 0.42 – 1.14, $p=0.15$), for fatal pulmonary aspiration of 0.25 (95%CI: 0.04 – 1.60, $p=0.14$) and for gastric outlet obstruction of 0.18 (95%CI: 0.03 – 0.97, $p=0.15$). However, concerning this latter aspect, after a semi-quantitative review no significant trend favouring pyloric drainage for gastric emptying, food intake and nutritional status were found suggesting a theoretical rather than a real role of surgical drainage in esophagectomy cases.

A systematic review by Gaur et al.,^[10] examined the necessity of a pyloric drainage procedure during esophagectomy with gastric conduit reconstruction, demonstrating no benefits in performing pyloroplasty for GGO/DGE (8.1% vs 13.2%) as far as a predisposition for both biliary reflux (0% vs 14.9%, $p=0.069$) and reflux esophagitis (10.3% vs 34.5%, $p<0.05$). Another three-brace cohort study from Palmes et al.^[5] showed no difference in anastomotic leaks (pyloroplasty vs control group: 11.8% vs 17.3%), in pulmonary complications (pyloroplasty vs control group: 8.8% vs 13%) and postoperative hospital stay (pyloroplasty vs control group: 16 vs 21.7 days). Moreover, secondary outcomes highlighted drainage techniques had no difference in gastrointestinal passage by gastrografin swallow in face of an augmented incidence of reflux esophagitis and biliary reflux ($p<0.05$).

Recent evidences from Arya et al.,^[4] in a systematic review including twenty-five studies, found no difference in anastomotic leak (RR: 0.65, 95%CI: 0.38 – 1.11), pulmonary complications (RR: 0.77, 95%CI: 0.46 – 1.28) and delayed gastric emptying (RR: 0.54, 95%CI: 0.20 – 1.44). Similarly, Cerfolio et al.,^[11] exploring long-term outcomes in 221 patients undergoing Ivor-Lewis esophagectomy, demonstrated no differences in DGE between no intervention and pyloroplasty braces (96% vs 96%, respectively). Antonoff et al.^[12] reported a single centre retrospective study enrolling 293 esophagectomy (164 transthoracic and 129 transhiatal approaches) patients undergoing drainage and no drain-

age procedure with 4-5 cm wide gastric conduit interposition. Authors reported a reduction in risk of postoperative aspiration in the drainage cohort (2.4 vs 11.4%, $p=0.030$) without any difference in cumulative risk for anastomotic leakage (2.3 vs 4.1%, $p=0.500$). Subgroup analysis demonstrated persistence of these findings when limiting the comparison only to transthoracic esophagectomies.

After a throughout review, discrepant results among studies has become evident. Reasons are to be found in design and inclusion bias which could significantly interfere with evidences. It would be clear the discrepancy in indications and results could be primarily attributable to the time-frame limit from studies' enrollment process. In fact, earlier studies recommended systematized pyloric drainage, while modern literature appears rather skeptical. This profound revision comes from several factors but, first of all, from the introduction and validation of endoscopic techniques, whose efficacy is rather comparable to surgical approaches in the treatment of GGO/DGE in the postoperative period.

The cumulative risk of GGO/DGE in patients undergoing pyloroplasty would seem to be highly correlated to the onset of perioperative edema as well as to the onset of long-term stenosis. Similarly, bile reflux could be explained by the interruption of the gastro-duodenal pressure gradient and by the action of the negative intrathoracic pressures on the gastric conduit. Discrepant results could also rise from the reconstruction techniques themselves and, specifically, from the adoption of a whole gastric conduit and from a heterotopic transposition of the stomach in both a retro- or antesternal fashion.

From Urschel's ancillary studies^[9] several notes of reflection emerge, in particular the meta-analysis is characterized by different aspects of heterogeneity that would hardly make results comparable to current evidences. In fact, it is an analysis conducted on pioneering studies where strict criteria for recruitment and interference analysis seems to lack (such as the coexistence of comorbidities or independent risk factors). Regarding the surgical technique, of the three included RCTs, one presented an anatomic reconstruction strategy, one a heterotopic plan and one mixed approach. Therefore, it would be clear it would be rather difficult to provide comprehensive and universal conclusions in the face of such heterogeneity, where the transposition procedures would certainly affect the postoperative functional outcomes. It is known, in fact, that a posterior (anatomical) mediastinal reconstruction is associated with fewer functional complications at the expense of an increased risk of an eventual locoregional recurrence with involvement of the duct. Furthermore, two studies expected the transposi-

tion of the whole stomach and one the transposition of a gastric tubule.

In this regard, as reported by Akkerman et al.^[13] a tubular reconstruction is associated with a reduced risk of postoperative dysautonomisms compared to a whole stomach translocation (RR: 0.34, 95% CI: 0.12-0.97) as well as improved quality of life, reduced atypical chest pain and reflux scores with no difference in patients' nutritional status.

Finally, further limits come from cohorts of patients enrolled in studies of the early 2000s, in particular from statistical analysis with confounding factors between multivariate analyses and estimation of the odds ratio outcomes that could have interfered with the results.

In conclusions, a systematic and intentional adoption of pyloroplasty during esophagectomy would not seem to prevent fearful perioperative complications, such as pneumonia and anastomotic leakage and nor would represent a protective factor for functional complications in the early postoperative period. From the revision of the literature emerges a clear indication for an anatomical transposition of a gastric conduit rather than of the whole stomach, that drainage surgical techniques predispose to dumping syndrome and alkaline refluxes and that, in the case of postoperative GGO/DGE, endoscopic approaches have the same efficacy as surgical ones.

Although new trials with standardized methods urge, it would seem the time of sunset for pyloroplasty has come.

Disclosures

Ethics Committee Approval: Ethics committee approval was not requested for this study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – M.B.; Design – M.B., M.I., G.C.; Supervision – G.C., F.M.; Materials – M.I., D.D.N.; Data collection &/or processing – M.B., M.I.; Analysis and/or interpretation – G.C., D.D.N.; Literature search – M.B., M.I.; Writing – M.B., M.I., D.D.N., G.C., F.M.; Critical review – M.B., M.I., D.D.N., G.C., F.M.

References

1. Kitagawa Y, Uno T, Oyama T, Kato K, Kato H, Kawakubo H, et al. Esophageal cancer practice guidelines 2017 edited by the Japan Esophageal Society: part 1. *Esophagus*. 1 gennaio 2019;16:1–24. [\[CrossRef\]](#)
2. Walters DM, McMurry TL, Isbell JM, Stukenborg GJ, Kozower BD. Understanding Mortality as a Quality Indicator After Esophagectomy. *Ann Thorac Surg*. 1 agosto 2014;98:506–12. [\[CrossRef\]](#)
3. Poghosyan T, Gaujoux S, Chirica M, Munoz-Bongrand N, Sarfati E, Cattani P. Functional disorders and quality of life after esophagectomy and gastric tube reconstruction for cancer. *J Visc Surg*. ottobre 2011;148:e327–335. [\[CrossRef\]](#)
4. Arya S, Markar SR, Karthikesalingam A, Hanna GB. The impact of pyloric drainage on clinical outcome following esophagectomy: a systematic review. *Dis Esophagus Off J Int Soc Dis Esophagus*. giugno 2015;28:326–35. [\[CrossRef\]](#)
5. Palmes D, Weilinghoff M, Colombo-Benkmann M, Senninger N, Bruewer M. Effect of pyloric drainage procedures on gastric passage and bile reflux after esophagectomy with gastric conduit reconstruction. *Langenbecks Arch Surg*. marzo 2007;392:135–41. [\[CrossRef\]](#)
6. Deldycke A, Van Daele E, Ceelen W, Van Nieuwenhove Y, Pattyn P. Functional outcome after Ivor Lewis esophagectomy for cancer. *J Surg Oncol*. gennaio 2016;113:24–8. [\[CrossRef\]](#)
7. Swanson EW, Swanson SJ, Swanson RS. Endoscopic pyloric balloon dilatation obviates the need for pyloroplasty at esophagectomy. *Surg Endosc*. luglio 2012;26:2023–8. [\[CrossRef\]](#)
8. Fritz S, Feilhauer K, Schaudt A, Killguss H, Esianu E, Hennig R, et al. Pylorus drainage procedures in thoracoabdominal esophagectomy – a single-center experience and review of the literature. *BMC Surg*. 1 marzo 2018;18:13. [\[CrossRef\]](#)
9. Urschel JD, Blewett CJ, Young JEM, Miller JD, Bennett WF. Pyloric drainage (pyloroplasty) or no drainage in gastric reconstruction after esophagectomy: a meta-analysis of randomized controlled trials. *Dig Surg* 2002;19:160–4. [\[CrossRef\]](#)
10. Gaur P, Swanson SJ. Should we continue to drain the pylorus in patients undergoing an esophagectomy? *Dis Esophagus Off J Int Soc Dis Esophagus*. agosto 2014;27:568–73. [\[CrossRef\]](#)
11. Cerfolio RJ, Bryant AS, Canon CL, Dhawan R, Eloubeidi MA. Is botulinum toxin injection of the pylorus during Ivor Lewis [corrected] esophagogastrectomy the optimal drainage strategy? *J Thorac Cardiovasc Surg*. marzo 2009;137:565–72. [\[CrossRef\]](#)
12. Antonoff MB, Puri V, Meyers BF, Baumgartner K, Bell JM, Broderick S, et al. Comparison of Pyloric Intervention Strategies at the Time of Esophagectomy: Is More Better? *Ann Thorac Surg*. 1 giugno 2014;97:1950–8. [\[CrossRef\]](#)
13. Akkerman RDL, Haverkamp L, Hillegersberg R van, Ruurda JP. Surgical Techniques to Prevent Delayed Gastric Emptying After Esophagectomy With Gastric Interposition: A Systematic Review. *Ann Thorac Surg*. 1 ottobre 2014;98:1512–9. [\[CrossRef\]](#)