ORIGINAL ARTICLE

Comparison of pyloromyotomy, pyloric buginage, and intact pylorus on gastric drainage in gastric pull-up surgery after esophagectomy

Gholamreza Mohajeri, Seyed Abbas Tabatabaei, Seyed Mozafar Hashemi, Hamidreza Hemmati
Department of Thoracic Surgery, Isfahan University of Medical Sciences, Isfahan, Iran

Background: There are controversies regarding the usefulness of the pyloric drainage methods after esophagectomy as well as differences among various pyloric drainage techniques. Therefore, we compared the outcome of pyloromyotomy, pylorus buginage, and no intervention methods on gastric emptying among patients undergone esophagectomy. **Materials and Methods:** In this randomized clinical trial, patients with diagnosed esophageal cancer or any other benign lesions candidate for esophagectomy were selected. They randomized in three groups with three different approaches for gastric pull-up esophageal surgery including esophagectomy with pyloromyotomy, esophagectomy without intervention, and esophagectomy with pylorus buginage. The outcomes of procedures regarding gastric emptying time and delayed gastric emptying were compared. **Results:** Thirty patients were allocated in three groups. Gastric emptying time was not significantly different in the three groups ($P > 0.05$). Frequency of delayed gastric emptying, complications and barium leakage were not different in three studied groups ($P > 0.05$). **Conclusion:** Gastric emptying time and delayed gastric emptying were not different between common pyloric drainage methods after esophagectomy and esophagectomy without drainage.

Key words: Esophagectomy, pyloric buginage, pyloromyotomy

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INTRODUCTION

Esophageal carcinoma is one of the most common gastrointestinal cancers, which is considered as the sixth leading causes of morbidity and mortality worldwide.[1,2]

The preferred treatment for esophageal cancer or its related benign disease is esophagectomy with gastric conduit reconstruction.[3]

Delayed gastric emptying is one of the most important problems after resection and reconstruction of the esophagus. It is reported that the problem is occurred in approximately 10–50% of patients undergoing the procedure.[4-6] It is associated with some other complications including increased aspiration and subsequent pneumonias, decreased patient satisfaction, and prolonged hospital stay.[7]

Different pyloric drainage methods have been introduced and are currently used for preventing the problem such as pyloroplasty, pyloromyotomy, and buginage.[8,9] Though the techniques are used frequently, there are still controversies regarding the usefulness of them.

Some evidence demonstrated beneficial effects of the procedures in reducing gastric emptying times as well as earlier tolerance of solid diet in patients undergone gastric pull-up surgery,[3,10] whereas others did not support the use of pyloric drainage procedures in this field.[11,12]

The findings of a systematic review study regarding the effectiveness of different pyloric drainage methods

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Address for correspondence: Dr. Hamidreza Hemmati, Thoracic Surgeon, Department of Surgery, Semnan University of Medical Sciences, Semnan, Iran. E-mail: dr.hemmati2007@yahoo.com
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indicated that they are not significantly associated with the risk of developing delayed gastric emptying after esophagectomy, and regardless of using a pyloric drainage procedure, the gastric function would be improved with time.[13] Other reported that gastric conduit reconstruction without any drainage procedure is considered as an appropriate surgical option to restore digestive continuity after esophagectomy.[14]

In addition, it is well established that occurrence of some complications such as stricture, leak, bile reflux, esophagitis, and dumping syndrome are associated with pyloromyotomy and buginage.[4,15] Moreover, the methods could impair gastric mobilization due to shortening or anchoring the gastric outlet.[16] Hence, some do not advocate using of the methods during esophagectomy.[15]

Considering the disparities regarding the usefulness of the methods as well as differences among various pyloric drainage techniques, this study compared the outcome of pyloromyotomy, pylorus buginage, and no intervention methods on gastric emptying among patients undergone esophagectomy.

MATERIALS AND METHODS

In this randomized clinical trial, patients with diagnosed esophageal cancer or any other benign lesions that diagnosed by pathology in a unique center referred to Al-Zahra Hospital, Affiliated to Isfahan University of Medical Sciences, for esophagectomy were enrolled from the year 2012 to 2013. The protocol of study was approved by the Regional Ethics Committee of Isfahan University of Medical Sciences (research project number; 389025).

The patients were selected by simple random sampling method. Patients with perioperative mortality due to medical or surgical complications or those with gastric ischemia or necrosis were excluded from the study.

Written informed consent was obtained from each patient. All selected patients randomized in three groups with three different approaches for gastric pull-up esophageal surgery as follows [Figure 1]; Group 1: Esophagectomy with pyloromyotomy, Group 2: Esophagectomy without intervention, and Group 3: Esophagectomy with pylorus buginage by a bougie.

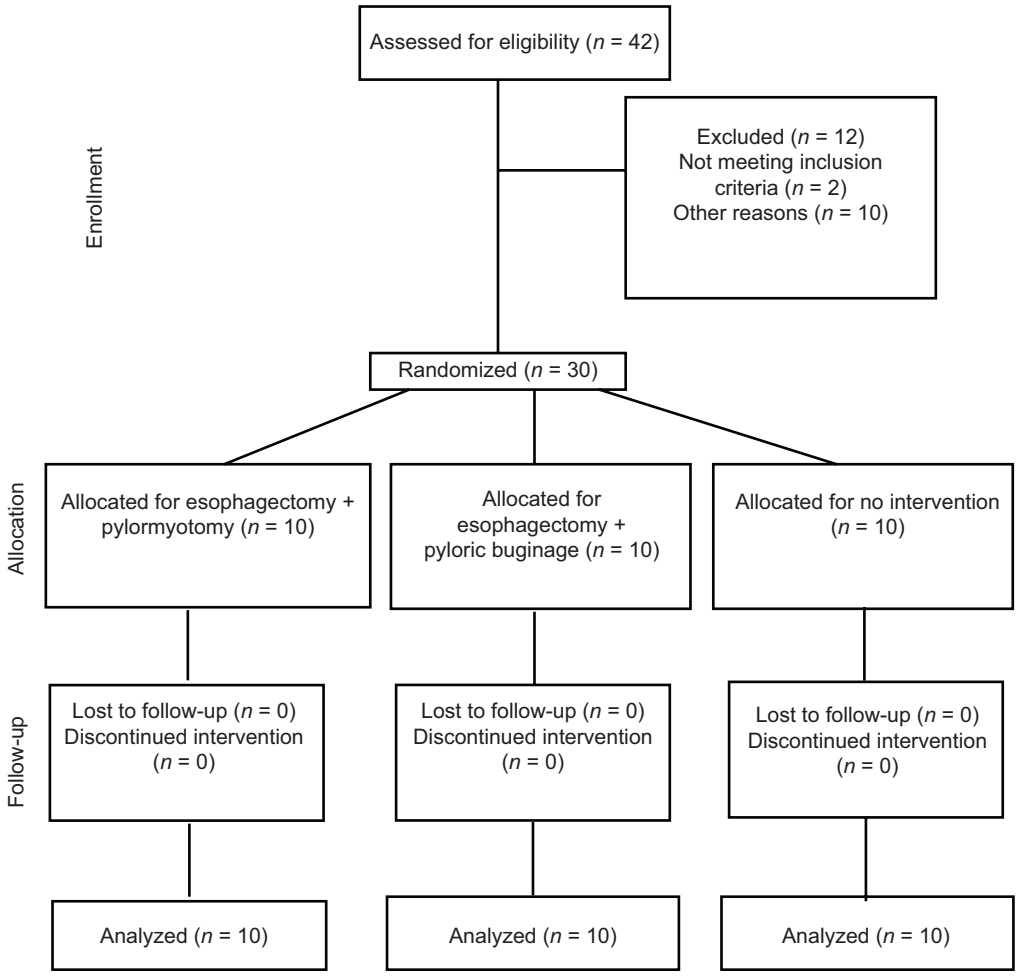

Figure 1: Consort diagram of the study

In all studied patients, the method of gastric pull-up esophageal surgery was similar (end to side esophagogastrostomy).

All patients undergone esophagectomy and after the surgery, they were managed with nasogastric tubes postoperatively for 3 days with a cervical anastomosis and for 5 days with a thoracic anastomosis.

All patients underwent a barium contrast agent swallow study on the 7th postoperative day to access gastric emptying in relation to the conduit and the pylorus and anastomotic integrity.

The results of barium swallow test were evaluated by a radiologist blinded to the method of surgery. Based on gastric emptying time, patients in three interventional groups were classified as normal and delayed gastric emptying or drainage.

Gastric emptying time ≤ 7 min considered as normal and more than 7 min as delayed.[17]

Presence of any anastomotic leakage was reported and repaired.

Demographic characteristics, medical history, and surgical outcome of each patients were recorded by a trained nurse using a questionnaire. The outcome of the three types of intervention in studied groups was compared.

Statistical analysis

Data analyzed using SPSS Version 18 software (SPSS, Inc., Chicago, IL, USA) and studied variables in three studied groups compared using Chi-square test. A $P < 0.05$ was considered as significant.

RESULTS

In this study, thirty patients who were candidate for esophagectomy were studied and randomly allocated in three different gastric pullup surgery. The characteristics of studied population in the three groups are presented in Table 1.

Mean (± standard deviation) of gastric emptying time, the frequency of normal and delayed gastric drainage, and barium leakage in three studied groups are presented in Table 2.

Table 1: The characteristics of studied population Group 1 (esophagectomy + pyloromyotomy), Group 2 (esophagectomy + pyloric buginage), and Group 3 (no intervention)

Variables	Group 1	Group 2	Group 3	*P*
Age (years)	58.13±9.31	56.38±18.98	64.63±16.32	>0.05
Sex (male/female)	7/3	7/3	7/3	>0.05
Pathology of the esophageal mass (%)				
Benign	0 (0)	2 (20)	0 (0)	>0.05
Malignant	10 (100)	8 (80)	10 (100)	>0.05
Gastric position (%)				
Normal	10 (100)	8 (80)	9 (90)	>0.05
Tubular	0 (0)	2 (20)	1 (10)	>0.05

The results presented as mean±SD or number (%) as appropriate. SD = Standard deviation

DISCUSSION

In this study, we compared the outcome of two methods of gastric drainage, pyloromyotomy, and pyloric buginage, with no intervention group on gastric emptying after esophagectomy. The findings indicated that there were not any significant differences between studied groups, and the gastric drainage methods had not significant superiority regarding gastric emptying than no intervention group.

As mentioned, there are controversies regarding using of various methods of gastric pull-up surgeries as well as its different techniques. However, using of pyloric drainage during esophagectomy is a challenging issue. Results of two meta-analysis studies suggest that the procedures could reduce gastric emptying time and rate of postoperative gastric outlet obstruction.[10,11] The results of a more recent meta-analysis which reviewed studies within the last decades indicated that pyloric drainage was unnecessary and could be omitted,[18] whereas another recent review study concluded that using of pyloric drainage strategies may be obsolete with the use of modern gastric tubes.[13]

There were some similar regional and worldwide studies that compared some methods of pyloric drainage. In this study, we compared the two most common procedures used in our department, i.e., pyloromyotomy and pyloric buginage with esophagectomy without pyloric drainage method.

Though the results of our study showed that there were not any significant differences between studied methods, it seems that cases with delayed gastric emptying were more common in cases with no pyloric intervention. It is suggested that the results would be more accurate with larger sample size.

In a similar study in Mashhad-Iran, Jangjoo *et al*. have compared the results of gastric emptying test between finger bougie of pylorus and pyloromyotomy or pyloroplasty in gastric pull-up surgery. They concluded that the outcome

Table 2: Mean (standard deviation) of gastric emptying time, the frequency of normal and delayed gastric drainage, and barium leakage in three studied groups

Variables	Group 1 (esophagectomy + pyloromyotomy)	Group 2 (esophagectomy + pyloric buginage)	Group 3 (esophagectomy without pyloromyotomy)	*P*
Gastric emptying time (min)	33.00±24.14	18.88±16.76	22.20±18.09	0.21
Gastric emptying pattern, *n* (%)				
Normal	5 (50)	5 (50)	2 (20)	0.28
Delayed	5 (50)	5 (50)	8 (80)	
Barium leakage, *n* (%)	2 (20)	1 (10)	3 (30)	0.45

of finger bougie of pylorus is the preferred and suggested method in this field.[19]

Mahmodlou have investigated the utility of pyloromyotomy in improving gastric emptying in patients underwent transhiatal esophagectomy. They did not find any superiority of pyloromyotomy in this regard.[20]

Manjari *et al*. in India have compared the patterns of gastric emptying using three different pylorus drainage procedures. They showed that all pylorus drainage procedures behave in much the same way.[21]

In a recent study, Antonoff *et al*. retrospective study compared the effectiveness of different pyloric drainage techniques among 293 patients. They found that using of pyloric drainage techniques could reduce the risk of aspiration and need for pyloric dilation before discharging from hospital and different drainage methods were similarly effective.[6]

In the current study, though we have few tubular gastric cases, the outcomes were not different in different statues of stomach. Similarly, the results were not different in benign and malignant lesions.

There are growing bodies of evidence that the drainage is more favorable in tubular gastric conduit than the whole stomach.[22]

The limitation of current study was the small sample size of the studied population. In addition, it is recommended to evaluate other pyloric drainage methods including botulinum toxin injection as well as balloon dilatation in this regard for obtaining more conclusive result. However, some studies have reported the advantages of botulinum toxin injection than other methods.[23]

A recent study has reported an approximately 95% success rate for balloon dilation.[24]

CONCLUSION

Gastric emptying time and delayed gastric emptying were not different between common pyloric drainage methods after esophagectomy and esophagectomy without drainage. Hence, it is preferred to limit the use of these methods. Using esophagectomy without pyloric drainage methods could also reduce the duration of surgery and related complication. Further larger prospective studies with larger sample size and comparing other options of pyloric drainage are recommended.

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Conflicts of interest

The authors have no conflicts of interest.

AUTHORS' CONTRIBUTION

All authors contributed in the study design, conducting the systematic review, and drafting the manuscript. All authors approved the final version for submission and took the responsibility for the manuscript content.

REFERENCES

1. Pennathur A, Gibson MK, Jobe BA, Luketich JD. Oesophageal carcinoma. Lancet 2013;381:400-12.
2. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: Globocan 2008. Int J Cancer 2010;127:2893-917.
3. Fok M, Cheng SW, Wong J. Pyloroplasty versus no drainage in gastric replacement of the esophagus. Am J Surg 1991;162:447-52.
4. Poghosyan T, Gaujoux S, Chirica M, Munoz-Bongrand N, Sarfati E, Cattan P. Functional disorders and quality of life after esophagectomy and gastric tube reconstruction for cancer. J Visc Surg 2011;148:e327-35.
5. Mortensen MB. Avoiding complications in esophageal cancer surgery. Minerva Chir 2013;68:341-52.
6. 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 2014;97:1950-7.
7. Martin JT, Federico JA, McKelvey AA, Kent MS, Fabian T. Prevention of delayed gastric emptying after esophagectomy: A single center's experience with botulinum toxin. Ann Thorac Surg 2009;87:1708-13.
8. Orringer MB. Transhiatal esophagectomy. In: Patterson GA, Pearson FG, Cooper JD, Deslauriers J, Rice TW, Luketich JD, Leurt AE, editors. Pearson's Thoracic and Esophageal Surgery. 13th ed. Philadelphia: Churchill Livingstone; 2008. p. 551-89.

9. Orringer MB. Transhiatal esophagectomy. In: Shields TW, LoCicero J, Reed CE, Fines RH, editors. General Thoracic Surgery. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2009. p. 1771-2002.
10. Khan OA, Manners J, Rengarajan A, Dunning J. Does pyloroplasty following esophagectomy improve early clinical outcomes? Interact Cardiovasc Thorac Surg 2007;6:247-50.
11. Urschel JD, Blewett CJ, Young JE, 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.
12. Lanuti M, de Delva PE, Wright CD, Gaissert HA, Wain JC, Donahue DM, *et al.* Post-esophagectomy gastric outlet obstruction: Role of pyloromyotomy and management with endoscopic pyloric dilatation. Eur J Cardiothorac Surg 2007;31:149-53.
13. Gaur P, Swanson SJ. Should we continue to drain the pylorus in patients undergoing an esophagectomy? Dis Esophagus 2014;27:568-73.
14. Maffettone V, Rossetti G, Rambaldi P, Russo F, Cuccurullo V, Brusciano L, *et al.* Whole stomach transposition without gastric drainage procedure: A good surgical option to restore digestive continuity after esophagectomy. Int Surg 2007;92:73-7.
15. 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 2007;392:135-41.
16. Marchand P. Pyloromyotomy: Technique and use for gastric drainage combined with vagotomy. Br J Surg 1971;58:225-8.
17. Schwizer W, Hinder RA, DeMeester TR. Does delayed gastric emptying contribute to gastroesophageal reflux disease? Am J Surg 1989;157:74-81.
18. Nguyen NT, Dholakia C, Nguyen XM, Reavis K. Outcomes of minimally invasive esophagectomy without pyloroplasty: Analysis of 109 cases. Am Surg 2010;76:1135-8.
19. Jangjoo A, Mehrabi M, Kavyani K, Amozeshi A. Comparison between finger bougie of the pylorus and pyloroplasty or pyloromyotomy in gastric pull-up esophageal surgery. Med J Mashad Univ Med Sci 2007;50:275-82.
20. Mahmodlou R, Badpa N, Nosair E, Shafipour H, Ghasemi-rad M. Usefulness of pyloromyotomy with transhiatal esophagectomy in improving gastric emptying. Gastroenterol Res 2011;4:223-7.
21. Manjari R, Padhy AK, Chattopadhyay TK. Emptying of the intrathoracic stomach using three different pylorus drainage procedures – Results of a comparative study. Surg Today 1996;26:581-5.
22. Bemelman WA, Verburg J, Brummelkamp WH, Klopper PJ. A physical model of the intrathoracic stomach. Am J Physiol 1988;254(2 Pt 1):G168-75.
23. 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 2009;137:565-72.
24. Lanuti M, DeDelva P, Morse CR, Wright CD, Wain JC, Gaissert HA, *et al.* Management of delayed gastric emptying after esophagectomy with endoscopic balloon dilatation of the pylorus. Ann Thorac Surg 2011;91:1019-24.