

Finger Bougie Method Compared with Pyloroplasty in the Gastric Replacement of the Esophagus

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Abstract: To elucidate the necessity of pyloroplasty for the gastric tube through the posterior mediastinum in esophageal surgery, gastric emptying and duodenogastric reflux (DGR) were evaluated in 16 cases undergoing an anterior pylorotomy (group P) and in 16 cases treated by the finger bougie method (group F). First, the obstruction and reflux symptoms were examined based on a patient questionnaire using a brief scoring system. The median value of the symptom score showed the patients in P to have more symptoms than those in F; however, the difference was not significant (8.0 vs 6.0). Secondly, the swallowed Tc O₄ (85 MBq) was counted using a gamma camera at three sites on the sternal bone in the upright position based on a gastric transit scintigram. Both the descending time of the RI peak and the clearance rates were similar between the two groups. Thirdly, intragastric 24-h pH monitoring was carried out. Antimony pH sensors were anchored 5 and 15 cm below the esophagogastric junction. We could not find any difference between the two groups in both the %time pH > 4 and %time pH > 7. These findings thus revealed no big difference between groups P and F. The finger bougie method to drain the vagotomized posterior mediastinal stomach was found to achieve results similar to conventional pyloroplasty, while it was also simpler and safer.

Key Words: gastric tube, esophageal cancer, pyloroplasty

Introduction

A gastric outlet obstruction after esophageal replacement sometimes occurs without pyloroplasty. However, the best method for draining a gastric outlet remains controversial. Many surgeons perform Heinecke-Mikulicz pyloroplasty after an esophageal resection and

gastric pull-up. On the other hand, it has been reported that closed pyloroduodenal digital dilatation is also successful after a truncal vagotomy.¹ The aim of this paper is to determine the superiority of either pyloroplasty or the finger bougie method regarding gastric emptying and duodenogastric reflux (DGR).

Subjects and Methods

Subjects

Sixteen cases of pyloroplasty (group P) and the same number of patients who were treated by the finger bougie of the pylorus (group F) were historically compared in terms of symptoms, gastric scintigram findings, and 24-h pH monitoring. Both groups were checked by following three kinds of examinations 3 months after surgery. They did not have any other gastrointestinal diseases or postoperative morbidity which could affect the results of the examinations. All carcinomas were removed through either a transhiatal or right thoracic approach. The whole stomach, with a blood supply from the right gastric and right gastroepiploic arteries, was substituted through the posterior mediastinal route in both groups.² It was anastomosed to the remnant of the cervical esophagus by layered hand suturing. The background of the subjects is shown in Table 1. No significant difference was found between the two groups. Figure 1 shows the schema of the drainage methods employed in this study. In group P, we adopted a modified Wangensteen method,³ that is, after removing the whole layer of the anterior half of the pyloric ring (anterior pylorotomy), the stomach and duodenum were sutured in a layer to layer fashion. In group F, the right first finger was passed through the pylorus ring with the invaginated gastric wall from the stomach to the duodenum for 5 min. Informed consent was obtained from each subject.

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Methods

Questionnaire of Obstruction and Reflux. Five symptoms were checked: dysphagia, reflux sensation, heartburn, chest pain, and swallowing pain. Each symptom was expressed as a brief score by dividing each symptoms into strength (0–3) and frequency (0–3). Therefore, the highest score would be 30 points.

Emptying Study of Esophageal Substitute. The patients all swallowed TcO_4^- (85 MBq) with 10 ml water in the upright position. Radiation intensity (RI) was counted

by a gamma camera (pHO Gamma/LFOV, Searle, Chicago, IL, USA). Regions of interest (ROI) were set up over the upper (ROI-1), middle (ROI-2), and lower (ROI-3) sternal bone. The decline time of the RI peak from ROI-1 to ROI-3 and the clearance rate at ROI-2 and ROI-3 were then compared between the two groups.

24-h pH Monitoring. Intra-gastric pH was measured continuously at 5 and 15 cm below the esophago-gastrostomy using 2-channel antimony pH sensors (LS-2, Synectics Medical, Stockholm, Sweden). The alkaline reflux was evaluated by calculating the %time pH > 4 and %time pH > 7 with the use of a computer analysis (Gastrosoft, Dallas, TX, USA).

The data were analyzed statistically by the Mann-Whitney test and Student's *t*-test. The criterion for statistical significance was the 0.05 level.

Table 1. Characteristics of subjects

	Pyloroplasty (P)	Finger bougie (F)
Number	16	16
Mean age	63.6 (49–81)	62.9 (42–79)
Sex (M/F)	13/3	14/2
Operation		
thoracotomy	11	12
THE ^a method	5	4
Main location of the lesion		
Upper 3rd	2	2
Middle 3rd	12	7
Lower 3rd	2	7
Curability		
CIII	12	6
CII	3	6
CI	0	1
C0	1	3
Mean Months after surgery	3.5	3.4

^aTHE, transhiatal esophagectomy

Results

Scoring Based on a Questionnaire of the Symptoms

The median value of the total score in group P was higher than that in group F; however, there were no significant differences, as shown in Fig. 2 (8.0 vs 6.0: group P vs F, respectively). The median score of the reflux sensation seemed to be less in group F (2.0 vs 0, not significant).

Emptying Study of Esophageal Substitute

The median decline time of the RI peak was similar between the two groups, as shown in Fig. 3 (3.9 vs 3.7 s,

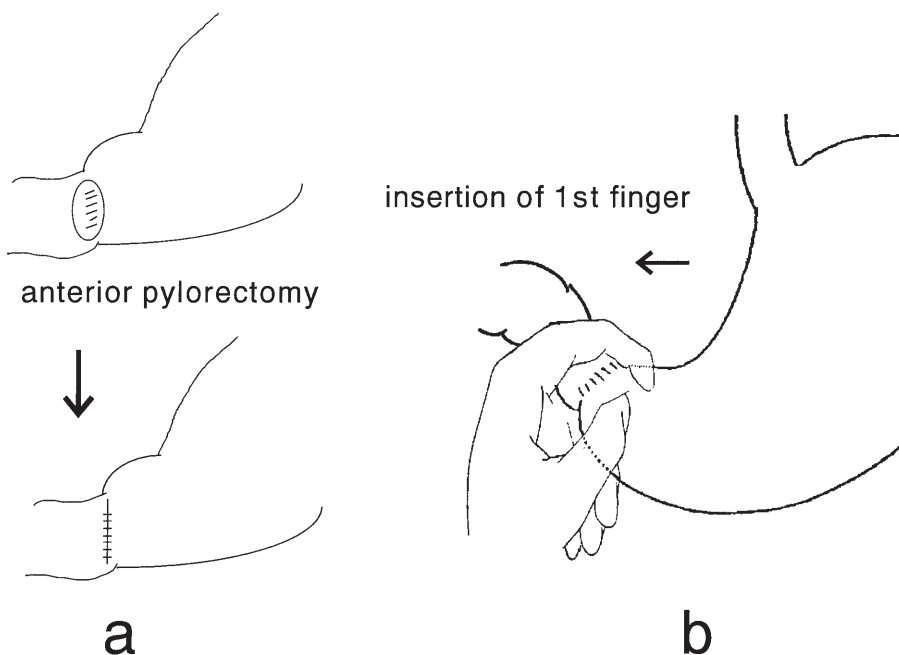


Fig. 1. Schema of the pyloroplasty and finger bougie methods used in this study. **a** Pyloroplasty; **b** finger bougie

not significant). The median clearance rate at ROI-2 and ROI-3 was also similar between the two groups (ROI-2: 75.1 vs 74.0%; ROI-3: 49.6 vs 52.6%; both not significant). However, the data of both groups were much slower in comparison to normal esophageal emptying.

24-h pH Monitoring

The intragastric pH environment obviously deviated to the alkaline in both groups compared with the pH profiles of the normal esophagus.⁴ The comparison of intragastric alkalization is shown in Fig. 4. The mean value of %time pH > 4 at 5 and 15cm below the anastomosis were 76.4% vs 86.4% and 78.5% vs 71.9%,

respectively. The mean value of the %time pH > 4 was 21.4% vs 21.5% and 24.2% vs 26.3%, respectively. Both the %time pH > 4 and the %time pH > 7 were not significantly different between the two groups.

Discussion

Many feel that some form of drainage procedure is needed in the gastric substitution of the esophagus. Some recent studies have shown gastric substitution with pyloroplasty to be superior to that without drainage. This was carried out in a prospective fashion with special reference to both symptoms and postoperative morbidity.⁵⁻⁷ We adopted a historical comparison in order to choose uniform subjects. The subjects chosen had no postoperative morbidity such as anastomotic leakage, which could alter our results. Therefore, the effect of the finger bougie method for vagotomized posterior mediastinal stomachs was evaluated more exactly by the objective findings of gastric emptying and reflux.

A brief scoring system for symptoms was thus found to be useful to compare between the groups. This was supported by such other criteria as gastric emptying, pH monitoring, and the histological findings of the gastric mucosa.

There is no standard methodology concerning esophageal scintigraphy or gastric emptying while taking into account the body position, observation time, characteristics of RI, sites of ROI, and so forth. Therefore, a simple method was devised. Prolonged gastric emptying seems to give information on not only transit but also reflux.

It remains controversial as to how to measure excessive DGR. The conventional %time pH > 4 or %time

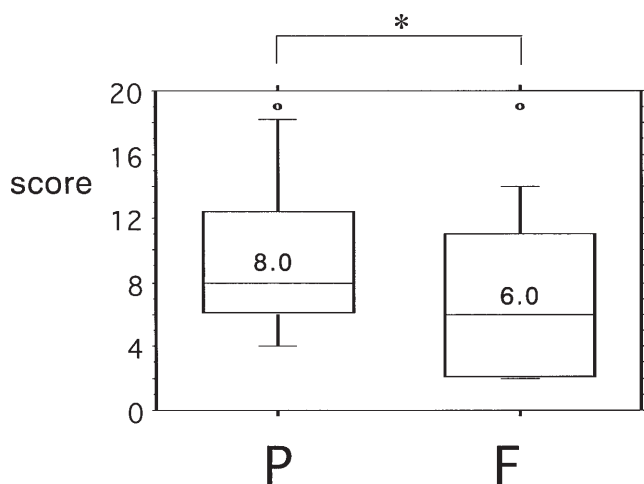


Fig. 2. Comparison of the median reflux score based on a questionnaire which consists of five symptoms between group P (pyloroplasty) and group F (finger bougie). *P = 0.21, Mann-Whitney test

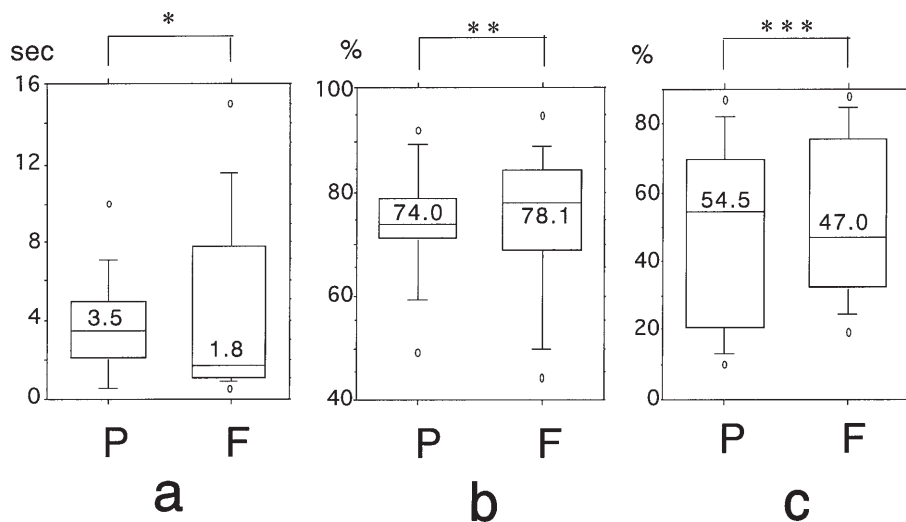


Fig. 3. Median value of the descending time and clearance rate in emptying study of esophageal substitute. Regions of interest were set up at three sites on the sternal bone. a Descending time from ROI-1 to ROI-3. b Clearance rate at ROI-2. c Clearance rate at ROI-3. ****Not significant; Mann-Whitney test

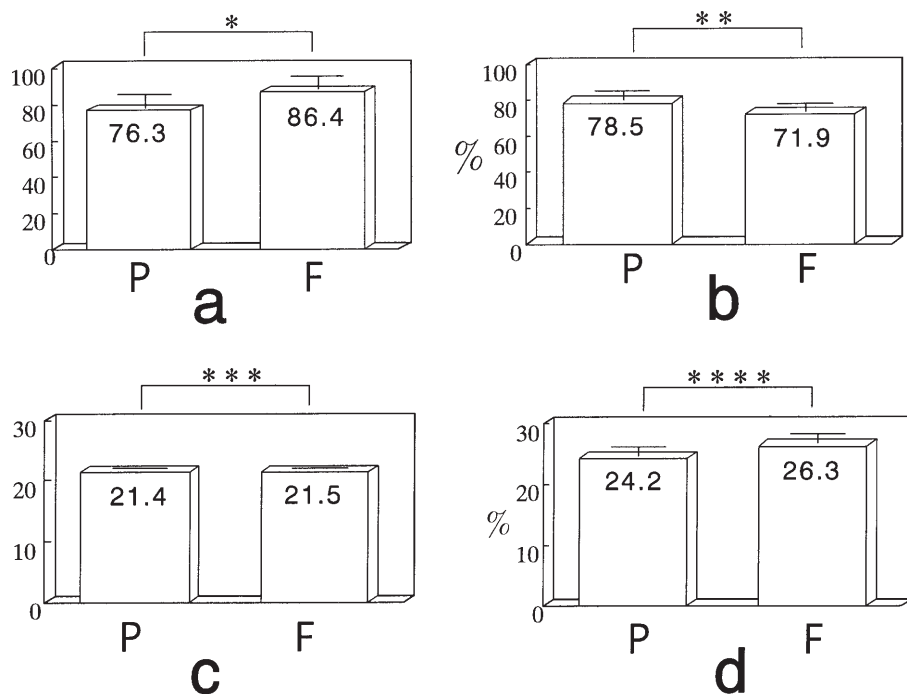


Fig. 4. Mean value of the %time pH > 4 and the %time pH > 7 in 24-h pH monitoring. Two-channelled pH sensors were anchored at 5 and 15 cm below the esophagogastronomy. **a** %time pH > 4 at 5 cm below anastomosis; **b** %time pH > 4 at 15 cm below anastomosis; **c** %time pH > 7 at 5 cm below anastomosis; **d** %time pH > 7 at 15 cm below anastomosis. ****Not significant; Student's *t*-test. Bars show the standard error

pH > 7 does not always show a correct alkaline environment for DGR on 24-h pH monitoring because a mixed reflux with gastric acid must be taken into consideration. Acid production of the vagotomized gastric tube was greatly reduced,⁸ so the %time pH > 7 and the %time pH > 4 may be useful in measuring DGR. The acid production of the gastric tube also has to be taken into consideration when measuring intragastric alkalization. The increase of saliva pH and bacterial overgrowth might influence the pH status of the gastric tube. It would be useful to also directly examine the quantity of bile by using a portable spectrophotometer with a fiberoptic sensor for bilirubin.⁹

A gastric outlet obstruction of the esophageal substitute may delay feeding without pyloroplasty after surgery.^{5,6} In this paper, no difference was observed in the transit and reflux between pyloroplasty and the finger bougie method within at least 3 months after surgery. We have already reported that no difference was found regarding the quantity of oral intake in the early period after surgery.¹⁰ However, longer observations are still called for.

In conclusion, the finger bougie method, which is used to dilate the pyloric ring of the gastric substitute, was found to be simpler and safer than pyloroplasty because the stomach does not have to be opened. Based on the above findings, finger bougienage should thus be used instead of conventional pyloroplasty whenever possible.

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