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Comparison of the effects of tubular gastroesophageal anastomosis and traditional gastroesophageal supra-arch anastomosis on the postoperative lung function of patients with esophageal carcinoma.

Hui-Li Chang[#], Ming-Hui Zhou[#], Jun-Ping Han[*]

The First Department of Gastrointestinal Surgery, Yantai Yuhuangding Hospital, Yantai, Shandong, PR China

[#]These authors contributed equally to this paper

Abstract

Objective: This study aimed to investigate and compare the effects of tubular gastroesophageal anastomosis and traditional gastroesophageal supra-arch anastomosis on the postoperative lung function of patients with esophageal carcinoma.

Methods: A total of 90 patients with middle-lower segmental esophageal cancer admitted in our hospital from August 2014 to August 2016 were recruited to our study. They were randomly divided into two groups. The observation group underwent tubular gastroesophageal anastomosis, whereas the control group underwent traditional gastroesophageal supra-arch anastomosis. Changes in the postoperative pulmonary function were compared between the two groups.

Results: The numbers of CD4 cells (27.45 ± 5.48), CD8 cells (35.97 ± 7.16), and natural killer cells (20.79 ± 2.49), as well as the CH4/CD8 ratio (0.69 ± 0.18), of the patients in the observation group were significantly higher than the (38.45 ± 5.98), (20.45 ± 6.41), (39.44 ± 3.49), and (1.31 ± 0.48), respectively, of the patients in the control group. The differences between the two groups were statistically significant (P<0.05). By contrast, the preoperative forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and maximum voluntary ventilation (MVV) did not significantly differ between the two groups (P>0.05). The FEV1 (1.76 ± 0.41 L), FVC (2.33 ± 0.32 L), and MVV (33.7 ± 5.2 L/min) of the observation group were significantly higher than those of the control group (P<0.05). Meanwhile, the complication rate of the observation group was 42.2%, which was significantly lower than that of the control group (75.6%) (P<0.05).

Conclusion: Tubular gastroesophageal anastomosis can benefit patients with esophageal cancer by significantly reducing the adverse effects on their postoperative pulmonary function and control the occurrence of postoperative complications.

Keywords: Tubular gastroesophageal anastomosis, Traditional gastroesophageal supra-arch anastomosis, Esophageal cancer, Pulmonary function.

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Introduction

The traditional treatment for middle–lower segmental esophageal cancer is mainly gastroesophageal supra-arch anastomosis [1]. This operation often results in pulmonary hypofunction and variable complications, which seriously affect the prognosis. Meanwhile, tubular gastroesophageal anastomosis is a modified operation based on the traditional gastroesophageal supra-arch anastomosis [2,3]. The majority of clinical studies have demonstrated that the latter surgery can significantly reduce the negative changes in postoperative pulmonary function, as well as the postoperative complications, of patients with esophageal cancer [4]. This study aimed to investigate and compare the effects of tubular gastroesophageal anastomosis and traditional gastroesophageal supra-arch anastomosis on the postoperative pulmonary function of patients with esophageal carcinoma.

Materials and Methods

General information

A total of 90 patients with middle–lower segmental esophageal cancer admitted in our hospital from August 2014 to August 2016 were selected. These patients included 66 males and 24 females aged 26-72 years, with an average age of 55.4 ± 7.3 years. Among these cases, 50 presented with lesions in the middle segment and 40 in the lower segment. A total of 73 cases were squamous carcinomas, 17 adenocarcinomas, 16 stage I tumors, 56 stage II tumors, and 18 stage III tumors. All

the patients were diagnosed by pathological examination and electronic gastroscopy. They were randomly divided into the observation and control groups, with 45 cases in each group. No statistical difference was noted in the general data (P<0.05).

Method

The procedures of the radical resection of esophageal carcinoma were consistent between the two groups. Tracheal intubation and intravenous general anesthesia were adopted for anesthesia. In the observation group, the stomach was dissociated at least 5 cm away from the distal end of the tumor below the gastric cardia. Then, the lesser curvature was dissociated from the third branch of right gastric artery. The lesser curvature and cardia were removed with a stitching instrument, and the right gastroepiploic artery was selected as the nutrient vessel. The left gastric artery, short gastric artery, left gastroepiploic artery, and right gastric artery proximal branch were severed. A tubular stomach of 4-5 cm diameter was created through the aortic arch esophageal bed. Lastly, gastroesophageal end-to-side anastomosis was performed through the left thoracic apex. In the control group, the stomach was dissociated at least 5 cm away from the distal end of tumor below the gastric cardia. The cystic stomach was crossed over the aortic arch. Then, gastroesophageal end-to-side anastomosis was performed through the left thoracic apex.

Clinical observation index

For pulmonary function, the forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and maximum voluntary ventilation (MVV) were measured preoperatively and 1 month after surgery. For the complications, postoperative pulmonary infection, anastomotic leakage, and gastroesophageal reflux were checked.

Statistical methods

The data were processed using the SPSS 17.0 statistical software and tested by T and $\chi 2$ tests. Differences at P<0.05 were considered statistically significant.

Results

Immune function changes before and after treatment

The numbers of CD4 cells (27.45 ± 5.48), CD8 cells (35.97 ± 7.16), and natural killer (NK) cells (20.79 ± 2.49), as well as CH4/CD8 ratio (0.69 ± 0.18), of patients in the observation group were significantly higher than the (38.45 ± 5.98), (20.45 ± 6.41), (39.44 ± 3.49), and (1.31 ± 0.48), respectively, in the control group (P<0.05) (Table 1).

Table 1. Immune function changes before and after treatment.

Group	CD4	CD8	CD4/CD8	NK
Control group	27.45 ± 5.48	35.97 ± 7.16	0.69 ± 0.18	20.79 ± 2.49
Observation group	38.45 ± 5.98	20.45 ± 6.41	1.31 ± 0.48	39.44 ± 3.49
t	11.507	13.703	10.262	36.912
P	<0.05	<0.05	<0.05	<0.05

Comparison of lung functions between the two groups before the operation and in the postoperative 1 month

The preoperative FEV1, FVC, and MVV of the patients in the two groups were not significantly different P>0.05). By contrast, the FEV1 (1.76 ± 0.41 L), FVC (2.33 ± 0.32 L), and MVV (33.7 ± 5.2 L/min) of the observation group in the postoperative 1 month were significantly higher than those of the control group (P<0.05) (Table 2).

Table 2. Comparison of lung functions between the two groups before the operation and in the postoperative 1 month.

Group	Time	FEV1 (L)	FVC (L)	MVV (L/min)
Observation group	Preoperative	2.24 ± 0.34	2.93 ± 0.36	41.5 ± 5.7
	Postoperative 1 month	1.76 ± 0.41	2.33 ± 0.34	34.7 ± 4.2
Control group	Preoperative	2.28 ± 0.40	2.93 ± 0.40	41.6 ± 5.5
	Postoperative 1 month	1.34 ± 0.36	1.84 ± 0.36	26.5 ± 3.7
t		7.038	8.930	9.238
P		0.014	0.007	0.003

Note: t and P expressed the comparison between the observation and control groups in the postoperative 1 month

Comparison of the postoperative complications between the two groups

The complication rate of patients in the observation group was 42.2%, which was significantly lower than that of the control group (75.6%) (P<0.05) (Table 3).

Table 3. *Comparison of the postoperative complications of the patients between the two groups (n [%]).*

Group	n	Pulmonary infection	Stomal leak	Gastroesophageal reflux	Complication
Observation group	45	2 (4.4)	1 (2.2)	16 (35.6)	19 (42.2)
Control group	45	3 (6.7)	1 (2.2)	30 (66.7)	34 (75.6)
X^2					9.850
P					0.000

Discussion

Esophageal cancer is a common malignant tumor with the highest mortality rate. However, most patients are only diagnosed in the middle and late stages of their disease. The 2 year survival rate is usually less than 15% [5]. Moreover, 90% of esophageal cancer cases are undifferentiated or poorly differentiated squamous carcinoma by pathological examination. The malignancy degree of tumors with this pathological type is higher than those of others and leads to easy metastasis and recurrence. Hence, esophageal cancer is difficult to treat [6]. Even so, with the development of modern radiotherapy and chemotherapy techniques, patients with esophageal cancer have attained survival benefits. A study reported that the 5-year survival rate of patients with early esophageal cancer reached up to 80% after radiotherapy. However, the adverse reactions caused by radiotherapy also inflict increased pain in such patients [7].

Surgical resection plays an important role in treating middle-lower segmental esophageal cancer. The surgical incision should be reasonably set depending on the tumor location to improve the resection rate of the lesion. The anatomical relationship of esophageal carcinoma is distinctive. The surgical approach through the left thoracic cavity can increase the difficulty of anastomosis after tumor resection and may also result in residual neoplastic foci [8]. Clinically relevant statistics showed that about 15%-30% of patients with esophageal cancer suffer from postoperative pulmonary complications. Meanwhile, radical surgery for esophageal carcinoma can reduce lung function and leads to a poor prognosis, seriously affecting the patients' quality of life. In the present study, the FEV1, FVC, and MVV of patients with esophageal cancer declined in the postoperative 1 month. This result indicated that the radical surgery for esophageal cancer is clinically important in lung function damage. The FEV1 (1.76 ± 0.41 L), FVC (2.33 ± 0.32 L), and MVV (33.7 ± 5.2 L/min) of the patients in the observation group were significantly higher than those of the control group in this postoperative period. Hence, tubular gastroesophageal anastomosis attained a superior prognosis to that of the traditional procedure and effectively reduced lung dysfunction. Reports showed that relative to that in traditional surgery, the lung function after the modified operation was significantly improved in the postoperative 4 weeks [9]. This result was achieved because the modified operation replaced the resected esophagus with a tubular stomach, which is a reconstructed anatomical structure with a similar physiological structure to that of the original segment removed. Moreover, the stomach space was not expanded; thus, excessive encroaching of the thoracic volume was avoided, and the lung was not compressed.

Esophageal cancer resection can damage the lower esophageal sphincter, diaphragm crura, phrenoesophageal ligament, and other structures that can effectively prevent gastroesophageal reflux. Thus, esophagectomy easily leads to gastroesophageal reflux [10]. In the present study, only 35.6% of the patients in the observation group suffered from gastroesophageal reflux. This proportion was significantly lower than that in the control group. Thus, tubular gastroesophagostomy can significantly reduce postoperative gastroesophageal reflux. This result was attained probably because a major portion of the lesser curvature was resected, the delomorphous cells were significantly reduced in number, and gastric acid secretion was hence controlled. Moreover, the size of the tubular stomach was similar to that of the esophagus. The reconstructed digestive tract was comparable to the physiological and anatomical structure. As a result, gastric emptying was promoted after eating and the food retention time in the chest and stomach was reduced. No difference in the incidence of two kinds of complications after esophageal carcinoma resection (postoperative pulmonary infection and anastomotic fistula) was observed between the two groups. Overall, the incidence of complications in the observation group was significantly lower than that in the control group. Hence, the tubular stomach can control the postoperative complications after esophageal cancer resection.

Conclusion

In summary, tubular gastroesophageal anastomosis can significantly reduce the adverse effect of surgery on the postoperative pulmonary function of patients with esophageal cancer, as well as control the occurrence of postoperative complications. As such, the procedure merits clinical application.

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*Correspondence to

Jun-Ping Han

The First Department of Gastrointestinal Surgery

Yantai Yuhuangding Hospital

Yantai

PR China