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Comparison of Efficacy and Safety Between Video-Assisted Thoracoscopic Surgery and Traditional Thoracotomy in the Treatment of Esophageal Cancer

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Abstract: *Objective:* To compare the therapeutic effect of video-assisted thoracoscopic surgery and traditional thoracotomy in patients with esophageal cancer. *Methods:* 60 patients with esophageal cancer who were treated from February 2022 to February 2023 were randomly divided into groups. Video-assisted thoracoscopic surgery was included in group A, and thoracotomy was included in group B. The curative effects of esophageal cancer surgery were compared. *Results:* All surgical indexes in group A were better than those in group B ($P < 0.05$); interleukin-6 (IL-6), C-reactive protein (CRP), and tumor necrosis factor-α (TNF-α) levels in group A were lower than those in group B ($P < 0.05$); the postoperative SF-36 score in group A was higher than that in group B ($P < 0.05$); the postoperative complication rate in group A was lower than that in group B ($P < 0.05$). *Conclusion:* Video-assisted thoracoscopic treatment for patients with esophageal cancer can reduce postoperative inflammatory response and reduce surgical trauma, which is safe and efficient.

Keywords: Esophageal cancer; Traditional surgery; Video-assisted thoracoscopy; Curative effect; Safety

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1. Introduction

Esophageal cancer is a common clinical malignant tumor with a high mortality rate, and its typical feature is lymph node metastasis. After the occurrence of esophageal cancer, the patient's survival period is about 10 months, and the 5-year survival period after surgery is about 20%. The sooner surgery is performed, the longer the survival is. In addition, surgical treatment for patients with esophageal cancer can completely remove the cancer focus and help patients restore the function of the digestive system. Conventional thoracotomy is relatively common in the treatment of esophageal cancer, but various complications are prone to occur after the operation, and the prognosis of most patients is poor. As minimally invasive techniques continue to mature, video-assisted thoracoscopic techniques are gradually being used in the treatment of esophageal cancer, which can reduce surgical injuries and bleeding and has been widely used in thoracic surgery [1]. In this paper, 60 patients with esophageal cancer were recruited to explore the effect of video-assisted thoracoscopic treatment.

2. Materials and methods

2.1. General information

A total of 60 patients with esophageal cancer who were treated from February 2022 to February 2023 were recruited and randomly divided into groups A and B. The data of patients with esophageal cancer in group A were not different from those in group B (P>0.05), as shown in **Table 1**.

Table 1. Data analysis of esophageal cancer

Group	No.	Gender		Age (years)		Tumor stage (%)			Tumor location		
		Male	Female	Interval	Average	I	II	III	Upper section	Middle section	Lower paragraph
Group A	30	17	13	54–79	66.28 ± 2.19	2	19	9	4	21	5
Group B	30	19	11	54–80	66.31 ± 2.21	3	19	8	5	19	6
x^2 / t	-	0.2778		0.0528		0.0577			0.0584		
P	-	0.5981		0.9581		0.9362			0.9782		

2.2. Inclusion and exclusion standards

The inclusion criteria included: (1) patients with pathological and imaging results suggesting esophageal cancer; (2) patients who choose surgical treatment; (3) patients with informed consent; and (4) patients undergoing angiographic examination, showing that the diameter of the lesion is less than 5 cm.

The exclusion criteria included: (1) patients with abnormal liver, kidney, and cardiopulmonary function; (2) patients with a history of chest surgery; (3) patients with blood system lesions; and (4) patients with other malignant tumors.

2.3. Treatment methods

Group A video-assisted thoracoscopic treatment: the operation was completed under video-assisted thoracoscopic surgery, and the patient was assisted in the left lateral position before the operation; With general anesthesia, and the double-lumen tracheal intubation was performed, with an opening in the 6th or 7th intercostal space, and the length of the incision was controlled at about 1.0–1.5 cm, which was put in the endoscope; 2 main operation holes were determined and opened at the 5 intercostals in the right armpit, the incision length was controlled at about 1.5–2.0 cm, the 5 intercostals at the right midaxillary line were opened and the incision length was controlled at 1.0–1.5 cm, followed by completion of the thoracoscopic surgery through the aforementioned main operation hole; a secondary operation hole was determined and opened at the 9th rib between the posterior axillary line and the scapular line, and the length of the incision was controlled at 2.0–3.0 cm. With the assistance of video-assisted thoracoscopic surgery, the thoracic esophagus, azygos vein, and mediastinal lymph nodes were dissected. If relevant conditions were met, a drainage tube was indwelled. Afterward, the good limbs were placed, and the lateral position was changed to a supine position. An incision was made with a length of 1.5 cm. At the same time, small incisions in the four quadrants were made to thoroughly clean the lymph nodes in the stomach. After the completion, the stomach is freed to maintain a tubular shape. After suturing, the tube-like stomach is lifted to the neck, and gastroesophageal anastomosis is carried out.

Group B thoracotomy treatment: the operation method is thoracotomy with three incisions radical operation, the patient was instructed to lie on the left side, the incision position was at the 6th intercostal space

on the right side, the incision length was controlled at 20–25 cm, and then the incision was made in the supine position. The location was in the middle of the abdomen, the length was controlled at 18–20 cm, the operation after the opening was the same as that of group A, and finally, the neck anastomosis was carried out.

2.4. Observation indicators

The observation indicators of this study are as follows:

(1) Surgical indicators: record incision length, operation time, hospitalization time, chest drainage volume, number of dissected lymph nodes, and blood loss during operation.
(2) Inflammatory indicators: detect the levels of interleukin-6 (IL-6), C-reactive protein (CRP), tumor necrosis factor α (TNF-α), and other indicators.
(3) Quality of life: The quality of life of patients with esophageal cancer was evaluated by SF-36, with a score of 0–100.
(4) Adverse reactions: Anastomotic leakage, recurrent laryngeal nerve injury, tracheal injury, and cardiopulmonary complications were recorded.

2.5. Statistical research

Esophageal cancer data were processed with SPSS 21.0, % records (x^2 test) count data of esophageal cancer patients, mean ± standard deviation (SD) records (*t*-test) measurement data of esophageal cancer patients. There is a statistical difference if $P < 0.05$.

3. Results

3.1. Surgical indicators for esophageal cancer

Table 2 showed that the surgical indicators of patients with esophageal cancer in group A were better than those in group B ($P < 0.05$).

Table 2. Comparison of surgical indicators for esophageal cancer (mean ± SD)

Group	Incision length (cm)	Operation time (min)	Length of hospital stay (d)	Chest drainage volume (ml)	Number of lymph nodes dissected (pieces)	Intraoperative blood loss (mL)
Group A ($n = 30$)	5.58 ± 1.25	261.25 ± 1.88	11.84 ± 1.25	425.15 ± 25.25	11.01 ± 0.58	187.25 ± 8.19
Group B ($n = 30$)	16.11 ± 1.39	339.42 ± 1.99	19.48 ± 1.36	548.36 ± 31.44	12.84 ± 0.64	333.61 ± 9.43
t	30.8525	156.3974	22.6539	16.7356	11.6049	64.1829
P	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.2. Inflammatory factor indicators

After the operation, the levels of IL-6, CRP, and TNF-α in patients with esophageal cancer in group A were lower than those in group B ($P < 0.05$), as shown in **Table 3**.

Table 3. Analysis table of inflammatory factor levels before and after the operation (mean ± SD)

Group	IL-6 (ng/L)		CRP (mg/L)		TNF-α (ng/L)	
	Before	After	Before	After	Before	After
Group A (n = 30)	8.31 ± 0.42	71.86 ± 11.25	5.01 ± 0.89	6.29 ± 1.32	20.07 ± 3.25	36.11 ± 4.15
Group B (n = 30)	8.29 ± 0.44	100.14 ± 15.43	5.03 ± 0.91	8.25 ± 1.39	20.05 ± 3.27	47.85 ± 6.21
t	0.1801	8.1115	0.0861	5.6004	0.0238	8.6092
P	0.8577	0.0000	0.9317	0.0000	0.9811	0.0000

3.3. Quality of life indicators

Table 4 showed that the SF-36 scores of patients with esophageal cancer in group A were higher than those in group B after the operation ($P < 0.05$).

Table 4. SF-36 score analysis of patients with esophageal cancer before and after the operation (mean ± SD)

Group	Physical health (points)		Mental health (points)		Physiological functions (points)		Social functions (points)	
	Before	After	Before	After	Before	After	Before	After
Group A (n = 30)	61.28 ± 2.15	83.25 ± 3.58	62.49 ± 2.36	84.11 ± 3.61	63.25 ± 2.42	81.42 ± 3.41	61.52 ± 2.21	81.59 ± 3.52
Group B (n = 30)	61.31 ± 2.17	72.43 ± 2.79	62.51 ± 2.41	73.16 ± 3.43	63.27 ± 2.39	72.84 ± 3.25	61.49 ± 2.15	62.36 ± 3.43
t	0.0538	13.0572	0.0325	12.0441	0.0322	9.9762	0.0533	21.4306
P	0.9573	0.0000	0.9742	0.0000	0.9744	0.0000	0.9577	0.0000

3.4. Complications

The surgical complication rate in group A was lower than that in group B ($P < 0.05$), as shown in **Table 5**.

Table 5. Analysis table of complications in two groups [n (%)]

Group	Anastomotic fistula	Recurrent laryngeal nerve injury	Tracheal injury	Cardiopulmonary complications	Incidence rate
Group A (n = 30)	0	0	0	1	3.33
Group B (n = 30)	1	1	1	3	20.00
x^2	-	-	-	-	4.0431
P	-	-	-	-	0.0444

4. Discussion

In the early stage of esophageal cancer, patients may experience symptoms such as dysphagia, tight throat, and dry throat. In the early stage of esophageal cancer, patients may experience symptoms such as dysphagia, tight throat, and dry throat. During daily eating, foreign body sensations and swallowing blockage may occur, and some patients may also have abdominal pain [2]. With the progression of esophageal cancer, the diameter of

the tumor continues to expand, and the patient has the problem of being unable to swallow dry and hard food. In the middle and advanced stages, the symptoms of dysphagia are progressively aggravated, and there is no remission period of dysphagia during the onset. In summary, the causes of esophageal cancer are as follows: (1) Alcoholism and smoking: the aforementioned factors are high-risk factors for esophageal squamous cell carcinoma, and the incidence rate of smokers is 3–8 times higher than that of ordinary people, and the incidence of alcoholics is 7–50 times higher than that of ordinary people; (2) Nitrite: nitrosamines are mainly composed of nitrites. Food containing nitrosamines can cause esophageal epithelial hyperplasia and induce esophageal cancer. In addition, there are a lot of nitrites in pickled food, so it is not advisable to overly eat; (3) Fungi: there are a lot of mycotoxins in moldy food, which can act on nitrate, causing it to undergo a reduction reaction to generate nitrite, which in turn generates carcinogen nitrosamines; (4) Lack of trace elements: long-term lack of trace elements in large quantities can also increase the risk of cancer; (5) overly high body mass; (6) occurrence of precancerous lesions: factors such as esophageal diverticulum and esophageal burns can induce chronic esophagitis, and long-term inflammatory infiltration can cause esophageal canceration; and (7) inheritance: esophageal cancer is hereditary in families. However, the specific clinical causes of esophageal cancer are yet to elucidate, so it is difficult to prevent and treat esophageal cancer [3,4].

The risk of esophageal cancer in China is relatively high, and the pressure of diagnosis and treatment is relatively high. Based on the analysis of the physiological and anatomical structure of the esophagus, there is a rich lymphatic network inside, and the risk of cancer metastasis is high. Once it metastasizes to the mediastinal lymph nodes, it can increase the mortality of patients. At present, surgery is mostly used in clinical treatment of esophageal cancer. The conventional operation is thoracotomy, which is a large trauma operation and can increase the infection rate after surgery which then prolong the recovery time of patients. Some patients with esophageal cancer cannot tolerate it. In recent years, video-assisted thoracoscopic surgery has gradually been used in the treatment of patients with esophageal cancer. With the assistance of photography technology, advanced equipment is used to complete the operation. A clear surgical field is helpful for doctors to determine the scope of surgical operations [5]. In addition, video-assisted thoracoscopic surgery can ensure doctors completely remove esophageal lesions, thereby reducing the recurrence rate after surgery; thoracoscopic surgery can also assist doctors in fully observing the physiological structure from the top of the chest to the diaphragm and has a deep lighting function, which can improve the doctor's operation accuracy, to avoid damaging the adjacent tissues during surgical resection, thereby ensuring surgical safety [6]. Compared with traditional thoracotomy for the treatment of esophageal cancer, the video-assisted thoracoscopic operation has less trauma and is more suitable for the treatment of patients with esophageal cancer.

Combined with the data analysis in this paper, the surgical indicators of patients with esophageal cancer in group A were better than those in group B ($P < 0.05$). It is suggested that video-assisted thoracoscopic surgery is more conducive to the rehabilitation of patients with esophageal cancer. Conventional thoracotomy for esophageal cancer appears to be traumatic, which is not conducive to the prognosis of patients. However, the surgical operation under video-assisted thoracoscopic surgery can reduce the surgical incision, help doctors to observe the physiological and anatomical structure of the surgical area, and can also perform precise free operation and reduce surgical trauma, so the prognosis of patients is better [7]. Another set of data showed that IL-6, CRP, and TNF-α in patients with esophageal cancer in group A were lower than those in group B ($P < 0.05$). It shows that after video-assisted thoracoscopic treatment, the level of inflammation in patients is lower. During video-assisted thoracoscopic treatment, several small incisions are made on the chest wall, and the doctor observes the physiological structure of the chest cavity on the monitor screen and uses specific surgical instruments to carry out the surgical treatment, which is equivalent to the doctor looking directly at the

patient's chest cavity, and the thoracoscope has high-definition imaging, magnifies the local tissue function, and can expand the surgical field of view, so the surgical operation is more accurate and the adjacent tissue is less damaged, hence, the postoperative inflammatory reaction is mild [8]. In addition, the incision range of video-assisted thoracoscopic surgery is similar to that of thoracotomy, and the positive rate of intraoperative pathological biopsy is higher than that of needle biopsy, which is suitable for the treatment of patients with esophageal cancer [9]. In this study, the SF-36 score of group A was higher than that of group B ($P < 0.05$). Lymph node dissection and resection of esophageal cancer lesions are important factors affecting the prognosis of patients with esophageal cancer. Video-assisted thoracoscopic treatment can expand the physician's surgical field and facilitate the evaluation of the tissue gap during the separation period. At the same time, the recurrent laryngeal nerve and lymphatic vessel location can be observed, so the postoperative recovery of patients is better, and the quality of life score is higher [10,11]. The last group of data showed that the postoperative complication rate of patients with esophageal cancer in group A was lower than that in group B ($P < 0.05$). Video-assisted thoracoscopic surgery has a slight impact on the patient's abdominal breathing, which is conducive to the patient's spontaneous coughing, and single-lung ventilation can avoid the risk of secondary cardiopulmonary injury after surgery, which is safe and efficient.

In summary, video-assisted thoracoscopic surgery for patients with esophageal cancer can reduce postoperative complications of esophageal cancer, reduce postoperative inflammatory response, and enhance the quality of life of patients, which has a promotion value.

Disclosure statement

The author declares no conflicts of interest.

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