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Analysis of the effect of video-assisted thoracoscopic surgery on immune function and survival in patients with early stage lung cancer undergoing radical operation

Zhang Xi

The Tumor Hospital of Shaanxi Province, Xi'an, Shaanxi, 710065, China

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ABSTRACT

Objective To analysis of the effect of video-assisted thoracoscopic surgery on immune function and survival in patients with early stage lung cancer undergoing radical operation. **Methods** From August 2009 to May 2011, 96 cases of early stage lung cancer undergoing radical operation patients were studied in our hospital. According to the simple random method were divided into control group and observatio n group, each group of 48 patients. The control group underwent thoracotomy and resection of lung cancer and the observation group underwent endoscopic resection of lung cancer. Comparison of the two groups of patients with surgery, immune parameters, quality of life and prognosis. **Results** The operation situation of the two groups were compared, found no significant difference between the two groups of patients with operation time (P>0.05), but the amount of intraoperative bleeding, postoperative drainage, extubation time and postoperative ambulation time were significantly lower than the control group (P<0.05); two groups of patients before and after surgery, IgA IgM had no significant difference (P>0.05), and IgG patients after surgery is higher than the level before surgery, and CD_3^+,CD_4^+,CD_8^+T cell fraction less than before the surgery, compared with statistical significance (P<0.05); the patients in the observation group 1 days after IgG was significantly higher than control group, and CD_3^+,CD_4^+,CD_8^+T cell fraction in 1 days after

Corresponding author:

Zhang Xi, The Tumor Hospital of Shaanxi Province, Xi'an, Shaanxi, Email: 173559682@qq.com

surgery was lower than that of control group, compared with statistical significance (P<0.05); the control group of patients with 5 year survival rate was 43.75% and the observation group patients 5 year survival rate was 56.25%. Two groups of patients with 5 year survival rate, recurrence rate and distant metastasis showed no significant difference (p>0.05). But the recurrence time of the observation group was significantly higher than the control group (P<0.05); the two groups of patients after treatment, the physiological status, social / family status, emotional status, functional status, additional lung cancer status was better than that before treatment (P<0.05), and the observation group of patients with physiological status, social / family, emotional status, functional status, additional lung cancer status was significantly better than the control group (P<0.05). **Conclusion** Compared with thoracotomy, video-assisted thoracoscopic surgery for early lung cancer resection, with small trauma, short recovery time of patients with, and has little effect on the immune function of patients, prolong the recurrence time of patients, improve the quality of life of patients.

0 Introduction

Lung cancer is one of the most common cancers in the respiratory system, which has the characteristics of high morbidity and mortality, and the number of people with lung cancer is increasing[1].At present, in the clinical treatment of early lung cancer, more surgical radical resection is used to prevent the spread of cancer. In the past, thoracotomy was used to remove it. However, because of the bigger trauma of thoracotomy, it will not only cause physical trauma, but also cause severe incision pain after operation[2].The study found[3] that the surgical trauma can inhibit the immune function of the body. The greater the trauma, the more serious the body's immune injury. The immune function of patients with lung cancer has been reduced. Combined with the effect of surgical trauma, the immune function of patients decreased further, and then the risk of postoperative infection increased. Serious patients can cause cancer proliferation, resulting in serious complications. Therefore, how to reduce the impact of surgical trauma on the body becomes a hot research point in thoracic surgery. With the development of minimally invasive technique, it has the advantages of small surgical incision, light postoperative pain and quick recovery of postoperative patients, which has become the first choice for surgical treatment of thoracic surgery[4]. This article will analyze the effect of video-assisted thoracoscopic surgery on the immune function and survival period of patients with early lung cancer undergoing radical operation, and understand the clinical value of video-assisted thoracoscopic surgery in the treatment of early lung cancer, so as to improve the therapeutic effect and improve the quality of life of patients. Specific reports are as follows.

1 Materials and methods

1.1 General Information

The whole study was approved by the Ethics committee of our hospital, and the treatment program was informed to the patients and their families. The consent of the patients and their families was obtained and the informed consent was signed. Inclusion criteria:(1) the patient was admitted to the hospital with CT examination and was suspected to be lung cancer;(2) the pathological examination of postoperative patients showed Ⅰ and Ⅱa period; (3) patients had no surgical contraindications. Exclusion criteria: (1) the patient had autoimmune disease; (2) patients received adjuvant chemotherapy before operation; (3)patients could not be followed-up. According to the inclusion and exclusion criteria, 96

patients with early lung cancer who were admitted to our hospital from August 2009 to May 2011 were retrospectively analyzed. According to the simple random method, the patients were divided into control group and observation group,48 patients in each group. The patients in the control group was treated with thoracotomy for lung cancer while the patients in the observation group was treated with laparoscopic resection of lung cancer. There was no statistically significant difference in gender, age, pathologic classification and lesion location and other general situations between the two groups of patients (P>0.05). So it can be compared and analyzed. See table 1 for specific data.

Table 1 General situations comparison of patients

groups	control group（n=48）	observation group（n=48）	χ^2/T value	P value
male/female（n）	32/16	31/17	0.0462	0.8299
average age（years old）	61.34±7.52	62.13±7.38	0.5195	0.6047
pathological type				
lung adenocarcinoma	17	18	0.003	0.9565
lung squamous carcinoma	13	13	0.0163	0.8985
adenosquamous carcinoma of the lung	8	6	0.3345	0.563
bronchioloalveolar carcinoma	6	6	0	1
other	4	5	0.0804	0.7768
lesion site			0.3858	0.9836
upper lobe of left lung	12	14		
inferior lobe of left lung	9	8		
upper lobe of right lung	11	10		
middle lobe of right lung	9	8		
inferior lobe of right lung	7	8		
Clinical Staging			0.1939	0.6597
Ⅰ Period	34	32		
Ⅱa period	14	17		

1.2 Methods

1.2.1 Surgical methods

（1）control group: treatment with conventional thoracotomy: underwent general anesthesia and intravenous administration with double lumen bronchial intubation. Auxiliary ventilation in the contralateral side. The patient was a contralateral side, intercropping a 15-20cm incision in the 5th rib into the thoracic cavity to explore the situation of cancer, the location, size of the tumor and its relationship with the surrounding structure. Free bronchi,venous and arterial, ligation, resection of cancer and cleaning mediastinal and hilar lymph nodes, placed thoracic closed drainage tube and closed the thoracic cavity.（2）observation group: underwent general anesthesia and intravenous administration with double lumen bronchial intubation. Auxiliary ventilation in the contralateral side. The patient was a contralateral side. A length of approximately 1cm observation port was set at the intersection of the axillary midline with the 7th or 8 intercostal area, placed in a thoracoscope to explore and identified the location of cancer. The main operation mouth auxiliary the operation mouth. Free bronchi,venous and arterial under the video-assisted thoracoscope, ligation, resection of cancer and cleaning mediastinal and hilar lymph nodes. Finally, ventilation was performed on both lungs to check for air leakage and active bleeding. A drainage tube was placed in which the upper lobe of the lung in the observation hole and the auxiliary operation place, and 1 drainage tube were placed in the observation hole in the middle lobe and the lower lobe of the lung.

1.3 Observation indicators

Record surgery time, the amount of intraoperative bleeding and postoperative drainage, extubation time and postoperative ambulation time of two groups of patients; IgA, IgM, IgG level and CD3+、CD4+、CD8+T cell fraction of preoperative and 1 days, 3 days, 7 days after the operation; preoperative and postoperative survival quality score of patients (based on FACF-L Chinese version 4.0[5]) and recurrence and survival of lung cancer for patients in 5 years follow-up.

1.4 Statistical analysis

The data obtained from this subject are SPSS15.7 package for processing. (X±s) is used to express measurement data. T-Test is used to compare the difference and [N (%)] is used to show the count data. $\chi 2$ is used to test the difference.When $P< 0.05$, the difference is considered statistically significant.

2 Results

2.1 Comparison of operation situations between the two groups

The operation situation of the two groups were compared and it was found that the operation time has no significant difference between the two groups of patients ($P>0.05$), compared with no statistical significance ($P>0.05$); but the amount of intraoperative bleeding, postoperative drainage amount, extubation time and postoperative ambulation time of patients in observation group were significantly lower than the control group ($P<0.05$), compared with statistical significance（$P<0.05$). See table 2 for specific data.

2.2 The test results of preoperative and postoperative immune function index in two groups of patients

There was no significant difference in IGA and IgM between the two groups of patients before and after operation（$P>0.05$). The IgG level and CD3+、CD4+、CD8+T cell fraction of patients after operation were lower than before operation, compared with statistical significance($P<0.05$). The IgG level of the observation group was significantly higher than that of the control group 1 days after operation and the CD3+、 CD4+、CD8+T cell fraction was lower than those in control group 1 days after operation, compared with statistical significance($P<0.05$). See table 3 for specific data.

Table 2 Comparison of operation situations between the two groups [x±s]

Groups	operation time（min）	intraoperatie bleeding（ml）	postoperative drainage（ml）	extubation time（d）	postoperative ambulation time（d）
control group（n=48）	136.50±42.40	167.31±29.16	415.32±54.76	3.93±1.17	4.05±1.01
observation group（n=48）	153.09±39.51	103.37±23.64	230.13±59.35	2.13±1.02	2.11±1.37
T value	1.9832	7.6437	15.8883	8.0343	7.8967
P value	0.0503	<0.0001	<0.0001	<0.0001	<0.0001

Table 3 The test results of preoperative and postoperative immune function index in two groups of patients [x±s，n=48]

index		preoperative	postoperative 1d	postoperative 3d	postoperative 7d
IgG（g/L）	control group	14.04±3.35	10.41±2.39[1]	11.19±2.22[1]	9.97±2.23[1]
	observation group	14.52±2.43	12.01±2.12[12]	11.02±2.16[14]	9.91±2.13[14]
IgA（g/L）	control group	2.12±0.72	1.74±1.72[3]	1.76±0.66[3]	1.80±0.63[3]
	observation group	2.12±1.45	1.97±0.83[34]	2.05±0.97[34]	2.09±1.03[34]
IgM（g/L）	control group	1.46±0.67	1.11±0.48[3]	1.20±0.51[3]	1.30±0.55[3]
	observation group	1.32±0.68	1.30±1.06[34]	1.14±0.58[34]	1.09±0.59[34]
CD3+T cell fraction（%）	control group	45.17±5.82	32.52±6.17[1]	37.81±6.39[1]	43.31±6.22[1]
	observation group	45.20±5.78	37.01±6.04[12]	38.20±6.02[14]	43.20±5.64[14]
CD4+T cell fraction（%）	control group	34.70±3.11	27.79±4.03[1]	31.20±4.02[1]	33.62±4.22[1]
	observation group	35.10±3.33	30.66±3.90[12]	31.45±3.40[14]	33.36±3.64[14]
CD8+T cell fraction（%）	control group	26.40±4.64	24.34±5.26[1]	24.42±5.23[1]	26.40±4.12[1]
	observation group	26.18±4.81	21.99±5.11[12]	24.39±5.34[14]	26.21±4.22[14]

Note：1p<0.05，compared to preoperative；2p<0.05，compared with the control group；3p>0.05，compared to preoperative；4p>0.05，compared with the control group.

2.3 Evaluation results of survival quality before and after operation in two groups of patients

evaluate the quality of life of two groups of patients before the operation and after 6 months after the operation. After treatment, the two groups had better physiological condition, social/family status, emotional status, functional status, and additional lung cancer status than before treatment, compared with statistical significance（ P<0.05). The physiological condition, social/family condition, emotion status, function status and additional lung cancer status of patients in the observation group were better than those in the control group, compared with statistical significance (P<0.05). See table 4 for specific data.

Table 4 Evaluation results of survival quality before and after operation in two groups of patients（x±spoints）

Groups		the physiological status	social/ family status	emotional status	functional status	additional lung cancer status	total
control group（n=48）	preopera-tive	18.13±1.18	19.12±1.62	19.02±1.48	18.84±1.43	17.98±1.86	96.16±4.97
	Postoper-tive	19.94±1.861	23.69±1.911	21.07±1.871	21.16±2.781	25.54±1.801	113.09±4.711
observation group（n=48）	preopera-tive	18.93±1.48	19.13±1.54	19.13±1.47	19.14±1.36	19.23±1.77	95.33±5.19
	Postopera-tive	22.84±1.8512	23.99±1.9212	22.39±2.0912	23.46±1.8712	26.34±1.9612	118.66±6.4112

Note：[1]p<0.05，compared to preoperative；[2]p<0.05，compared with postoperative of the control group.

2.4 Comparison of postoperative tumor recurrence, metastasis and survival situations in two groups of patients

The 5-year survival rate of patients in the control group was 43.75%. The 5-year survival rate of patients in the observation group was 56.25%. There was no statistically significant difference between the 5-year survival rate, recurrence rate and distant metastasis in two groups（p>0.05). But the postoperative recurrence time of the observation group was significantly higher than the control group, compared with statistical significance（P<0.05). See table 5 for specific data.

3 Discussion

With the development and maturation of video-assisted thoracoscopic surgery technology, significant achievements have been made especially in the treatment of early lung cancer[6]. In clinical practice, video-assisted thoracoscopic surgery is the main surgical method for early radical resection of lung cancer. Domestic and international studies have found that video-assisted thoracoscopic surgery resection of early lung cancer can achieve the same therapeutic effect as traditional thoracotomy for lung cancer resection[7-8]. In the earlier stage of resection of lung cancer, the posterior lateral incision was used to enter the thoracic cavity for resection of cancer and dissection of lymph nodes[9-10]. However, the operative incision of this method is larger, and it needs to cut off the patient's latissimus dorsi muscle and the anterior saw muscle, which has a greater trauma, more bleeding, and slower

Table 5 Comparison of postoperative tumor recurrence, metastasis and survival situations in two groups of patients

Groups	recurrence time[x±s, month]	recurrence rate[n(%)]	distant metastasis[n(%)]	survival rate after 5 years[n(%)]
control group（n=48）	16.19±2.13	3（6.25）	5（10.42）	21（43.75）
observation group（n=48）	19.93±1.90	4（8.33）	2（4.16）	27（56.25）
T value	9.0781	0.1541	1.3868	1.5
P value	<0.0001	0.6947	0.2389	0.2207

postoperative recovery. And the patient's postoperative wound pain is intense, easy to cause cardiovascular and respiratory complications[11-12]. In the late 1980s, with the advent of endoscopic surgical equipment and instruments, endoscopic technology developed rapidly. Swanson [13]and others have found that video-assisted thoracoscopic surgery can achieve the objective of thoracotomy surgery. But it only has 2-3 holes in the chest wall and does not need to open the chest, then reducing the surgical trauma. The results showed that there was no significant difference in operation time between the two groups. However, the intraoperative bleeding volume, postoperative drainage volume, extubation time and postoperative ambulation time of patients in the observation group were significantly lower than those in the control group. The results show that video-assisted thoracoscopic surgery has less trauma, faster recovery and lower physiological effects on the body.

The study found[14-15] that surgical trauma could inhibit somatic cell immunity and humoral immunity. Humoral surface immunity for B cells is stimulated , producing IgG, IgA, IgM and other specific immunoglobulin. Immunoglobulins can identify specific antigens and bind to specific antigens to prevent antigen-cell binding. The results showed that there was no significant difference in IGA and IgM between the two groups before and after operation.The level of IgG of patients was lower than before the operation.The IgG level in patients with video-assisted thoracoscopic surgery was significantly higher than those with thoracotomy surgery. It shows that the operation can consume specific immunoglobulin. The more the immunoglobulin consumes, the greater the degree of trauma[16-17]. Therefore, video-assisted thoracoscopic surgery can protect the body's immune function.The study showed that cellular immunity is limited after surgery, and the total number of T cells can be reduced to varying degrees. Nq [18]and other studies showed that the total number of lymphocytes in patients after thoracotomy and video-assisted thoracoscopic surgery decreased. However, the inhibition degree of CD_4^+T cells in patients with video-assisted thoracoscopic treatment was lighter than that in the thoracic group, and the inhibition time was shorter. It is indicated that video-assisted thoracoscopic surgery has less inhibitory effect on body immunity[19-20]. The results of this study showed that the CD3 +, CD4+ and CD8+T cell fraction after the operation were lower than before the operation in the two groups. However, the CD3+、CD4+、CD8+T cell fraction of the group with video-assisted thoracoscopic surgery were significantly lower than those in the control group 1 days after operation. It is indicated that

video-assisted thoracoscopic surgery can better protect the immunity of organism, and can prevent the risk of complications such as postoperative infection.

The results showed that the 5-year survival rate of patients with open radical resection of the cancer group was 43.75%, and the 5-year survival rate was 56.25% for the patients with the radical resection of the video-assisted thoracoscopic surgery. There was no statistically significant difference in survival rate, recurrence rate and distant metastasis between the two groups in 5 years. But the recurrence time of the group with the radical resection of video-assisted thoracoscopic surgery was significantly higher than that of the group with the open radical resection of cancer. After treatment, the two groups had better physiological condition, social/family status, emotional status, functional status, and additional lung cancer status than before treatment. The physiological status, social/family status, emotional status, functional status, and additional lung cancer status of the group with radical resection of the cancer after video-assisted thoracoscopic surgery were better than that of open radical resection of the cancer group. It is indicated that video-assisted thoracoscopic surgery is beneficial to prolong the recurrence time of lung cancer patients after operation and the safety is high. It also can improve the 5-year survival rate and improve the quality of life of patients.

In conclusion, compared with thoracotomy, video-assisted thoracoscopic surgery for early lung cancer resection has some advantages, such as small trauma, short recovery time for patients and has little effect on the immune function of patients. It also can prolong the recurrence time of patients, improve the quality of life of patients under the precondition of ensuring effective dissection of lymph nodes. Therefore, the use of video-assisted thoracoscopic surgery for early lung cancer to implement radical resection has an important clinical significance.

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