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Videothoracoscopy for Surgical Treatment of Tumors and Mediastinal Cysts

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Abstract The treatment of 58 patients with tumors and cysts of the mediastinum aged from 17 to 67 years is presented. The patients were divided into two groups: control group - 36 and main group - 22. Localization was in the anterior mediastinum in 37 patients, in the posterior mediastinum in 21 patients. Video-assisted thoracoscopic interventions were performed in 22 patients, conversion in 2 patients, single-port or video-assisted thoracoscopy in 2 patients. **Results:** There were no complications observed in patients undergoing video-assisted thoracoscopic surgery. The data obtained indicate the high safety and effectiveness of video-assisted thoracoscopic operations in patients with mediastinal tumors due to the low incidence of intra- and postoperative complications. Videothoracoscopic interventions make it possible to remove large tumors in the absence of ingrowth or ingrowth of mediastinal structures.

Keywords Videothoracoscopy VTS, Single-port thoracoscopy, Video-assisted thoracoscopy VATS, Robotic videothoracoscopy RVTS

1. Introduction

The roots of thoracoscopy go back to 1910, when the Swedish physician Han Christian Jacobeus first looked into the pleural cavity through the small opening of a modified cystoscope [1,3] to perform pleural adhesiolysis for tuberculosis. Thus, a new way of diagnosing and treating chest diseases was opened. The method was reborn with the advent of new instruments in the early 1990s, and a new approach called video-assisted thoracic surgery (VATS) [2,5].

Over the next two decades, up to this point, a revolution in thoracoscope design unfolded before our eyes. These innovations are the fruits of the joint efforts of surgeons and engineers. With unprecedented visual clarity [1,7], comparable surgical productivity [1,8], equivalent or improved postoperative outcomes [4,9], and subsequent cost reductions, thoracopic surgery in its various forms is beginning to attract more surgeons to this area. VTS has proven to be an excellent surgical approach in many centers. As a result, this approach is gradually replacing open thoracotomy as the standard of care for the diagnosis and treatment of a number of chest diseases.

However, the field faces two major challenges, namely limited agility and poor control intuition.

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We analyzed the strengths and weaknesses of VTS in parallel with traditional thoracotomy in the treatment of mediastinal tumors and cysts.

Mediastinal tumors are a group of benign and malignant tumors of various structures, located within the anatomical limits of the mediastinum and of non-organ origin. The frequency of mediastinal tumors in the structure of oncological diseases is about 1%. Malignant and benign are found and diagnosed in a ratio of 4: 1. Mediastinal tumors are detected mainly in young and middle age; men and women are affected equally often. Open diagnostic operations (mediastinotomy, diagnostic thoraco- and sternotomy) are performed less and less often due to their traumatic nature, and the role of videothoracoscopy as a universal diagnostic alternative is still not fully defined.

Complete surgical resection of mediastinal tumors requires excellent knowledge and management. Large tumors in proximity to vital structures require a high level of training and sufficient knowledge to assess the risks and benefits during certain surgical procedures. Currently, anterior and posterior mediastinal tumors are recognized as ideal candidates for minimally invasive resection.

However, there is no consensus among surgeons regarding the best minimally invasive technique between VTS, VATS, and RATS. VTS provides better impact due to high definition, three-dimensional images and the possibility of using a fourth thoracoport. These intraoperative benefits include minimally invasive techniques using VTS to reduce

mortality and morbidity, improve quality of life, and shorten length of hospitalization [5,6].

2. Materials and Methods of Research

From 2020 to 2023, 58 patients with mediastinal diseases, aged from 17 to 67 years, were under our supervision at the Fanomed clinic. The patients were divided into two groups: the main group and the control group.

Upon admission, patient 7 had no complaints. The remaining patients had the complaints presented in Table 1.

Table 1. Distribution of patients according to the presence of complaints

№	Complaints	abs	%
1.	Weakness	42	72%
2.	Dyspnea	13	22%
3.	Fast fatiguability	28	48%
4.	Ptosis	21	36%
5.	Diplopia	21	36%
6.	Chest pain	38	65%
7.	Cough	8	13%
8.	Itchy skin	1	1,7%
9.	Dysphagia	26	44%
10.	Blurred vision	21	36%
11.	Heartbeat	3	5,1%
12.	Swelling of the face and neck	2	3,4%

Note. * - some patients had several complaints.

The control group included patients who used traditional methods for surgical treatment of mediastinal formations, that is, sternotomy, thoracotomy. The main group included those patients who underwent videothoracoscopy. The control group included 36 patients, including 20 men and 16 women. The main group included 22 patients: 14 men, 8 women. Table 2.

Table 2. Distribution of patients by type of mediastinal neoplasm

№		Control group		Main group		General
		male	female	male	Female	
	Anterior mediastinum	10	11	9	7	37
1.	Thymoma	8	5	6	2	21
2.	Lymphoma	1	1	1	2	5
3.	Pericardial cyst	1	3	1	2	7
4.	Sarcoidosis	0	2	1	1	4
	Posterior mesiastinum	9	6	5	1	21
5.	Neuroma	8	4	4	1	17
6.	Schwannoma	1	2	1	0	4

All patients underwent comprehensive general clinical laboratory instrumental examinations, as well as radiography in 2 positions, MSCT, MRI, if necessary, MSCT angiopulmonography and PET CT.

3. Results of the Study

In patients in the control group with thymic formations, longitudinal sternotomy and extended thymectomy were performed in 10 cases. In one case, due to tumor growth into the pericardium and the right atrium, it was possible to partially remove the thymus gland, leaving part of the tumor. In the postoperative period, one patient developed suppuration of the postoperative wound, mediastinitis, which was eliminated by conservative methods.

Mortality occurred in one patient in the postoperative period on day 3; the cause of death was massive pulmonary embolism. In other cases, a lateral thoracotomy of 5 m/r was performed. Pericardial cysts in all 4 cases were located on the right side and were completely removed. In 4 cases in patients with sarcoidosis and lymphoma, the operation ended with tumor resection and biopsy.

In patients in the control group with neoplasms of the posterior mediastinum, lateral thoracotomy and tumor removal were performed. Table 3.

Table 3. Distribution of patients by volume of intervention performed

№	Volume of operation	Number of patients
1	Complete removal of the tumor	27 (75%)
2	Cytoreductive surgery	2 (5,5%)
3	Tumor biopsy	7 (19,4%)

In the main group, all patients began surgery with videothoracoscopy.

Thoracoscopy was performed using standard techniques in the lateral position.

Three thoracoports were installed in the pleural cavity (one for the optical system, two for manipulation). The points of trocar insertion depended on the localization of the pathological process (Figure 1).

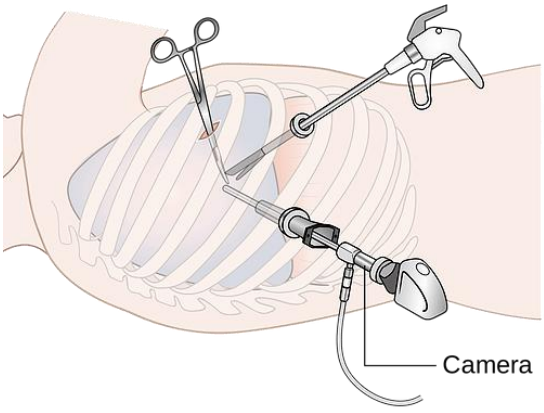


Figure 1. Diagram of the location of thoracoports

Thoracoscopy was used as the final stage of diagnosis in the absence of morphological verification of the diagnosis, and as a therapeutic procedure.

In patients with thymoma, in 7 cases VTS was performed on the right, in one case on the left. It was possible to perform extended thymectomy completely using videothoracoscopic

techniques in 6 patients. In 2 cases conversion was carried out. In one case, due to tumor invasion into the upper lobe on the left, a lateral thoracotomy, extended thymectomy, and polysegmental resection of the upper lobe were performed. In one case, due to massive bleeding, a lateral thoracotomy had to be performed; after stopping the bleeding, the operation was completed with an extended thymectomy. In patients with pericardial cysts (all cases on the right side), the cysts were completely eliminated using VTS. In 5 patients with lymphoma and sarcoidosis, it was possible to resect the main area of the tumor using videothoracoscopic surgery and take a biopsy. This group of patients had no complications in the postoperative period. In 6 patients in the main group with neoplasms of the posterior mediastinum, VTS was used to remove the formations without additional incisions. Table 4.

Table 4. Distribution of patients depending on access option

№	Operation option	Number of patients
1	Videothoracoscopic removal	18 (81,8%)
2	Conversion	2 (9%)
3	Single or video assisted intervention	2 (9%)

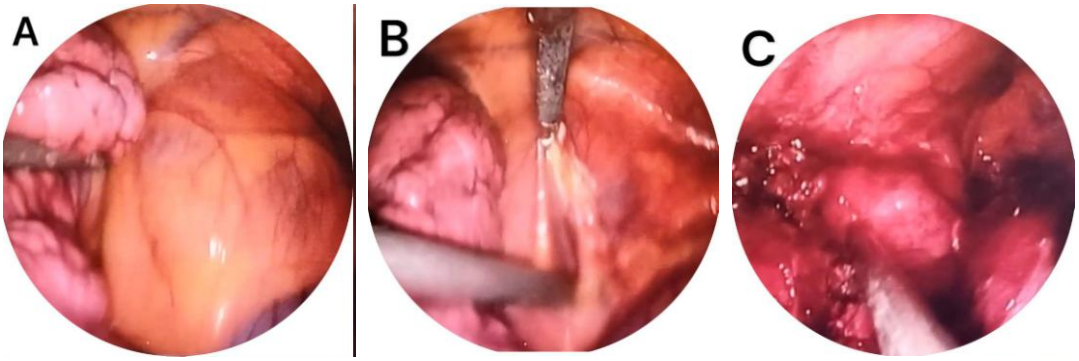
In the postoperative period, in the main group of patients, restoration of respiratory function and extubation was performed in the early hours by 0.5-1 hour p\o, than in the control group by 2-5 hours (especially in patients with thymoma with myastinic syndrome). In patients in the main group compared to the control group, there was a decrease in pain in one day, one week and 2-4 weeks. There was a decrease in the need for analgesics after surgery and an improvement in quality of life. Reduced hospital stay by 2.6 days. The location of the drainage tube was correspondingly reduced in patients in the main group compared to the control group on days 2-3 after surgery in the main group than on days 4-5 in the control group.

Here is our observation: Patient A, 30 years old, was admitted to the clinic with complaints of fever up to 37-38C, weakness, moderate pain in the anterior surface of the chest, more on the left, and a dry cough. According to him, he has been ill for several months, was repeatedly examined and treated in various hospitals without visible results. After admission, MSCT of the chest revealed a cystic formation in the anterior mediastinum on both sides. Figure 2.

After examination, the patient underwent VTS removal of the pericardial cyst in stages, first on the right side and then on the left side.

A **B**

Figure 2. MSCT image (A,B) of a complete pericardial cyst on the right, a protrudicular cyst on the left



A – revision of the pericardial cyst on the right.

B - resection of the cyst.

C – stage of resection of the pericardial cyst on the left.

Figure 3. Stages of video-assisted thoracoscopic surgery in this patient

The postoperative period proceeded smoothly; drainage tubes were removed 2-3 days after surgery. On control radiography, the lungs are expanded, the sinuses are free. Pathohistological examination: right: fibro-fatty tissue with hyperplastic lymphoid tissue, left: thymolipoma.

4. Conclusions

Videothoracoscopy is an effective and safe method in patients with mediastinal masses, which indicates a low incidence of intra and postoperative complications. In this case, the choice of access (videothoracoscopy, one port or video-assisted intervention) should be determined strictly by the localization, size of the formation, and its relationship with surrounding vital organs.

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