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Videothoracoscopic thymectomy for diagnostic and treatment of thymic tumors

Relevance: *The incidental anterior mediastinal tumors present a diagnostic challenge, while the biopsy is associated with a risk of dissemination of tumor cells in the pleural cavity. Video thoracoscopic (VATS) thymectomy (TE) does not create such a problem; however, like any operation, it presents a potential risk.*

The purpose of this study *was to demonstrate the possibility of safe application of VATS TE for thymic tumors diagnostics and treatment.*

Results: *The data of 156 patients (of them, 50 men, 32.1%, and 106 women, 67.9%) who underwent VATS TE was retrospectively analyzed. The average age of the patients was 43.8±18.1 years. The average size of the removed tumor was 56.1±32.6 mm. The average time of the operation was 119±57.1 min, intraoperative blood loss was 39.7±76.5 ml. The chest tube drainage took 1.4±0.9 days, and the postoperative stay was 4.9±2.1 days. 28 (8.9%) patients developed postoperative complications of degree I-II. There was no 90-day postoperative mortality.*

Conclusion: *VATS TE is an effective and relatively safe operation that can be recommended for diagnostics and treatment of small anterior mediastinal tumors without preliminary histological verification.*

Keywords: *VATS thymectomy, thymoma, anterior mediastinal tumor.*

Introduction: D.J. Sugarbaker and W. Coosemans et al. [1, 2] first reported about video thoracoscopic thymectomy (VATS TE) in 1993. VATS TE has a number of advantages compared to sternotomy. VATS TE is associated with smaller intraoperative blood loss and fewer complications. This results in fewer blood transfusions and a shorter pleural cavity drainage and hospital stay [3]. However, these operations are only made in large reference centers, while sternotomy remains the "gold standard" of treatment for thymoma and myasthenia, due to a relative rareness of that pathology.

At the same time, the need for histological verification of the diagnosis before surgery is still a matter of argument since the anterior mediastinum may be the location of cysts, primary thymus lymphomas, germ cell tumors, etc. which require a different approach to treatment. The advantages of different types of access (traditional, single-port, subxiphoid, etc.) and the choice of the operation side and the volume of intervention are still under discussion [4-9].

The purpose of this study was to demonstrate the possibility of safe application of VATS TE for thymic tumors diagnostics and treatment.

Materials and Methods: The authors made a retrospective analysis of data of 156 patients (of them, 50 men, 32.1% and 106 women, 67.9%) who underwent VATS TE from January 2001 till May 2019.

The criterion of inclusion in the study was the detection during a complex examination of a tumor lesion in the projection of the thymus gland without signs of invasion into the surrounding tissue. See Table 1 for clinical and demographic features of the operated patients.

Table 1 – Patient profile

Indicator	Value
Age, year	43.8±18.1
Sex male female	 50 (32.1%) 106 (67.9%)
BMI	27.9±6.9
FEV1, %	92.8±25.4
Tumor size, mm	56.1±32.6
Myasthenia	31 (19.8%)
Operation side: right side left side	 103 (66%) 53 (34%)
Access: three-port single-port	 146 (93.6%) 10 (6.4%)

The surgery was performed under general anesthesia with separate intubation of the bronchi. The patient's position on the operating table: on the side at an angle of 45 ° with the arm retracted and bent at the elbow on the operation side. The port for video camera was installed in the 7th intercostal space along the mid-clavicular line. The two 5-mm ports for instruments were located in the 5th intercostal space along with the nipple and in the 6th along the posterior axillary lines. In the case of single-port VATS TE, the access was provided according to the method described by B. Bedetti et al. (2016) [4]. The surgery in the volume of extended thymectomy included simultaneous removal of the thymus gland with fiber and lymph nodes of the anterior mediastinum and the neck up to the thyroid gland bottom pole level. The macro preparation was extracted in an extraction bag. The pleural cavity was drained by one 28Fr drainage through the lower thoracentesis with three-port access or through the wound with single-port access.

Since various analgesia approaches were used in different years, the number of days of systemic analgesia and the number of patients who required narcotic analgesics were calculated to assess the postoperative pain syndrome. The VATS TE safety was assessed using the Clavien–Dindo classification of surgical complications [10].

The study materials were statistically processed using the IBM SPSS Statistics *v.23* software.

Results and discussion:

Immediate VATS TE results are presented in Table 2.

Table 2 – Immediate VATS TE results

Indicator	Value
Duration of surgery, min	119±57.1
Blood loss, ml	39.7±76.5
Duration of drainage, days	1.4±0.9
Duration of hospitalization, days	4.9±2.1
Need for narcotic analgesics on Day 1	14 (8.9%)
Duration of systemic anesthesia, days	4±1.1
Conversion to thoracotomy	1 (0.6%)
Complications	14 (8.9%)
90-days' mortality	0

No statistically significant differences were revealed in the duration of surgery, drainage, or hospitalization, depending on the presence of myasthenia, as well as when comparing thymomas with other anterior mediastinum tumors.

14 (8.9%) patients had postoperative complications. No statistically significant differences were revealed in the level of postoperative complications depending on gender, age, type of access, side of the operation, concomitant diseases, or myasthenia. The structure of registered complications is presented in Table 3.

Table 3 – The structure of postoperative complications

Complications	N (%)
Minor complications	**13 (8.3%)**
Degree I Bone-diaphragmatic pleurisy Subcutaneous emphysema Dystelectasis Unstressed pneumothorax Pneumomediastinum Diaphragm relaxation	 5 (7.5%) 2 (3.8%) 1 (0.6%) 1 (0.6%) 1 (0.6%) 1 (0.6%)
Degree II Atrial fibrillation Pneumonia	 1 (0.6%) 1 (0.6%)
Major complications	**1 (0.6%)**
Degree III Bleeding	 1 (0.6%)
Degree IV	0
Degree V	0

Thus, VATS TE is a relatively safe operation with an acceptable level of postoperative complications; and we support the point of view of R. Vaja et al. (2017) that VATS TE can be recommended for diagnostics and treatment of small anterior mediastinal tumors without preliminary histological verification [11]. We also consider it inappropriate to reduce the volume of surgery because of the possible presence of areas of thymus ectopia and a hypothetical risk of a second thymoma development in the residual tissue or myasthenia [12-14].

The proponents of preoperative histological verification point to unnecessary operations or unjustified expansion of their extent in the case of some formations (cysts, lymphomas, hyperplasia, etc.). Histological examination showed a cystic component in 13 (24.5%) patients with thymoma. Computed tomography (CT) does not always allow distinguishing this component from a simple cyst. In 14 (26.4%) patients, the cystic component was combined with myasthenia. Though thymic cysts occur in 17% of patients, one should remember that they are not always benign and can result in fatal complications [15].

Histological characteristics of the removed thymus tumors are presented in Table 4.

Table 4 –Histological characteristics of removed tumors

Histological type	n (%)
Thymoma A AB B1 B2 B3 C Rare types of thymoma	53 (33.9%) 17 15 5 9 3 2 2
Thymus hyperplasia	36 (23.1%)
Thymus cysts	27 (17.3%)
Germ cell tumors	13 (8.3%)
Lymphoma	11 (7.1)
Vascular tumors	5 (3.2%)
Ectopia of other glands	2 (1.3%)
Metastatic tumors	2 (1.3%)
Other	7 (4.5%)
Total	156 (100%)

G. Romano et al. (2017) reported thymomas in 17.8% of patients with myasthenia and nodular hyperplasia during histological examination [16]. In our study, thymomas were detected in 4 (10%) out of 40 patients with a preoperative diagnosis of "thymus hyperplasia." In 17 (47.2%) patients, hyperplasia was combined with myasthenia. Consequently, hyperplasia without myasthenia accounted for 12.2% of thymus gland pathologies.

Conclusion: Thymoma accounts for 33.9% of thymus gland tumors. 24.5% of thymomas have a cystic component, which is combined with myasthenia in 26.5% of cases. Histological examination reveals thymoma in 10% of patients with a preoperative diagnosis of "thymus hyperplasia".

VATS TE is an effective and relatively safe operation that can be recommended for diagnostics and treatment of small anterior mediastinal tumors without preliminary histological verification. However, remote results shall be studied to define oncological radicalism of VATS TE in thymoma treatment.

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