

Video-assisted thoracoscopic thymectomy: experiences from 103 Military Hospital

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Keyword:

Video-assisted thoracoscopic surgery, Myasthenia gravis, Thymectomy.

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Receiving date: 31/8/2018

Approving date: 06/9/2018

**Publishing permission date:
10/9/2018**

Abstract

Introduction: To investigate clinical and laboratory characteristics of thymoma and to evaluate the early results of VATS thymectomy for thymoma in Military Hospital 103.

Material and Methods: Of 66 thymoma patients with or without myasthenia gravis (MG) underwent VATS thymectomy in Military Hospital 103, from 10/2013 to 5/2018 were enrolled.

Results: The mean age was 47.94 ± 6.3 . The male : female ratio was 1.0. MG was present in 86.4% patients, mostly at MG stage IIA. There was no in-hospital mortality or major postoperative complication. The mean operation time was 75 ± 35 min, intensive care length of stay 19 ± 5 hr, and postoperative hospital length of stay was 6.5 ± 1.3 days.

Conclusion: VATS thymectomy for thymoma in Vietnamese patients achieved better cosmesis, and was safe for both non-MG and MG patients.

1. Introduction

Thymoma is a primary tumor originally from thymic epithelial cells, mostly occurs in the superior and anterior mediastinum (90%), accounted for 5 to 21.7% of all mediastinal tumors, 47% of all tumors located in posterior mediastinum, and about 0.2 to 1.5% of all malignant tumors. According to the American Cancer Society, the rate of thymoma is about 15 cases for 100000 people. The occurrence rate is similar between men and women (1/1).

According to studies by both national and international authors, after the definitive diagnosis of thymoma, thymectomy and the tumor is the first-line and the most effective treatment. Until now, there are many thymectomy methods, for example, transsternal, transcervical or video-assisted approaches. At the present, video-assisted thoracoscopic (VATS) thymectomy for thymoma has become a routine

surgery. In order to have a systematic assessment of this method, we conducted this study to observe the clinical and laboratory features found in patients with thymoma. We also aimed to assess the first results of this method at 103 Military Hospital.

2. Materials and method

66 patients with a definitive diagnosis of thymoma, confirmed by postoperative histopathological study, with or without myasthenia gravis, were given VATS for thymoma at 103 Military Hospital from October 2013 to May 2018 with a previously agreed procedure. The classification of myasthenia gravis was based on the 4-stage classification of Osserman in 1979 [12].

Laboratory and imaging examinations

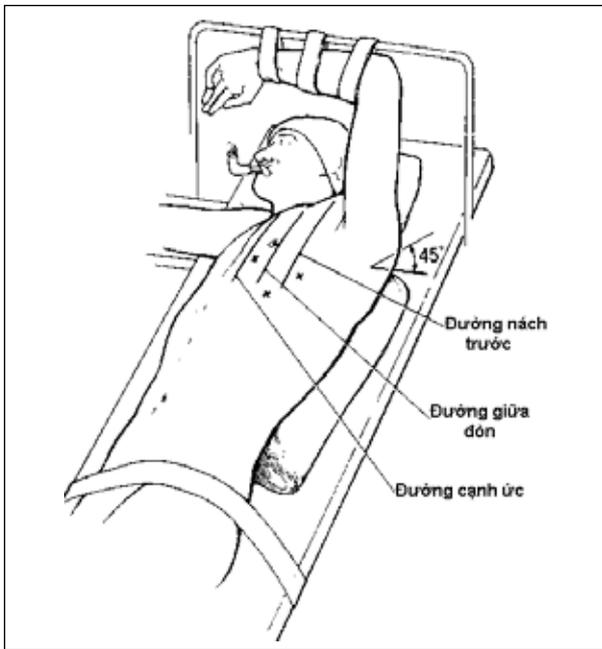
Thoracic computed tomography was indicated for all patients prior surgery to measure the size of tumor. Postoperative histopathological studies were

conducted to confirm the diagnosis and classify the tumor. The tumors were classified based on the classification of WHO in 2004 (type A, type AB, B1, B2, B3, and thymic carcinoma) [16]. Histological classification of the tumors was based on the 4-grade classification of Masaoka [10].

Surgery

Anesthesia: Selective lung ventilation using a double-lumen endotracheal tube.

Position: Patient is positioning in a 30 to 45-degree lateral recumbent to the opposite side of the procedure. The arm is higher over the head, and a pillow is put under the shoulder to expose the intercostal space.



Picture 1: Patients position and trocars placement

Port point: left or right depending on the side of the tumor on pre-operative computed tomography scan.

Trocars: 3 trocars are normally used in the procedure.

A 5-mm trocar in the anterior axillary line between the 3rd intercostal space to insert equipment.

A 10-mm trocar in the anterior axillary line between the 4th or 5th intercostal space for the camera.

A 10-mm trocar in the midclavicular line between the 6th intercostal space to insert dissecting equipment.

In some cases, another trocar may be put to insert supporting equipment to expose the surgical site.

Research variables:

Clinical variables: age, sex and the condition of myasthenia gravis.

Laboratory and imaging variables: tumor size on computer tomography and histological study.

Surgical variables: duration of surgery, whether convert to open surgery was needed or not, length stay in the ICU, duration of stay in the hospital and postoperative complications were noted.

Data processing was done using SPSS 16.0 (SPSS Inc., Chicago, IL, USA).

3. Result

Clinical results: Among of 66 patients with thymoma treated using VATS thymectomy, 33 patients (50%) are male, the male-to-female ratio is 1.0. The average age is 47.94 ± 6 . Most of them were myasthenic (57 patients, or 86.4% of all patients), among those, most were classified with Grade IIA on the Ossermans classification (Table 1).

Table 1: Clinical features

	Age	47.94 ± 6.3 (21 – 73)
Sex	Male	33 (50%)
	Female	33 (50%)
	Male/Female	1.0
Myasthenia gravis	Grade IIA	45 (68.2%)
	Grade I	12 (18.2%)
	Have no myasthenia gravis	9 (13.6%)

Laboratory and imaging studies: The common type of thymoma among these patients were type AB and B2, with 19 (28.8%) and 20 (30.3%) patients for each type, respectively, followed by type B2. There was no case of thymic carcinoma. Type AB and type B2 tumors were also the largest, at 58.78 ± 26.08 mm and 36.4 ± 6.78 mm, respectively (Table 2).

Table 2: Size and histological feature of the tumors

Histological type	N (%)	Tumors' largest diameter (mm)
A	14 (21.2%)	44.3 ± 23.01
AB	19 (28.8%)	58.78 ± 26.08
B1	12 (18.2%)	46.75 ± 16.57
B2	20 (30.3%)	36.4 ± 6.78
B3	1 (1.5%)	57
Thymic carcinoma	0	0
Total	66 (100%)	51.37 ± 21.36

None of the tumors was in Grade IV on the Masaokas classification. The majority of cases were in Grade I (65.2%) and Grade II (31.8%). There were, however, 2 cases in Grade III - these patients have invasive thymoma involving the lung and large vessels.

Table 3: Masaokas classification of thymoma

Grade	N (%)
I	43 (65.2%)
II	21 (31.8%)
III	2 (3.0%)
IV	0
Total	66 (100%)

Surgical procedures: Most of the surgeries (90.9%) were done on the right side, with one harder case required 4 trocars being used. 4 cases had to convert to open surgery due to bleeding (2

cases), large tumor (1 case) and type B3 invasive thymoma involving large vessels (1 case). 2 patients had invasive thymoma, with 1 involving the lung and 1 involving large vessels. One case with the large vessels invaded, conventional transsternal thymectomy was required to ensure safety and complete removal of the tumor. In the case with lung invasion, we used automatic stapler for atypical lobectomy of the affected lobe.

There were 3 postoperative complications: 2 patients had respiratory distress, and 1 patient had pleural effusion. There was no death during the hospital stay, and no severe complication. The average duration of a surgery is 75 ± 35 minutes, with 21 patients less than 60 minutes and only one case lasted more than 120 minutes. The average duration in the ICU is 19 ± 5 hours, and the average of postoperative hospital stay is 6.5 ± 1.3 days (Table 4).

Table 4: VATS thymectomy for thymoma

Description		N (%)
Side	Left	60 (90.9%)
	Right	6 (9.1%)
Number of trocars	3	65 (98.5%)
	4	1 (1.5%)
Intra-operative death		0 (0%)
Death during hospital stay		0 (0%)
Convert to open surgery		4 (7.5%)
Postoperative complication	Respiratory distress	2 (3.0%)
	Pleural effusion	1 (1.5%)
Duration of surgery (minutes)		75 ± 35
ICU stay time (hours)		19 ± 5
Number of days in hospital after surgery (days)		6.5 ± 1.3

4. Discussion

Indication for surgery

The average age of the patients is 47.94 ± 6.3 , ranging from 21 to 73 years of age, most of them

were between 20 to 50 years old, both for men and women, with a sex ratio of 1.0. This number is smaller than a study by Drachman (1988) with a sex ratio of 1.5 [4]. It can be said that VATS thymectomy for thymoma can be indicated for patients of all ages, and in both genders.

Myasthenia gravis is very common among patients with thymoma (86.4%), especially in the Grade I and Grade IIA groups (18.2% and 68.2%, respectively). Strollo et al (1997) reported a lower rate, about 30 to 50% of the patients had myasthenic symptoms [14]. We usually do not indicate for Grade IIB myasthenic patients and higher because of the risk of postoperative complication, especially respiratory distress. These patients have to be managed medically using ambenonium (Mytelase®) and steroid with the dosage gradually lowered before the operation; or even with plasma exchange, in order to stabilize and improve the myasthenic condition. Surgery will be considered when the myasthenic condition is stabilized, or reduced to Grade IIA or lower. We had 7 cases reduced from Grade IIB to IIA after intensive medical management.

According to WHO, there are 2 types of thymic epithelial tumors: thymoma and thymic carcinoma. Of these types, thymoma is classified into 5 types: A, AB, B1, B2, B3, each has its own prognostic value. Type A, AB, and B1 are “less malignant” than type B2 and B3 [5]. In 2006, Detterbeck FC et al reported the 10-year survival rate for each type: 97% for type A, 95% for type AB, 92% for type B1, 81% for type B2, 62% for type B3 and 29% for thymic carcinoma. Obviously, thymic carcinoma has the worst prognosis. Clinically, predicting malignancy is crucial in planning treatment and deciding surgical method (laparoscopic or open surgery). In our study, those with type B2 have the highest risk of malignancy (30.3%), followed by type AB (28.2%). These findings are similar to those of Tomiyama et al (2002) on 53 patients, those with type AB had the highest risk (26.4%) [15]. In contrast, according to Jeong et al (2004), the types with the highest risk were B2 and B3 (49.5%) [5]. We did not encounter

any case of thymic carcinoma, while others reported fairly high rate of occurrence, for example, Jeong with 15/91 cases (16.5%) [5] and Tomiyama with 8/53 cases (15.1%) [15].

While many studies have pointed out that thymic carcinoma tumors are larger than the others, the question about the correlation between tumor size and malignancy arises. In one study by Liu et al (2012), on 105 patients, those who are at high risk of malignancy (type B2, B3) have larger tumors than the ones with lower risk (type A, AB, and B1) [6]. Tomiyama reported that the type with the smallest tumors are in type A, but there was no difference between type AB, B1, and B3. [15]. Jeong et al (2004) have not found the difference in size between the two group (A, AB, and B1) and (B2 and B3) [5]. Similarly, our results show that there is no difference in size between types of thymoma (Table 2). In fact, smaller tumors occurred in type B2 (36.4 ± 6.78 mm), while the largest ones occurred in type AB (58.78 ± 26.08 mm). On the other hand, we believe that tumor size also depends on the duration of illness, and malignancy depends on something other than just tumor size (there are smaller tumors with very high malignancy). Thus, tumor size is valuable in prognosis and may help us deciding an appropriate surgical option.

By using Masaokas classification, Agasthian et al (2011) recommended that thymoma at an early stage can be safely removed with thoracic surgery. However, the author did report that 13 patients with invasive thymoma were treated surgically with success [1]. A study by Chung et al (2012) on 25 non-myasthenic patients pointed out that there was 1 patient with grade III and only 1 patient with grade IV on the Masaokas classification [20]. Similarly, our study shows that there were only 2 patients with Masaokas grade III (3%), the rest were in grade I and II.

Video-assisted thoracoscopic thymectomy for thymoma

With our experience, we performed VATS thymectomy for thymoma under anesthesia with

selective lung ventilation using a double-lumen endotracheal tube, and the patients were on a 45-degree lateral recumbent. Yim et al (1995) recommend a 90-degree lateral recumbent [19]. The decision to approach from the left or the right side depends on the surgeons experience and imaging diagnosis on pre-operative computed tomography [17],[7]. While Yim et al (1995) preferred the right side, European surgeons choose the left side. In our study, we mainly approached from the right side (90.9%). In fact, approaching from the right allows a larger operating field, better management of the superior vena cava and innominate vein, reducing complications. However, we did not find any statistical difference regarding the approaching side [7],[17].

With 3 trocars: one for the camera and the other two for the instruments, if needed, 4 or 5 trocars may be used. Some authors used 4 trocars [11], or performing laparoscopy with one port [2]. In our 66 cases, we can safely and conveniently remove the tumors using 3 trocars, and in only one case did we need to use the fourth (1.5%) when a large tumor was encountered and we needed more instrument to hold the tumor.

In VATS thymectomy for thymoma, not only the tumor is removed, but also the entire thymus and even fat deposit in the mediastinum. We had to convert to open surgery in 4 cases because of bleeding, large tumors, and invasion of large vessels. Thus, one should carefully examine the features of the tumor on computed tomography before the surgery, to have the best plan for the operation and avoid having to switch to open surgery.

Except for the two cases of post-operation respiratory distress (3.0%) and one case with pleural effusion (1.5%), we had no death and any other serious complication. Postoperative respiratory distress occurred in the myasthenic group, but they only needed mechanical ventilation 24 to 48 hours after the surgery. The risk of postoperative respiratory distress can be reduced not only by pre-operation medical management but also by pain

relief. VATS thymectomy does not require cutting through the sternum, which is an important pain relief measure for the myasthenic patients, and by relieving pain, the patients can breathe easier. We did not observe any case of pneumothorax after the surgery, unlike those reported by Loscertales J [8] and Popescu I [13].

As surgical experience increases, the duration of each surgery shortens. While the average duration of a surgery is 75 ± 35 minutes, in later surgery, when we had more experience, the duration of each operation shortened, with 21 out of 66 cases (31.8%) operated for less than 60 minutes, in comparison with other authors, for example, Yim (1999): 107 minutes [18], Tommaso Claudio Mineo (1996): 160 minutes [11], Popescu I (2002): 90 minutes [13] and Xie X (2016): 80 minutes [17].

VATS thymectomy has improved the postoperative treatment and intensive care greatly, as shown by the reduction in patients number and duration of stay in the hospital. The duration of stay in ICU is 19 ± 5 hours (1 to 72 hours), and the postoperative duration of stay in the hospital is 6.5 ± 1.3 days. It is though, still longer than other authors report, for example, Yim (1995): 5 days [19], Tommaso Claudio Mineo: 3 days [11], Mack M.J (1996): 4 days [9], Popescu I (2002): 2.28 days [13]. However, in comparison with previous open surgery (9.4 and 15 days), this duration has been shortened very much.

5. Conclusion

VATS thymectomy for thymoma is a safe surgery, and can be used widely even for those with myasthenia gravis, with no death, few complications and offered good results.

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