Comparison of Clinical Outcomes of Thymectomy for Myasthenia Gravis: Thoracoscopic Thymectomy vs Transsternal Thymectomy

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ABSTRACT

Objective: Thoracoscopic thymectomy has become increasingly popular as a surgical treatment for myasthenia gravis because of its better cosmetic results and comparable efficacy compared with conventional open surgery. We review our outcomes of both techniques.

Methods: Between January 2004 and January 2008, 57 thymectomies were performed for myasthenia gravis; 27 by thoracoscopic thymectomy and 30 by transsternal thymectomy. Preoperative classification and Post-operative disease status were compared between the groups.

Results: Mean age was 36.6 (thoracoscopic thymectomy) versus 40.0 years (transsternal thymectomy) (p =0.342); the preoperative duration of myasthenia gravis was 15.9 versus 17.4 months (p =0.76) and mean of clinical follow up was 6.5 vs 7.5 years (p =0.0003) respectively. In thoracoscopic thymectomy group, no patient required conversion to sternotomy technique. The median operative time was 165 min (range, 45-255) in thoracoscopic group vs. 135 min (range, 80-190) in transsternal group (p<0.05). Mean length of stay was 3.8 versus 5.2 days (p< 0.05) respectively. Post-operative DeFilippi classification for remission revealed improvement in 88% of thoracoscopic group versus 87 % in transsternal group. (p = 0.81)

Conclusion: Thoracoscopic thymectomy is an effective treatment for myasthenia gravis which decreases hospital stay with equivalent clinical outcomes when compared with transsternal thymectomy.

Keywords: Video-assisted thymectomy, thymectomy, myasthenia gravis, thoracoscopic thymectomy

Siriraj Med J 2015;67:134-138
E-journal: http://www.sirirajmedj.com

INTRODUCTION

Thymectomy for myasthenia gravis was first described in 1939 by Alfred Blalock[1] and has become a standard of care for patients with myasthenia gravis. However, no controlled trial to assess the efficacy of thymectomy in myasthenia gravis has been reported. A conventional transsternal thymectomy technique demonstrate excellent clinical outcome with improvement of symptoms in up to 70% and complete remission rate were report in the literature from 25-60%.[2-4] Minimally invasive techniques such as thoracoscopic thymectomy have become increasingly popular due to their low procedural morbiity and mortality, improved cosmesis, lesser degree of access trauma and post-operative pain with equivalent efficacy compared with conventional open techniques.[5] In our current practice there is also an increase of thoracoscopic thymectomy for myasthenia gravis. We have reviewed our experience of thoracoscopic thymectomy compared with conventional transsternal thymectomy in patients with myasthenia gravis.

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Received 16 February 2015
Revised 30 March 2015
Accepted 31 March 2015

MATERIALS AND METHODS

This retrospective study was approved by the Siriraj Institutional Review Board. The medical records of patients who underwent thymectomy for myasthenia gravis at Siriraj Hospital during 2004-2008 were examined for patient demographics; preoperative symptoms and therapy and severity using Osserman classification, surgical approach and Post-operative recovery including length of hospitalization, complication, histopathology of thymus gland and post-operative severity of the disease assessed by the DeFilippi classification.

We routinely use the right-sided approach with single lung ventilation using a double-lumen endotracheal tube, the patient was propped up at 30 degrees in a semi-supine position with a roll under the shoulder, and the ipsilateral arm was held abducted over a padded screen to expose the axilla for port placement. Two 10 mm ports were placed at 3rd intercostal space around the axilla area and 6th intercostal space anterior axillary line. Another 5 mm port was placed at 5th intercostal space mid clavicular line. An additional port is used sometimes when there is a need for better exposure such as patient with thymoma or large thymus. Visualization is through a 30 degree,10 mm thoracoscope placed through the most posterior port. Resection was performed using blunt dissection and electric cautery. Thymic vein was identified, clipped and divided. Patients are typically extubated in the operating room, and no intensive care unit is needed.

All statistical analysis was performed using SPSS statistical software version 10.0. Student's t test and Fisher's Exact test were used for determination of statistical significance ($P< 0.05$).

RESULTS

Fifty nine patients with myasthenia gravis were included in this study, 27 patients underwent thoracoscopic thymectomy and 32 patients underwent transsternal thymectomy. Table 1 demonstrates the demographic characteristics and post-operative parameters between groups.

The mean age in the transsternal group was 40.0 years, versus 36.6 years in the thoracoscopic thymectomy group. Preoperative duration of MG in the transsternal group was 17.4 months, versus 15.9 months in the videoscopic thymectomy group. When assessing preoperative status using Osserman classification, the transsternal group had more early classes when compared with the thoracoscopic group ($p=0.003$). The median operative time in thoracoscopic thymectomy group was 165 min (range 45-255) versus 135 min (range 80-190) in transsternal thymectomy group ($p=0.039$).

There was a statistically significant difference in the post-operative length of stay, with 5.2 days in the transsternal group versus 3.8 days in the thoracoscopic thymectomy patients ($p= 0.043$). In follow up 7.5 years in the transsternal group versus 6.5 years in the thoracoscopic thymectomy patients ($p = 0.0003$)

The most common histopathology is thymic involute which accounted for 48% in the transsternal group and 42% in thoracoscopic group. Thymoma was found to be 16% in the transsternal group versus 7% in the thoracoscopic thymectomy patients. There was no statistically significant difference in histopathology for both groups (p-value= 0.724).

No patients in the thoracoscopic thymectomy group were converted to transsternal thymectomy. All patients in both groups were extubated in the operating room. No respiratory failure occurred in the operating room and recovery room.

The effect of thymectomy on medication requirements to control myasthenia gravis revealed no statistically significant difference between the two groups. There was one case with sternal wound infection in the transsternal group and there were two patients with right phrenic nerve injury in the thoracoscopic group. Both patient groups were our early experience with thoracoscopic technique.

Only one patient in the transsternal group developed respiratory failure on post-operative day 2. Another 3 patients from both group developed respiratory failure after discharge and required another admission.

TABLE 1. Comparative demographics and post-operative parameters.

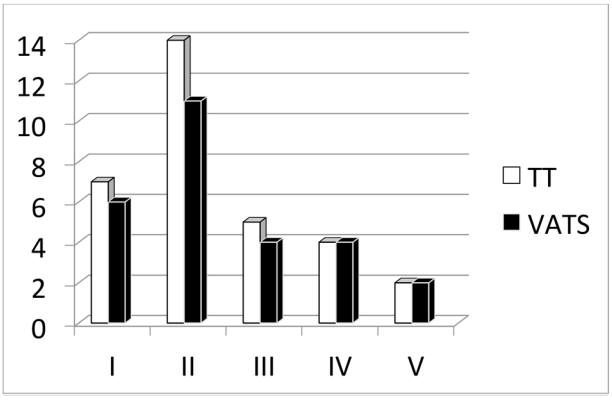
	Transsternal	TT	p-value
Sex (M/F)	5/27	1/26	0.311
Mean age (years)	40.0±13.0	36.6±14.7	0.342
Pre op duration of MG months	17.4±21.4	15.9±17.1	0.766
Follow up (year)	7.5±1.2	6.5±0.6	<0.001
Severity (osserman classification)			<0.001
I (occular)			
IIa (mild generalized)	29	18	
IIb (moderate-severe)	3	5	
III (acute fuminating)	0	4	
IV (late severe trauma)	0	0	
Post op length of stay (days)	5.2±3.3	3.8±.6	0.043
Preoperative medication for control MG			0.177
Mestinon alone	7 (22%)	2 (7.5%)	
Mestinon+Predisolone	20 (64%)	24 (85%)	
Mestinon+Predisolone+Imuran	4 (14%)	2 (7.5%)	
Operative time (min)	135±30	165±60	0.039
Post-operative medication for control MG			
Add imuran after surgery	25.8% (8/31)	14.3% (4/28)	0.248
Decrease prednisolone and/or imuran	25.8% (8/31)	17.8% (5/28)	0.405
Maintain medication	48.3% (15/31)	64.2% (19/28)	0.493
Histopathology			0.724
Involute	15 (48%)	12 (42%)	
Hyperplasia	10 (32%)	12 (42%)	
Thymoma	5 (16%)	2 (7%)	
Thymiclipoma	1 (4%)	1 (4.5%)	
Thymic cyst	0 (0%)	1 (4.5%)	
Complication			0.451
No complication	28 (90%)	24 (85%)	
Wound infection	1 (4%)	0	
Phrenic nerve injury	0	2 (7%)	
Respiratory failure	2 (6%)	2 (8%)	

TT = Thoracoscopic thymectomy, MG = Myasthenia gravis

Post-operative severity of the disease was followed by DeFilippi classification (Fig 1). There were 7 patients (22%) in the transsternal group versus 6 patients (22%) in the thoracoscopic group with complete remission. 88 % in the thoracoscopic thymectomy group showed clinical improvement (DeFilippi classification I+II+III) versus 87 % in the transsternal group. (p = 0.81)

DISCUSSION

Surgical management of MG is becoming increasingly recognized as an effective treatment option. Currently no consensus is in place on which surgical method is first line. The Myasthenia Gravis Foundation of American (MGFA) has described the primary goal for thymectomy in



Class I = Complete remission, Class II = Asymptomatic; decreased medication requirements, Class III = Improvement in symptoms, Class IV = No change in symptoms or medication requirements, Class V = Worsening symptoms, TT = Transsternal thymectomy, VATS = Thoracoscopic thymectomy

Fig 1. Impact of surgical techniques on outcomes based upon post-operative DeFilippi classification.

myasthenia gravis is to completely remove all thymic tissue.[6] Transsternal thymectomy is a standard operation for thymectomy because of excellent exposure and easy to perform. However transsternal thymectomy requires a midline incision and a median sternotomy which causes significant post-operative pain, longer recovery period and unsatisfactory cosmetic result. Minimally invasive approach in surgery has been gaining popularity and has become standard in many subspecialities such as general surgery, urology and gynecology because of better cosmetic scars, shorter hospital stay, less post-operative pain, faster recovery and less complications. The first thoracoscopic thymectomy was reported by Sugarbaker from Boston and also by the Belgium group in 1993[7,8] and was adopted by many surgeons. Now there are many techniques for videoscopic thymectomy such as right side approach,[9,10] bilateral approach,[11,12] combined thoracoscopic with neck incision[13] and recently robotic thymectomy.[14,15] We prefer a right side approach because there is more space to work when compared to the left side approach. In order to achieve a complete removal of thymic tissue especially on the left side, we use a 30 degree camera which offers superior magnified panoramic visualization and exposure of all aspects of the chest, from the thoracic inlet to the pericardial-diaphragmatic recesses, and the phrenic nerve to the phrenic nerve. We found that complete thymectomy with visualization of both phrenic nerves and aortopulmonary window fat can be achieved with a left side approach by moving the camera to a medial port and opening the opposite pleura. Completeness was confirmed anatomically at the time of surgery by inspecting the specimen and the resected thymic bed. This technique is performed by many centers with excellent result.[5,9,16]

In our study, the critical aspects of the transsternal and the thoracoscopic thymectomy approaches were compared. Post-intervention status was analyzed using Post-operative DeFillipi classification. Analysis of the two groups showed significant differences in severity, operative time, follow up time and post-operative length of stay. Operative mortality was not significantly different between the two groups and post-operative results were similar in both groups. Thoracoscopic thymectomy is technically more demanding and associated with a longer operating time compared to transsternal thymectomy. However, thoracoscopic thymectomy can be performed with short operative time in some cases. In our experience, resection around the innominate vein and left phrenic nerve are the most difficult parts which could take a long time to perform. Once the thymus has been removed, the closure is faster because there is no need to close the sternum.

In our series, 88% of the patients in the thoracoscopic thymectomy group and 87% of the patients in the transsternal thymectomy group experience clinical improvement. The complete remission rate was 22% in both groups. The clinical outcome was similar between both groups despite more patients with severe Osserman classification and less follow up time in the thoracoscopic group. The results of both techniques are comparable with many other studies. Intermediate follow-up data of recent thoracoscopic thymectomy series showed satisfactory results with remission rates ranging between 14% and 60%.[17-19]

According to these outcomes, the acceptable complete remission rate, high improvement rate, short hospital stay, low conversion rate, low morbidity rate and no mortality demonstrate that thoracoscopic thymectomy is a safe and effective method for myasthenia gravis patients. Our retro-

spective study is based on a historical comparison of two subsequent periods. Multiple factors might have biased the results. Therefore, further randomised controlled studies on the result of different surgical treatment for mysthenia gravis patients may be necessary. However, nowadays, more patients are requesting the thoracoscopic technique than a standard approach because of perception of better recovery and cosmesis.

REFERENCES

1. Paul A, Kirschner MD. Classics in Thoracic Surgery Alfred Blalock and Thymectomy for Myasthenia Gravis. Ann Thorac Surg. 1987;Mar:4338-49.
2. Zahid I, Sharif S, Routledge T, Scarci M. Video-assisted thoracoscopic surgery or transsternal thymectomy in the treatment of myasthenia gravis? Interact Cardiovasc Thorac Surg. 2011 Jan;12(1):40-6.
3. Meyer DM, Herbert MA, Sobhani NC, Tavakolian P, Duncan A, Bruns M, et al. Comparative clinical outcomes of thymectomy for myasthenia gravis performed by extended transsternal andminimally invasive approaches. Ann Thorac Surg. 2009 Feb;87(2):385-90.
4. Pompeo E, Tacconi F, Massa R, Mineo D, Nahmias S, Mineo TC. Long-term outcome of thoracoscopic extended thymectomy for nonthymomatous myasthenia gravis. Eur J Cardiothorac Surg. 2009 Jul;36(1):164-9.
5. Ng CS, Wan IY, Yim AP. Video-assisted thoracic surgery thymectomy: the better approach. Ann Thorac Surg. 2010 Jun;89(6):S2135-41.
6. Jaretzki A 3rd, Barohn RJ, Ernstoff RM, Kaminski HJ, Keesey JC, Penn AS, et al. Myasthenia gravis: recommendations for clinical research standards. Task Force of the Medical Scientific Advisory Board of the Myasthenia Gravis Foundation of America. Neurology. 2000 Jul 12;55 (1):16-23.
7. Sugarbaker DJ. Thoracoscopy in the management of anterior mediastinal masses. Ann Thorac Surg. 1993 Sep;56(3):653-6.
8. Coosemans W, Lerut TE, Van Raemdonck DE. Thoracoscopic surgery: the Belgian experience. Ann Thorac Surg. 1993 Sep;56(3):721-30.
9. Stephen R. Hazelrigg, MD Thoracoscopic or Video-Assisted (VATS) Thymectomy Operative Techniques in Thoracic and Cardiovascular Surgery, Vol 9, No 2 (Summer), 2004. p.184-92.
10. Yim APC, Izzat MB. VATS approach to the thymus. In: Yim APC, Hazelrigg SR, Izzat MB, et al, editors. Minimal access cardiothoracic surgery. Philadelphia: W.B. Saunders Company, 2000. p. 209-20.
11. Lee CY, Kim DJ, Lee JG, Park IK, Bae MK, Chung KY. Bilateral video-assisted thoracoscopic thymectomy has a surgical extent similar to that of transsternal extended thymectomy with more favorable early surgical outcomes for myasthenia gravis patients. Surg Endosc. 2011 Mar;25 (3):849-54.
12. Chang PC, Chou SH, Kao EL, Cheng YJ, Chuang HY, Liu CK, et al. Bilateral video-assisted thoracoscopic thymectomy vs extended transsternal thymectomy in myasthenia gravis: a prospective study. Eur Surg Res. 2005 Jul-Aug;37 (4):199-203.
13. Yu L, Shan M, Jiang J, Jing Y, Zang N, Wang T, et al. Combined transcervical and unilateral-thoracoscopic thymectomy for myasthenia gravis: 2 years of follow-up. Surg Laparosc Endosc Percutan Tech. 2008 Oct;18 (5): 489-92.
14. Marulli G, Rea F, Melfi F, Schmid TA, Ismail M, Fanucchi O, et al. Robot-aided thoracoscopic thymectomy for early-stage thymoma: a multicenter European study. J Thorac Cardiovasc Surg. 2012 Nov;144(5):1125-30.
15. Marulli G, Schiavon M, Perissinotto E, Bugana A, Di Chiara F, Rebusso A, et al. Surgical and neurologic outcomes after robotic thymectomy in 100 consecutive patients with myas thenia gravis. J Thorac Cardiovasc Surg. 2013 Mar;145(3): 730-5.
16. Loscertales J, Ayarra JJ, Congregado M, Arroyo AT, Jiménez RM, Girón JC, et al. Video-Assisted Thoracoscopic Thymectomy for the Treatment of Myasthenia Gravis. Arch Bronconeumol. 2004 Sep;40(9):409-13.
17. Agasthian T, Lin SJ. Clinical outcome of video-assisted thymectomy for myasthenia gravis and thymoma. Asian Cardiovasc Thorac Ann. 2010 Jun;18(3):234-9.
18. Pompeo E, Tacconi F, Massa R, Mineo D, Nahmias S, Mineo TC. Long-term outcome of thoracoscopic extended thymectomy for nonthymomatous myasthenia gravis. Eur J Cardiothorac Surg. 2009 Jul;36(1):164-9.
19. Zahid I, Sharif S, Routledge T, Scarci M. Video-assisted thoracoscopic surgery or transsternal thymectomy in the treatment of myasthenia gravis? Interact Cardiovasc Thorac Surg. 2011 Jan;12(1):40-6.