

Original Research Article

Safety and feasibility of video assisted thoracoscopic thymectomy for myasthenia gravis: a single centre experience

Raj N. Gajbhiye, Hemant Bhanarkar, Vikrant V. Akulwar*, Bhupesh Tirpude,
Niketan Jambhulkar, Gayatri Deshpande

Department of Surgery, Government of Medical College and Hospital, Nagpur, Maharashtra, India

Received: 27 March 2019

Accepted: 15 May 2019

*Correspondence:

Dr. Vikrant V. Akulwar,

E-mail: vikrantakulwar@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Myasthenia gravis (MG) is an autoimmune disease affecting acetylcholine postsynaptic receptor of voluntary muscles. Thymectomy is a mainstay in the treatment for myasthenia gravis with or without thymoma. For many years transsternal and transcervical thymectomy had been the most common approaches used, video assisted thoracoscopic thymectomy is still not accepted as approach of choice. We intend to study the role of Video assisted thoracoscopic thymectomy for myasthenia gravis in central Indian population.

Methods: Study was conducted in single tertiary care institute from January 2015 to November 2018. It is a prospective study. Aims of the study were to evaluate the safety and feasibility of video assisted thoracoscopic thymectomy for patients of myasthenia gravis. All patients of myasthenia gravis who underwent video assisted thoracoscopic thymectomy (VATS) were included in the study. Intraoperative and postoperative details were studied to assess the safety and feasibility of VATS for treatment of myasthenia gravis.

Results: 16 patients including 7 men and 9 women with the mean age of 35.5 years were investigated. All patients had myasthenia gravis, 12 pts had thymoma while remaining 4 pts had normal thymus. Mean operating time was 104 mins, Mean intraoperative blood loss was 45 ml (range 20 to 60 ml). There was no major intraoperative or postoperative complication or mortality. Mean ICU stay and hospital stay was 33 hrs and 4.25 days respectively.

Conclusions: VATS thymectomy is safe and effective approach for the treatment of MG with or without thymoma. MG treated by VATS resulted in comparable neurological outcomes to those associated with the transsternal approach.

Keywords: Myasthenia gravis, Thymoma, Video assisted thoracoscopic thymectomy

INTRODUCTION

Myasthenia gravis (MG) is an uncommon autoimmune disease, characterized by circulating antibodies originating from the thymus. These antibodies are directed against the postsynaptic nicotinic acetylcholine receptors in the neuromuscular junction of voluntary skeletal muscle. This results in fluctuating muscle weakness, worsening with exertion and improving with rest. The prevalence of MG has been estimated at

1.5/10000 population.¹ Treatment of MG is mostly initiated with anticholinesterase like pyridostigmine, and then progressed to glucocorticoids and other immune suppressants. Plasmapheresis and intravenous immunoglobulins are required for rapid results in patients with crisis and to improve patient's condition prior to surgery.

Thymectomy is recommended in all patients of MG with thymoma. In the absence of tumour evidence suggests

that up to 85 % of patients experience improvement after thymectomy which is for long term.² It is the consensus that thymectomy should be carried out in all patients with generalized MG or myasthenic crisis, who are between the ages of puberty and at least 55 years, once fit for surgery.² Video assisted thoracoscopic thymectomy (VATS) provides a clearer view as well as all advantages of minimal invasive surgery over open surgical approaches like transsternal and transcervical thymectomy.

However, open surgical approach via median sternotomy is still the most common approach used. Probably because VATS thymectomy is technically difficult and there are concerns of completeness of resection of thymus tissue. With major reports published in these regards lacking, especially from India, presents study aims to evaluate safety and effectiveness of thoracoscopic treatment of MG in central Indian population.

METHODS

A prospective study was performed on 16 patients who were diagnosed with myasthenia gravis and underwent video assisted thoracoscopic thymectomy in our hospital from Dec 2014 to Nov 2018. Myasthenia gravis was diagnosed using the patient's history, physical examination, laboratory tests and slow repetitive nerve stimulation (RNS). Level of antibodies against acetylcholine receptors were tested in all patients, in those patients antibody levels were not raised slow repetitive nerve stimulation test was done to confirm MG. All patients of MG were classified as per Osserman and Genkins classification system for MG. CT scan of thorax was performed in all patients diagnosed with MG.

Inclusion criteria for the study were patients who suffered from MG and underwent VATS thymectomy. Exclusion criteria's were patients with only ocular MG, patients below the age 12 and adults above the age of 55 and patients not willing or unfit for surgery. Patients of myasthenia crisis were operated, once they were stabilised by plasmapheresis and immunoglobulin along with other drugs.

Patients were given general anaesthesia with endotracheal intubation using double lumen tube. Patient was placed in supine position with a sand bag under the right or left side of chest from where the surgery was done, with a tilt of 30 degrees towards the opposite side.

Monitor was placed on the opposite side of the surgeon. We generally preferred to operate from left side but in those cases where right lobe of thymus was enlarged or had thymoma we operated from right side.

During surgery complete thymus along with surrounding fat between right and left phrenic nerve was excised (Figure 1, 2, 3, and 4). All intraoperative and postoperative parameters were studied like operating

time, conversion to open, blood loss, complications, death, intensive care unit (ICU) stay, hospital stay.

Histopathology reports were noted as per WHO Histopathologic classification of thymic tumor. Masaoka clinical staging of thymomas was also used. Patients were followed up as per De Filippi postoperative classification.

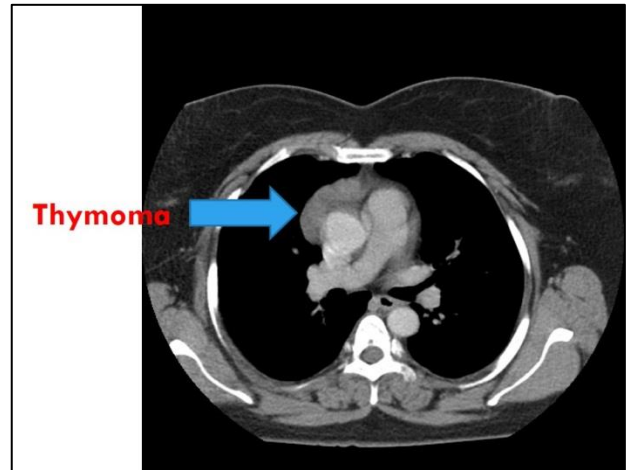


Figure 1: Preoperative CT scan thorax of one of the patient of MG, showing thymoma.

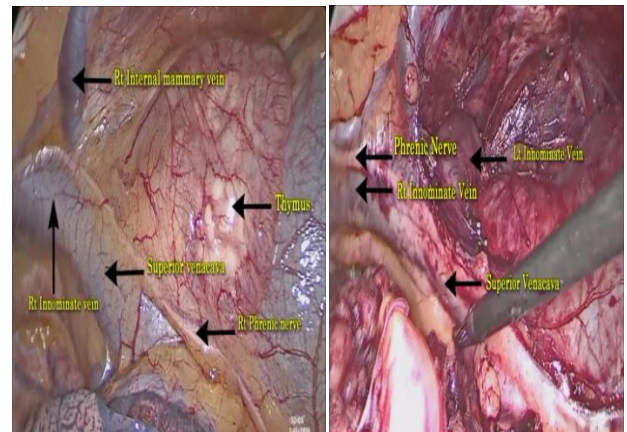


Figure 2: Intra operative view of same patient. a) before excision of thymus. b) After complete excision of thymus, with specimen placed in endobag.



Figure 3: Post operative specimen of same patient.



Figure 4: Post operative photograph showing scar of same patient.

RESULTS

16 patients were enrolled for the study. Mean age was 35.5 years, with a range of 25 to 45 years. There were 9 females and 7 male patients. All patients had Myasthenia Gravis and they were classified as per Osserman's classification, there were 4 pts of group 2A, 8 group 2B, 4 group 4 and none in group 1 (Table 1).

Table 1: Characteristics of 16 patients undergoing VATS thymectomy.

Variable	No. of Patients (n=16)
Age	35.5 years (range 25 to 45)
Male	7
Female	9
Ossermans Clasification	
Class 1	0
Class 2 A	6
Class 2 B	8
Class 3	0
Class 4	2
WHO histopathological type	
Normal	4
Thymic Hyperplasia	0
A	1
AB	2
B1	4
B2	5
B3	0
Thymic carcinoma	0
Masaoka stage of thymic tumors	
I	5
II	7
III	0
IV	0

Thymoma was found in 12 patients and in 4 pts thymus was normal. As per WHO histopathologic classification 1 patient had A type, 2 pts had AB type, 4 pts had B1 type while 5 pts had B2 type of thymoma. There was no case of thymic carcinoma in the present study. Five pts had Masaoka stage1 and seven pts had Stage 2 thymic tumour. No patient belonged to stage 3 and stage 4 thymic tumour (Table 1).

CT scan was done in all pts, were 12 pts had thymoma with average diameter of 4.26 cms and range of 3.2 to 5.6 cms. We preferred to operate the patient from left side, only in 4 pts where right lobe of thymus harboured thymoma we operated from right side. All patients were operated with 3 ports except in 1 patient we used 4th port to solve the ergonomic issues due to excessive extension of thymic horns into the neck. Mean operating time was 104 mins with a range of 78 to 145 mins. No case was converted to open. Mean intraoperative blood loss was 45 ml (range 20 to 60 ml). There was no case of intraoperative or postoperative complications or death. Mean ICU stay was 33 hrs and mean hospital stay was 4.25 days with a range of 3 to 5 days (Table 2).

Table 2: Perioperative data of video assisted thoracoscopic thymectomy for MG in 16 patients.

Variables	No. of patients
Operation side	
Right	4
Left	12
No. of ports used	
3	15
4	1
Operation time (mins)	104 mins (78 to 145 mins)
Conversion to open	0
Intra-operative blood loss (ml)	45 ml (range 20 to 60 ml)
Intra-operative complications	0
Intra-operative death	0
Extubation after surgery (hrs)	6 hrs (range 0 to 48 hrs)
Intensive care unit stay (hrs)	33 hrs (range 12 to 36)
Post-operative hospital stay (day)	4.25 days (3 to 5)
Post-operative complications	0
Post-operative death	0

Patients were followed up for 5 to 21 months with a mean follow up of 12.5 months.

Complete remission was found in 18.75%, asymptomatic with decreased medication in 56.25 %, improved with decreased medication in 18.75 %, while no change was found in 6.25% of patients (Table 3).

Table 3: Follow up as per De Filippi postoperative classification.

Class	Description	No. of patients	%
Class 1	Complete remission, no medication	3	18.75
Class 2	Asymptomatic, decreased medication	9	56.25
Class 3	Improved, decreased symptoms or decreased medication	3	18.75
Class 4	No change	1	6.25
Class 5	Worsening symptoms	0	0

DISCUSSION

Myasthenia gravis is the most common disease of the neuromuscular junction, but remains relatively rare. Its incidence varies from 1.7 to 10.4 per million populations per year. There are two frequency peaks between 20 to 40 years where women are preferentially affected and second after 50 years where men are affected.³ The mean age of presentation in our study was 35.5 years with a range of 25 to 46 years, this could be because younger patients MG being referred to us for surgery. The role of thymus in pathogenesis has been well established by producing circulating antibodies against postsynaptic acetylcholine receptors.⁴ Thymectomy is the treatment of choice for all patients of MG with thymoma and is recommended for patients of generalised MG or myasthenic crisis for long term benefit. Open thymectomy still remains most common approach, while

video assisted thoracoscopic thymectomy is not the approach of choice even now, because of concerns of its safety and efficacy in MG. Present study strives to study the safety and feasibility of VATS in MG. With few recent studies being published in this regards, suggesting the benefits of minimal invasive thymectomy, scenario may change in near future. Our hospital is a tertiary level referral center. Most of our patients referred to us for surgery, are already diagnosed and treated with anticholinestrases and immunosuppressents. This could be the reason for most of our patients belong to class 2 of Osserman's classification at presentation to us. We have not operated any patient of class 1 MG as thymectomy is controversial for this group. As per modified Masaoka staging all our patients belong to Stage 1 or 2.

In our experience single lung ventilation with 30 degree lateral tilt achieved good exposure, while Yim et al used 90 degree lateral position.⁵ The choice of left or right sided approach for VATS depends on anatomical location of tumor and surgeons experience.

In our study we used left sided approach in most cases except 4 cases were rt lobe of thymus harboured the thymoma. Yim et al prefer to approach the tumor via right VATS for better visualization of superior vena cava, aorta and rt atrium while most European surgeons prefer a left sided approach. All intra operative and post operative factors were studied in detail. In our experience, we had no case of conversion to open, Nguyen et al had 4 cases of conversion to open out 53 in there series of VATS thymectomy due to bleeding, a large tumor or severe adhesion to great vessels.⁶

Table 4: Comparison of studies about surgical treatment of thymoma.

Authors	Masaoka stage	Approach	No. of patient	Blood loss (mL)	Operative time (min)	Post-op stay (days)
Liu et al ⁷	I,II	Sternotomy	44	159.7±109.6	149.9±33.3	9.1±3.8
		VATS	76	105.1±142.2	141.7±62.8	7.1±3.6
Chao et al ⁸	I,II	Sternotomy	48	75±96	173±56	7±2.2
		VATS	48	40±66	153±60	5.8±2
Odaka et al ⁹	I-IV	Sternotomy	52	260	210	13
		VATS	88	100	233	4
Siwachat et al ¹⁰	I-IV	Sternotomy	45	100±150	140.4±47.8	10 4
		VATS	53	50±50	150.4± 34.9	7 4
Present study	I-III	VATS	16	45±30	104	4.25 ±2

We used laparoscopic vessel sealing device for most of the dissection which resulted in minimal blood loss. Intra operative blood loss in present study was 45±30 ml ,this was in either similar or less when compared to the studies published in the literature.⁷⁻¹⁰ There is sufficient evidence that intra operative blood loss is less in VATS Thymectomy compared to open thymectomy, this fact is supported by findings in our study. Mean operating time in our study was 104 mins with a range of 78 to 145 mins. We had considerably shorter operating time when

compared to those in the literature, were reported surgical time is between 80 to 160 mins.⁷⁻¹⁰ Postoperative intensive care requirement after thymectomy was reduced with VATS approach as observed by shorter ICU stay. In our study ICU stay was 33 hrs with a range of 12 to 36 hrs. The postoperative hospital stay was 4.25 days with a range of 3-5 days, which is comparable to that published in literature.⁷⁻¹⁰ Shorter ICU stay and lower ventilation requirement could be due to less pain because of minimal invasive approach, which resulted in reduced risk of

respiratory infection or failure. There was no major postoperative complication in our study. Based on this data VATS appears to be a safe approach of thymectomy for MG especially in well experienced centres. However, studies with larger sample size would be required to confirm the results of this study and to make some definitive conclusions (Table 4).

Many studies have reported full recovery rate of 20 to 55% after thymectomy Seyfari et al reported full recovery in 34%, partial recovery in 51% and no improvement in 14.9%.¹¹⁻¹³ Slightly lower complete recovery rate observed in our study may be because of shorter follow up period of 12.5 months, which is the limitation of the present study. Longer follow up is required to evaluate long term therapeutic effect of VATS thymectomy in patients of MG.

CONCLUSION

This study suggests that VATS thymectomy is safe and effective approach for the treatment of MG with or without thymoma, and it offers all the advantages of minimally invasive surgery. MG treated by VATS resulted in comparable neurological outcomes to those associated with the transsternal approach.

ACKNOWLEDGEMENTS

Authors would like to thanks Dr. Meenakshi Akulwar (Consultant pathologist) for her kind support on study of histopathological reports in the present research.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Phillips LH, Torner JC, Anderson MS, et al. The epidemiology of myasthenia gravis in central and western Virginia. *Neurol.* 1992;42:1883-93.
- Drachman D. Myasthenia Gravis and other diseases of the neuromuscular junction. In: Longo D, Fauci A, Kasper D, Hauser S, Jameson J, Loscalzo J, (Eds). *Harrison's Principles of internal medicine.* 18th ed. USA: Mc Graw Hill Medical. 2012: 3480-3486.
- Gronseth GS, Barohn RJ. Practice parameter: thymectomy for autoimmune myasthenia gravis (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurol.* 2000;55:7-15.
- Aubert S, Salort-Campana E, Franques J, Uzenot D, Pouget J. Myasthénie séronégative et myasthénie avec anticorps anti-MuSK: une série rétrospective de 20 cas. *Rev Neurol.* 2009;165:901-10.
- Yim AP, Kay RL, Ho JK. Video-assisted thoracoscopic thymectomy for myasthenia gravis. *Chest.* 1995;108:1440-3.
- Nguyen GT, Nguyen TN, Nguyen NV, Le AV. Video assisted thoracoscopic thymectomy for thymoma: a single center experience. *Asian Cardiovascular Thoracic Annals.* 2018;2(3):207-11.
- Liu TJ, Lin MW, Hsieh MS. Video-assisted thoracoscopic surgical thymectomy to treat early thymoma: a comparison with the conventional transsternal approach. *Ann Surg Oncol.* 2014;21:322-8.
- Chao YK, Liu YH, Hsieh MJ. Long-term outcomes after thoracoscopic resection of stage I and II thymoma: a propensity-matched study. *Ann Surg Oncol.* 2015;22:1371-6.
- Odaka M, Shibasaki T, Kato D. Comparison of oncological results for early- and advanced-stage thymomas: thoracoscopic thymectomy versus open thymectomy. *Surg Endosc.* 2017;31:734-42.
- Siwachat S, Tantraworasin A, Lapisatepun W, Ruengorn C, Taioli E, Saeteng S. Comparative clinical outcomes after thymectomy for myasthenia gravis: Thoracoscopic versus trans-sternal approach. *Asian J Surg.* 2018;41:77-85.
- Aydin Y, Ulas AB, Mutlu V, Colak A, Eroglu A. Thymectomy in myasthenia gravis. *Eurasian J Med.* 2017;49(1):48-52.
- Waitande SS, Thankachen R, Philip MA, Shukla V, Korula RJ. Surgical outcome of thymectomy for myasthenia gravis. *Indian J Thorac Cardiovasc Surg.* 2007;23(2):171-5.
- Seyfari B, Fatehi F, Shojaiefard M, Jafari M. Clinical outcome of thymectomy in myasthenia gravis patients: A report from Iran. *Iran J Neurol.* 2018;17(1):1-5.

Cite this article as: Gajbhiye RN, Bhanarkar H, Akulwar VV, Tirpude B, Jambhulkar N, Deshpande G. Safety and feasibility of video assisted thoracoscopic thymectomy for myasthenia gravis: a single centre experience *Int Surg J* 2019;6:2159-63.