Journal of
Cardio - Thoracic Medicine

http://jctm.mums.ac.ir

Short-Term Perioperative Outcomes of Video-Assisted Thoracoscopic Versus Open Thymectomy in Myasthenia Gravis: A Single-Center Cross-Sectional Study

Ghasem Amini [1], Fatemeh Sajedi [2], Hasan Mehrad Maj [3], Reza Boostani [4], Azra Rashidnezhad [5], Reza Bagheri [6]*

[1] Endoscopic and Minimally Invasive Research Center, Department of Surgery, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
[2] Department of Persian Medicine, School of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
[3] Clinical Research Development Unit, Ghaem Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
[4] Department of Neurology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
[5] Department of Neurology, Torbat Heydarieh University of Medical Sciences, Torbat Heydarieh, Iran.
[6] Lung Diseases Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

ARTICLEINFO

Article type:
Original Article

Article history:
Received: 17 September 2025
Accepted: 25 October 2025

Keywords:
Myasthenia gravis thymectomy
Open surgery
Perioperative outcomes
Video-assisted thoracoscopic surgery

ABSTRACT

Introduction: Thymectomy is a crucial aspect of managing myasthenia gravis (MG). Video-assisted thoracoscopic surgery (VATS) offers a less invasive option compared to traditional open transsternal thymectomy. However, there is limited data on perioperative outcomes in Iran remain limited.

Methods: This cross-sectional study included 66 MG patients who underwent thymectomy at Mashhad University of Medical Sciences between 2005 to 2024. Patients underwent either open surgery (n=44) or VATS (n=22). Perioperative outcomes, such as operative time, blood loss, postoperative drainage, ICU and hospital stay, transfusion requirements, cardiovascular complications, and conversion to open surgery, were compared using Mann–Whitney U and chi-square tests.

Results: VATS thymectomy had longer operative times (124.9±9.6 vs. 88.2±6.5 min, P<0.001) but was associated with lower blood loss (252±52 vs. 323±55 mL, P<0.001), reduced postoperative drainage (273±61 vs. 308±53 mL, P=0.006), shorter ICU stay (1.0±0.0 vs. 1.7±0.5 days, P<0.001), shorter total hospital stay (3.0±0.8 vs. 5.9±0.8 days, P<0.001), and fewer patients requiring transfusion (13.6% vs. 20.0%, P=0.23). Cardiovascular complications were rare and comparable (9.1% vs. 8.9%, P>0.999). Two patients (9.1%) in the VATS group required conversion to open surgery.

Conclusions: VATS thymectomy is a safe and effective minimally invasive alternative to open surgery for MG, providing superior short-term perioperative outcomes without increasing complications. These findings support the adoption of VATS in centers with adequate surgical expertise. Multicenter prospective studies are needed to confirm long-term outcomes and cost-effectiveness.

► *Amini, G., Sajedi, F., Mehrad Maj, H., Boustani, R., Bagheri, R. Short-Term Perioperative Outcomes of Video-Assisted Thoracoscopic Versus Open Thymectomy in Myasthenia Gravis: A Single-Center Cross-Sectional Study. J Cardiothorac Med. 2025; 13(4): 1599-1603.* ***Doi: 10.22038/jctm.2025.91254.1510***

* Corresponding authors: Reza Bagheri,(MD), Lung Diseases Research Center, Mashhad University of Medical Sciences, Mashhad, Iran. Email: bagherir@mums.ac.ir .

Introduction

Myasthenia gravis (MG) is a chronic autoimmune neuromuscular disorder characterized by fluctuating weakness of voluntary muscles, often affecting ocular, bulbar, and limb muscles (1). Autoantibodies against acetylcholine receptors or other components of the neuromuscular junction impair synaptic transmission, leading to muscle fatigue (2). Thymic abnormalities, including thymic hyperplasia and thymoma, are frequently observed in MG patients, making thymectomy a cornerstone of treatment (3).

Open transsternal thymectomy has traditionally been considered the gold standard, providing maximal thymic resection and long-term neurological benefit (4). However, it is associated with larger incisions, increased postoperative pain, longer intensive care unit (ICU) and hospital stays, higher intraoperative blood loss, and greater transfusion requirements (5, 6).

Minimally invasive approaches, particularly Video-assisted thoracoscopic surgery (VATS), are increasingly popular due to smaller incisions, reduced perioperative morbidity, and faster recovery (5, 7). Prior studies suggest VATS thymectomy achieves comparable long-term neurological outcomes to open surgery while providing perioperative advantages, including lower blood loss, reduced drainage, shorter ICU and hospital stays, and fewer transfusions (6, 8). Nevertheless, concerns remain regarding longer operative times, completeness of resection, and the learning curve associated with VATS (9).

Despite growing international evidence, data from Iran comparing perioperative outcomes of VATS versus open thymectomy remain limited. Local evidence is essential to guide surgical decision-making, optimize patient care, and support adoption of minimally invasive techniques in centers with developing expertise. This study aims to compare short-term perioperative outcomes between VATS and open thymectomy in MG patients.

Materials and Methods

Study Design and Setting

We conducted a single-center, cross-sectional study at Mashhad University of Medical Sciences in Iran, including patients who underwent thymectomy between 2005 and 2024. The study received approval from the institutional ethics committee (IR.MUMS.IRH.REC.1402.230), and all patients provided verbal informed consent.

Participants

Patients with a confirmed diagnosis of myasthenia gravis who underwent either open transsternal thymectomy or VATS thymectomy were eligible. Exclusion criteria included incomplete medical records or concurrent unrelated surgical procedures. A total of 66 patients met the inclusion criteria: 44 underwent open thymectomy and 22 underwent VATS.

Surgical Procedures and Postoperative Care

All procedures were performed by experienced thoracic surgeons following standard institutional protocols. Open transsternal thymectomy was performed via median sternotomy, and VATS thymectomy was conducted using a three-port thoracoscopic approach. Postoperative care included standardized analgesia, respiratory physiotherapy, and monitoring for complications. Conversion from VATS to open surgery was done if clinically indicated.

Data Collection and Outcomes

We gathered baseline demographics, clinical characteristics, and perioperative data from medical records. The primary outcomes included:

- Operative time (minutes)
- Intraoperative blood loss (mL)
- Postoperative chest drainage (mL)
- ICU stay (days)
- Total hospital stay (days)
- Blood transfusion requirements (units and proportion of patients)
- Cardiovascular complications (e.g., arrhythmias, myocardial infarction)
- Conversion from VATS to open surgery

Statistical Analysis

Continuous variables are presented as mean ± standard deviation and categorical variables as counts and percentages. The Mann–Whitney U test was used for non-normally distributed continuous variables, and the chi-square or Fisher's exact test was used for categorical variables. Statistical significance was defined as $p<0.05$. Analyses were conducted using SPSS version 26.

Result

A total of 66 patients were included, with 44 undergoing open thymectomy and 22 undergoing VATS thymectomy. Baseline demographics, including age and sex distribution, were comparable between groups (Table 1).

Operative and postoperative outcomes are summarized in Table 2. VATS thymectomy was associated with a longer operative time (124.9 ± 9.6 vs. 88.2 ± 6.5 min, $p<0.001$) but demonstrated significant advantages in perioperative outcomes. Specifically, VATS patients experienced lower intraoperative blood loss (252.3 ± 52.0 vs. 323.8 ± 55.5 mL, $p<0.001$), reduced postoperative chest drainage (272.7 ± 61.2 vs. 307.8 ± 53.3 mL, $p=0.006$), shorter ICU stay (1.0 ± 0.0 vs. 1.7 ± 0.5 days, $p<0.001$), and shorter total hospital stay (3.0 ± 0.8 vs. 5.9 ± 0.8 days, $p<0.001$).

No significant differences were observed in the mean number of transfused units (0.13 ± 0.45 vs. 0.20 ± 0.55, $p=0.64$) or the proportion of patients requiring transfusion (13.6% vs. 20.0%, $p=0.23$). Cardiovascular complications were rare and comparable between groups (9.1% vs. 8.9%, $p>0.999$). Two patients (9.1%) in the VATS group required conversion to open surgery due to intraoperative bleeding.

Overall, these findings indicate that VATS thymectomy provides superior short-term perioperative outcomes while maintaining a similar safety profile compared with open thymectomy.

Discussion

This study demonstrates that VATS thymectomy provides significant perioperative advantages over open transsternal thymectomy in patients with myasthenia gravis. Although the operative time was longer in the VATS group (mean 124.9 min vs. 88.2 min for open surgery), this was offset by reduced intraoperative blood loss (252 mL vs. 323 mL), lower postoperative chest drainage (272 mL vs. 307 mL), shorter ICU stay (1.0 vs. 1.7 days), reduced total hospital stay (3.0 vs. 5.93 days), and lower transfusion requirements.

Cardiovascular complications were rare and comparable between groups, indicating that VATS is safe when performed by experienced surgeons.

Table 1. Baseline characteristics of patients undergoing open thymectomy vs, VATS thymectomy.

Characteristic	Open surgery (n=44)	VATS (n=22)	p-value
Age, years (mean ± SD)	35.29 ± 13.47	30.27 ± 9.99	0.093
Male sex, n (%)	20 (45.5)	8 (36.4)	0.480

Table 2. Operative and postoperative outcomes in open thymectomy vs,VATS thymectomy.

Variable	Open surgery (n=44)	VATS (n=22)	p-value
Operative time, min (mean ± SD)	88.22 ± 6.49	124.91 ± 9.59	<0.001
Intraoperative blood loss, mL (mean ± SD)	323.78 ± 55.49	252.27 ± 52.00	<0.001
Postoperative drainage, mL (mean ± SD)	307.78 ± 53.25	272.73 ± 61.19	0.006
ICU stay, days (mean ± SD)	1.69 ± 0.47	1.0 ± 0.0	<0.001
Hospital stay, days (mean ± SD)	5.93 ± 0.84	3.0 ± 0.76	<0.001
Blood transfusion, units (mean ± SD)	0.20 ± 0.55	0.13 ± 0.45	0.640
Patients requiring transfusion, n (%)	9 (20.0)	3 (13.6)	0.230
Cardiovascular complications, n (%)	4 (8.9)	2 (9.1)	>0.999
Conversion to open surgery, n (%)	–	2 (9.1)	–

Two patients (9.1%) in the VATS group required conversion to open surgery due to intraoperative bleeding, which is consistent with global conversion rates reported at 5–15% (8,10).

These findings align with previous international studies reporting shorter hospital and ICU stays for VATS compared with open thymectomy. Pennathur et al. observed reduced hospital stay (3 vs. 5 days) in patients undergoing VATS (11), while Xie A et al. reported 7.0 vs. 9.8 days (8). Erşen et al. found mean hospital stays of 4.2 vs. 6.5 days for VATS and open surgery, respectively (10). Wang et al. similarly reported significantly shorter stays for VATS patients (12). A multicenter retrospective study including 220 patients demonstrated that VATS was associated with reduced ICU (0.2 vs. 1.2 days) and hospital stay (2 vs. 4.3 days) (13), consistent with national database findings from the NIS (14). In a meta-analysis, Yang et al. confirmed that thoracoscopic thymectomy significantly decreases hospitalization time (15).

Regarding intraoperative blood loss and transfusion, our results showed significantly lower blood loss in the VATS group, although transfusion rates were not statistically different. This is consistent with prior reports demonstrating reduced blood loss with VATS, including Xie A et al. (131.8 mL vs. 340.5 mL) (8) and Erşen et al (10). Yang et al. also reported lower transfusion rates following thoracoscopic thymectomy (15).

Postoperative chest drainage, a marker of surgical invasiveness and recovery, was significantly lower in the VATS group (272 vs. 307 mL), aligning with previous studies and meta-analyses showing shorter drainage duration after VATS (12,15,16).

Cardiovascular complications were rare and similar between groups in our cohort. Although some studies reported slightly fewer postoperative complications with VATS, including reduced pneumonia and cardiac events (8,10,13,15), the overall safety profile is comparable to open thymectomy.

In summary, despite longer operative times, VATS thymectomy offers superior short-term perioperative outcomes, including reduced blood loss, shorter ICU and hospital stay, lower drainage, and minimal complications. These findings support the adoption of VATS as a safe, minimally invasive, and efficient approach for selected MG patients. Careful patient selection, surgical expertise, and institutional experience remain essential to optimize outcomes.

Conclusion

VATS thymectomy is a safe, effective, and minimally invasive alternative to open transsternal thymectomy for patients with MG. It offers shorter recovery times, reduced intraoperative blood loss, lower postoperative drainage, and decreased transfusion requirements without increasing perioperative complications. In centers with adequate surgical expertise, VATS should be considered the preferred approach. Multicenter longitudinal studies are needed to evaluate long-term neurological outcomes and overall cost-effectiveness.

References

1. Fecto F. Myasthenia gravis: Mechanisms, clinical syndromes, and diagnosis. Disease-a-Month. 2025 Jun 26:101969.
2. Dresser L, Wlodarski R, Rezania K, Soliven B. Myasthenia gravis: epidemiology, pathophysiology and clinical manifestations. Journal of clinical medicine. 2021 May 21;10(11):2235.
3. Khan MA, Anjum F. Thymic hyperplasia.2020.
4. Di Crescenzo VG, Napolitano F, Panico C, Di Crescenzo RM, Zeppa P, Vatrella A, et al. Surgical approach in thymectomy: Our experience and review of the literature. International Journal of Surgery Case Reports. 2017 Jan 1;39:19-24.
5. Hess NR, Sarkaria IS, Pennathur A, Levy RM, Christie NA, Luketich JD. Minimally invasive versus open thymectomy: a systematic review of surgical techniques, patient demographics, and perioperative outcomes. Annals of cardiothoracic surgery. 2016 Jan;5(1):1.
6. Soder SA, Pollock C, Ferraro P, Lafontaine E, Martin J, Nasir B, et al. Post-operative outcomes associated with open versus robotic thymectomy: a propensity matched analysis. InSeminars in Thoracic and Cardiovascular Surgery 2023 Mar 1 (Vol. 35, No. 1, pp. 189-199). WB Saunders.
7. Coco D, Leanza S. Robotic thymectomy: a review of techniques and results. Kardiochirurgia i Torakochirurgia Polska/Polish Journal of Thoracic and Cardiovascular Surgery. 2023 Mar;20(1):36-44.

8. Xie A, Tjahjono R, Phan K, Yan TD. Video-assisted thoracoscopic surgery versus open thymectomy for thymoma: a systematic review. Annals of Cardiothoracic Surgery. 2015 Nov;4(6):495.
9. Saber B, Agrawal DK. Long-Term Outcomes of Minimally Invasive vs. Traditional Open Spinal Fusion: A Comparative Analysis. Journal of spine research and surgery. 2025 Mar 26;7(1):18.
10. Erşen E, Kılıç B, Kara HV, İşcan M, Sarbay İ, Demirkaya A, et al. Comparative study of video-assisted thoracoscopic surgery versus open thymectomy for thymoma and myasthenia gravis. Videosurgery and Other Miniinvasive Techniques. 2018 May 16;13(3):376.
11. Pennathur A, Qureshi I, Schuchert MJ, Dhupar R, Ferson PF, Gooding WE, et al. Comparison of surgical techniques for early-stage thymoma: feasibility of minimally invasive thymectomy and comparison with open resection. The Journal of Thoracic and Cardiovascular Surgery. 2011 Mar 1;141(3):694-701.
12. Wang GW, Tao T, Li CK, Li QC, Duan GX, Sang HW, et al. Comparison between thoracoscopic and open approaches in thymoma resection. Journal of Thoracic Disease. 2019 Oct;11(10):4159.
13. Imielski B, Kurihara C, Manerikar A, Chaudhary S, Kosterski S, Odell D, et al. Comparative effectiveness and cost-efficiency of surgical approaches for thymectomy. Surgery. 2020 Oct 1;168(4):737-42.
14. Gross DJ, Zangbar B, Muthu N, Chang EH, Badami A, Stein L, et al. Saving the split: the benefits of VATS thymectomy. Journal of Thoracic Disease. 2019 Apr;11(4):1428.
15. Yang Y, Dong J, Huang Y. Thoracoscopic thymectomy versus open thymectomy for the treatment of thymoma: a meta-analysis. European Journal of Surgical Oncology (EJSO). 2016 Nov 1;42(11):1720-8.
16. Hireche K, Canaud L, Lounes Y, Aouinti S, Molinari N, Alric P. Thoracoscopic versus open lobectomy after induction therapy for nonsmall cell lung cancer: new study results and meta-analysis. Journal of Surgical Research. 2022 Aug 1;276:416-32.