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Thymectomy in Myasthenia Gravis: The Short-Term Outcome at a Tertiary Center in Nepal

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ABSTRACT

Introduction: Myasthenia gravis is a common autoimmune condition that primarily affects women and typically present with symptoms ranging from ocular muscle weakness to severe generalize muscle fatigue. Thymectomy has been shown to improve outcomes by reducing both complications and mortality. This study evaluates short-term outcome of the patients who underwent thymectomy.

Methods: A retrospective cohort study was conducted at Nobel Medical College and Teaching Hospital, including patients admitted between March 2021 and December 2024. Patient records were reviewed using a structured questionnaire. Data were entered in Epi-data (Version 3.1) and analyzed using SPSS (Version 20). Ethical approval was obtained from the Institutional Review Committee.

Results: The study included 22 Myasthenia gravis patients, with a mean age of 33.7 years (range: 17–55 years), the majority of whom were female with normal BMI. Thyroid disorders being the most common comorbidities. Most patients presented with classic MG symptoms such as ophthalmoplegia, bulbar involvement, limb weakness, and respiratory issues. Following thymectomy, Thymic hyperplasia being most common pathology, 86.3% were weaned off prednisolone, and 86.4% had reduced pyridostigmine doses. The mean pyridostigmine dose decreased from 280 ± 88.8 mg preoperatively to 128.2 ± 105.3 mg postoperatively. Complete cessation of pyridostigmine was achieved in 36% patients, while 31% had a half reduction, 27% had a quarter reduction with significant symptomatic improvement.

Conclusions: In conclusion, thymectomy in myasthenia gravis shows a better outcome with improvement in symptoms and reduction in medication.

Introduction

Myasthenia gravis (MG) is the most common autoimmune disorder affecting the neuromuscular junction. While it is often manageable and sometimes curable, MG can lead to serious complications and even death if not diagnosed and treated early. The disease presents with a wide range of symptoms, from isolated eye muscle weakness to severe fatigue affecting limb, bulbar, and respiratory muscles. MG can develop at any age, but it most commonly affects young adult women and older men.[1-4]

Recent global epidemiological data report a prevalence of 124 cases per million people. Early-onset MG, which occurs before the age of 40, is more frequent in women, with a female-to-male ratio of about 3:1. Around 70% of MG patients show thymic follicular hyperplasia, while up to 15% may develop thymoma. Furthermore, approximately 40% of individuals with thymoma experience MG symptoms.[1,5-7]

The underlying cause of MG is often linked to abnormalities in the thymus gland,

including thymic hyperplasia and thymoma. Thymectomy, the surgical removal of the thymus, has become an increasingly accepted treatment approach. It aims to reduce antibody production and improve long-term disease control. Studies have shown that patients undergoing thymectomy often experience better symptom relief and a reduced need for medication compared to those who are treated without surgery.[3,4,9,10]

This study aims to evaluate the short-term outcomes of patients with myasthenia gravis who have undergone thymectomy.

Methodology

Study design: This was a hospital based retrospective cohort study conducted at Nobel Medical College and Teaching Hospital, involving patients with MG who underwent thymectomy.

Selection criteria

Inclusion criteria involved patients diagnosed with MG not responding to medical treatment and tested positive for Anti acetylcholine receptor antibodies (anti- AChR antibody). Computed Tomography (CT) and/or Magnetic Resonance imaging (MRI) was performed in all patients to confirm thymic pathology prior to surgical intervention. Patients in the mechanical ventilator are excluded in our study.

Sample size

All patients meeting the inclusion criteria between March 2021 and December 2024 were included. A total of 22 patients were enrolled in the study. Since the MG is a rare condition and difficult to identify in low resource setting because of its multi symptoms characters. the sample size for this study was typically low in short term studies. Although the sample size is low, the outcomes of the study can provide the relevant information regarding the MG cases with thymectomy.

Study procedure

The patients meeting the requirement of thymectomy based on history, physical examination and laboratory examination anti ACTH positive and radiological evidence.

Data collection tools and technique

Data collected included demographic information, clinical presentation, diagnostic imaging, operative details, and postoperative outcomes. Follow-up data were obtained from medical records and patient interviews, focusing on survival rates, symptom relief, and functional status. Structured questionnaire was used for the data collections.

Data Processing and Analysis

After data collection the data was checked for completeness, compiled and coded daily after the completion of field activities. After this, all data was entered in the EPI-DATA software. Then data was refined to find out any errors such as coding errors and entry errors. The refined data was then exported to SPSS for further analysis. As the data collected and entered are quantitative, it was analyzed using descriptive and analytical statistics as frequencies, percentage, and mean.

Quality Control and Quality Assurance

It is very important to ensure the quality of the study. Retrospective Cohort study was used to identify the relevant participants for the study. Validity and reliability are important issue in research that may lead to fault result. So, to maintain validity and reliability extensive literature review was conducted. The development of tools was done under expert supervision. According to objectives, variables was defined and then tools successively. Pretesting of the instrument was done. Each participant's free, prior informed consent was obtained. Data entry was done in EPI-DATA 3.1 that help to avoid beyond limit error and for within limit 10% data was selected randomly and was checked manually. Expert advice and peer review was used to draft the report. Ethics was also maintained while a grammatical correction was done.

Ethical consideration

The permission to conduct study was obtained from Noble Medical College and Teaching Hospital. The ethical approval for implementation of study was taken from Institutional Review Committee (IRC) of Nobel Medical College and Teaching Hospital. (IRC-NMCTH-131/2024)

Results

The mean age of the participants was found to be 33.7±10.2 years with age ranging from 17 years to 55 years. Most of them were female (90.9%). All the participants had normal BMI. Observing the comorbidity, thyroid (29.4%) and COAD (22.7%) more common followed by diabetes (18.2%). Only 2 participants (11.8%) had smoking habits. (Table 1)

Table 1: Participants characteristics

Characteristics (n=22)	Frequency	Percentage
Age		
Mean age : 33.7±10.2 years, Range: 17-55 years		
Gender		
Male	2	9.1
Female	20	90.9
BMI		
Normal	22	100.0
Comorbidities		
Diabetes	4	18.2
Hypertension	3	13.6
Thyroid	5	22.7
COAD	5	22.7
Smoking		
Yes	1	4.5
No	21	95.5

Clinical symptoms of the patients

Table 2 shows the clinical symptoms of the patients between preoperative and postoperative status. All the patients (100%) have ophthalmoplegia before surgery while only 13.6% had

ophthalmoplegia in postoperative stage. Most of them had bulbar symptoms (72.7%) before surgery while only 9.1% had postoperative bulbar symptoms. Some of the participants had limb weakness (40.9%) and respiratory symptoms (22.7%). Only 9.1% had limb weakness after surgery. Similarly, 22.7% of the patients had respiratory symptoms before surgery which was completely resolve after surgery.

Table 2: Clinical symptoms of the patients

Clinical features	Preoperative		Postoperative	
	Present n(%)	Absent n(%)	Present n(%)	Absent n(%)
Ophthalmoplegia	22(100.0%)	0(0%)	3 (13.6%)	19 (86.4%)
Bulbar symptoms	16 (72.7%)	6 (27.3%)	2 (9.1%)	20 (90.9%)
Limb weakness	9 (40.9%)	13 (59.1%)	2 (9.1%)	20 (90.9%)
Respiratory symptoms	5 (22.7%)	17 (77.3%)	0 (0%)	22 (100.0%)

Table 3: Preoperative characteristics of participants

Characteristics	Frequency	Percent
RF		
Normal	22	100.0
EF		
Normal	22	100.0
Heart rhythm		
Normal sinus rhythm	22	100.0
Diagnosis		
MG	22	100.0
Duration of illness		
Less than 1 year	7	31.8
1-2 years	9	40.9
More than 2 years	6	27.3
MG grade		
I	11	50.0
IIa	6	27.3
IIb	2	9.1
III	3	13.6
Family History		
Yes	2	9.1
No	20	90.9
Serum Calcium		
Sub optional	8	36.4
Normal	14	63.6
Serum Magnesium		
Sub optional	4	18.2
Normal	18	81.8

Table 3 shows the preoperative characteristics of the participants. Renal function (RF), Ejection Fraction (EF) and heart rhythm are normal for every patient. All the patients were diagnosed case of Myasthenia gravis (MG) with Anti - AChR antibody positive. Majority of the participants (40.9%) had duration of illness between 1-2 years. Half (50%) of the participants lies in MG grade I followed by grade IIa (27.3%), grade III (13.6%) and grade IIb (9.1%) respectively. Only 9.2% of the participants had family history of MG. More than one-third (36.4%) had sub-optional serum calcium level while 18.2% participant had sub-optional serum magnesium level. Surgery related information

Table 4: Surgery related information of participants

Characteristics	Frequency	Percent
Operation		
Thymectomy	22	100
Ventilator stay (Post OP)		
Within 24 hours	18	81.8
More than 24 hours	4	18.2
ICU stay		
Mean: 2.9±0.7 days, Range: 2-5 days		
Hospital Stay		
Mean: 8.6±1.3 days, Range: 7-12 days		
Surgical site infection		
No	22	100.0
Incision		
Upper J mini sternotomy	20	90.9
Median sternotomy	2	9.1

Table 4 shows the surgery related information of all the participants. More than four-fifth (81.8%) stayed ventilator less than 24 hours while remaining stayed more than 24 hours. The mean ICU stay was 2.9±0.7 days with the range of 2 to 5 days. Similarly, the mean hospital stay was 8.6±1.3 days with the range of 7 to 12 days. None of the participants had surgical site infection. More than nine-tenth (90.9%) had upper J mini sternotomy.

Medication variation of patients

Table 5 shows the medication of the patients. All the patients were under optimal does of prednisolone and Pyridostigmine before Surgery. Among them, more than four-fifth (86.3%) of patients were bean able to weaned off prednisolone (steroid) after the surgery, whereas 86.4% had reduction in doses of Pyridostigmine. The mean doses of Pyridostigmine before surgery was 280±88.8 mg while it was reduced to 128.2±105.3 mg after surgery. Overall, 36% had cent percent reduction in Pyridostigmine, while less than one-third (31%) had half reduction in Pyridostigmine. Similarly, more than one-fourth (27%) had one-quarter reduction in Pyridostigmine. Among all, single case had no change in Pyridostigmine dose.

Table 5: Medication variation of patients

S.N.	Preop Medication		Postop medication		Reduction of medication	
	Pyridostigmine (Mg divided does in 24hrs) A	Prednisolone (Steroid) B	Pyridostigmine (Mg divided does in 24hrs) C	Prednisolone (Steroid) D	Reduction in Pyridostigmine A and C in %	Reduction in Steroid B and D in %
1	240	Yes	00	No	100	100
2	360	Yes	180	No	50	100
3	240	Yes	00	No	100	100
4	480	Yes	240	Yes	50	00
5	240	Yes	120	No	50	100
6	180	Yes	00	No	100	100
7	360	Yes	240	No	25	100
8	360	Yes	180	No	50	100
9	240	Yes	180	No	25	100
10	240	Yes	180	No	25	100
11	240	Yes	120	No	50	100
12	360	Yes	00	No	100	100
13	240	Yes	180	No	25	100
14	240	Yes	00	No	100	100
15	240	Yes	120	No	50	100
16	180	Yes	00	No	100	100
17	480	Yes	360	Yes	25	00
18	240	Yes	240	No	00	100
19	240	Yes	120	No	50	100
20	360	Yes	240	Yes	25	00
21	240	Yes	120	No	100	100
22	160	Yes	00	No	100	100
Mean	280		128.2		59.1	86.4
SD	88.8		105.3		34.2	35.2
Min	160		0		0	0
Max	480		360		100	100

Post-operative outcomes

Among the total patients, 20 patients have Thymic hyperplasia (Figure 1) while remaining each patient have Type B1thymoma (figure 2a) and Type B2 thymoma (figure 2a) respectively with histopathological descriptions.

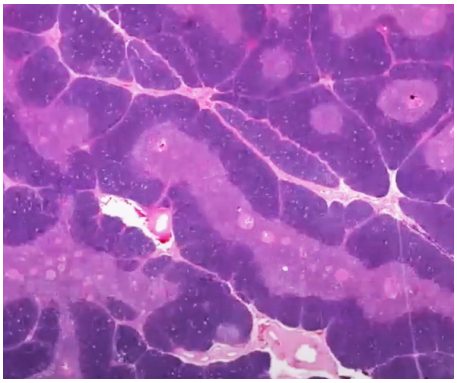

Figure1: Thymic hyperplasia with germinal centers and Hassall's corpuscles

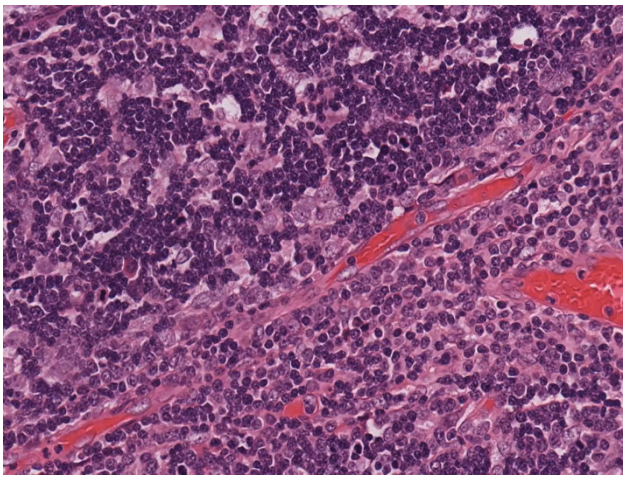

Figure 2a: Type B1 thymoma: Pale-staining medullary islands are scattered in a dark-staining thymic cortex–like background.

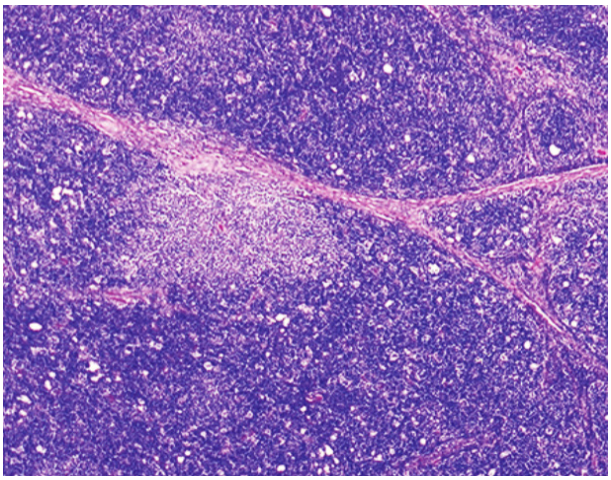

Figure 2b: Type B2 thymoma composed of small lymphocytes admixed with neoplastic large polygonal epithelial cells containing enlarged vesicular nuclei with conspicuous nucleoli

Discussion

This study evaluated the outcomes of thymectomy in patients with MG over a two-year period. The findings showed that the surgery was successfully performed with minimal complications and no postoperative deaths. Regardless of factors like age, sex, disease duration, severity, or thymic pathology, thymectomy helped reduce both the severity of symptoms and the need for medications.

The mean age of the patients diagnosed with MG were 33.7±10.2 years, with females being more frequently affected. This trend aligns with studies from Austria, Oman, and Switzerland, which also reported a younger average age of MG diagnosis and a higher prevalence among women.[1,11-14] However, some research contradicts this, showing an average age of 50 years at diagnosis with no significant gender differences.[8] MG seems to be more prevalent in Nepal and among certain Asian populations, which might be due to environmental, genetic, or diagnostic factors. Limited access to healthcare, delayed diagnosis, and gender-based disparities might explain why more women are diagnosed, potentially due to immunological and hormonal susceptibility. Additionally, healthcare providers may overlook MG symptoms in men, further widening the gender gap.

About one-fifth of the patients had other health conditions such as diabetes, hypertension, thyroid issues and COAD, consistent with findings from earlier studies.[12] At the time of presentation all the patients poses different grade of MG symptoms such as ophthalmoplegia, bulbar, limb weakness and respiratory difficulties. Two patients were intubated and received Intravenous Immunoglobulin (IVIg) for worsen symptoms before presenting to us. These findings are consistent with other research where patients presented with similar symptom patterns.[8,12] For instance, a study from Oman found initial symptoms included ophthalmoplegia in 75%, limb weakness in 39%, bulbar involvement in 57%, and respiratory issues in 39% of cases.

All participants in this study had MG symptoms for less than two years. However, previous studies have reported a wide range in disease duration, from a few months to several years.[12,13,15,16] This variation may be due to the subtle or non-specific nature of early MG symptoms, which are often mistaken for other conditions, leading to delayed diagnosis. Other contributing factors could include limited access to specialists, regional differences in diagnostic practices, and a lack of awareness among general practitioners.

Postoperatively, over 81.8% of patients required Mechanical Ventilation (MV) support for less than 24 hours, indicating quick recovery and minimal respiratory issues. The average ICU stay was 2.9 ± 0.7 days, with hospital stays ranging from 7 to 12 days. None of the patients developed surgical site infections. These results are consistent with a study from Norway where 75–85% of MG patients were weaned of MV support in under 24 hours, especially when their symptoms were well-managed before surgery. [17] Mantegazza et al. 2013 also noted similar ICU stays 1–4 days and hospital stay 7–10 days in patients without complications. [18] Factors like poorly controlled symptoms, older age, or comorbidities can lead to prolonged hospital stays, but these were not significant issues in our patient group.

Only 9.1% of patients required extended ventilation, which is notably lower than in other studies where rates ranged from 20–30%, especially in cases with poor symptom control or major resections. This likely reflects effective perioperative care and good disease management before surgery.

Strict infection control and close monitoring likely prevented surgical site infections, which, though rare, can lead to significant complications. The majority (90.9%) of patients underwent upper J mini-sternotomy, a less invasive procedure that offers quicker recovery and better cosmetic outcomes. This technique aligns with global trends toward minimally invasive approaches like video-assisted thoracoscopic surgery (VATS) and mini-sternotomy, which have been shown to yield comparable results with less discomfort and shorter hospital stays.[19,20]

All patients were on prednisolone and pyridostigmine before surgery, which is standard for symptom control. After surgery, only 13.6% continued on steroids, and 86.4% had a reduced need for pyridostigmine. This supports previous findings that thymectomy can significantly lessen MG symptoms and medication use. The MGTX trial also demonstrated that thymectomy combined with prednisone improved outcomes and reduced steroid dependency compared to medication alone.[21] Our results align with this, showing decreased reliance on corticosteroids, which helps avoid their long-term side effects. The reduction in pyridostigmine suggests better neuromuscular transmission and less disease activity post-surgery. Other retrospective studies also found reduced need for symptomatic treatments, especially in early-onset MG or cases with thymic hyperplasia.[12,22,23]

Our study shows that most of participants had thymic hyperplasia while only few had thymoma. Thymic hyperplasia is the most common thymic pathology in MG, especially in early-onset variants, according to the current literature. Thymomas are less common but nonetheless clinically relevant.[24,25]

Different epidemiological studies assume that 10-20% of MG had thymoma[24], while systematic reviews shows that nearly one-fifth of MG develop thymoma.[26] The ultimate goal in MG treatment is long-term symptom control and preventing severe complications. With low risk, minimal trauma, and short recovery times, thymectomy appears to be well-accepted when offered early in the disease course.

This study has several limitations. First, as a single-center study, the generalizability of the findings is limited. Second, its retrospective and non-randomized design introduces potential selection bias, further compounded by the lack of multivariate analysis. To validate the best timing and criteria for surgery, future large-scale, randomized, multi-center, long-term prospective studies are recommended.

Conclusion

This study highlights that thymectomy is a safe and effective surgical option for patients with myasthenia gravis, offering significant symptom relief, reduced medication dependence, and minimal postoperative complications. The high rate of successful outcomes, even among individuals with varied disease duration and severity, supports the broader applicability of thymectomy. The findings also suggest that early diagnosis and optimal preoperative management are key to improving surgical outcomes. Given the encouraging results, further multi-center, randomized studies are needed to establish standardized guidelines on the ideal timing and patient selection for thymectomy in MG management.

Conflict of the Interest: None

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