



Manubriotomy versus Median Sternotomy in Thymectomy for Myasthenia Gravis Cases

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Abstract

Background: Myasthenia Gravis (MG) is an autoimmune disease characterized by varying degrees of weakness of the skeletal muscles of the body and resulting from the production of antibodies against postsynaptic nicotinic acetylcholine receptors at the neuromuscular junction.

Aim: To compare between manubriotomy and median sternotomy in thymectomy for myasthenia gravis cases as regards intraoperative and postoperative complications.

Patients and Methods: This retrospective prospective comparative study is conducted in cardiothoracic surgery department, Mansoura University Hospital. This study includes forty patients with myasthenia gravis who had thymectomy surgery, and they were classified into two groups.

Group I: Included 20 patients with MG and operated upon through manubriotomy, While

Group II: Included 20 patients with MG and operated upon through median sternotomy.

Results: There is a highly significant difference between occurrence of chest infection in the form of tracheobronchitis and secretions in both groups. Chest infection occurred in one case in manubriotomy group but in 6 cases in median sternotomy group.

Conclusion: Manubriotomy is better than median sternotomy for thymectomy in MG patients.

Keywords: Manubriotomy; Median Sternotomy; Thymectomy; Myasthenia Gravis

Introduction

Myasthenia Gravis (MG) is an autoimmune disease characterized by varying degrees of weakness of the skeletal muscles of the body and resulting from the production of antibodies against postsynaptic nicotinic acetylcholine receptors at the neuromuscular junction [1].

Ocular weakness is the first manifestation in half of the patients who usually complain of ptosis or diplopia. Generalized weakness is observed in up to 85% of patients with extremely different manifestation, and the onset of symptoms may be gradual or abrupt, in addition there may be spontaneous remissions or aggravations [2].

Myasthenia Gravis may be associated with various abnormalities of the thymus gland as hyperplasia or thymoma. The thymus gland lies behind the breastbone and is an important part of the immune system in infancy and early childhood [3]. The hallmark of myasthenia gravis is muscle weakness that increases during periods of activity and improves after periods of rest. Certain muscles such as those that control eye and eyelid movement, facial expression chewing, talking, and swallowing are often, but not always involved in the disorder. The muscles that control breathing and neck and limb movements may also be affected [4]. The treatment of MG may be medical or surgical or both. Medical treatment includes the use of anticholinesterase agents, immunotherapy (corticosteroids, azathioprine, immunoglobulins) and plasmapheresis. The degree of improvement after surgery is not predictable, but can be significant [5]. The optimal approach and the extent of the resection to be performed are still under discussion. The sternotomy does have the advantage of providing excellent visualization and allowing an extended resection when necessary. The optimal surgical approach varies with the surgeon's experience and preference and most of the approaches are currently acceptable [6]. Minimally invasive methods of surgery have emerged over recent decades including manubriotomy, transcervical, Video Assisted Thoracoscopic Surgery (VATS) and Robotic Video Assisted Thoracoscope (R-VATS) [7].

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We aim in this study to compare between manubriotomy and median sternotomy in thymectomy for myasthenia gravis cases as regards intraoperative and postoperative complications especially those which are related to the approach of thymectomy whether manubriotomy or median sternotomy and also ICU and hospital stay of those patients.

Methods and Materials

This retrospective prospective comparative study is conducted in cardiothoracic surgery department, Mansoura University Hospital. This study includes forty patients with myasthenia gravis who had thymectomy surgery, and they were classified into two groups.

Group I: Included 20 patients with MG and operated upon through manubriotomy.

Group II: Included 20 patients with MG and operated upon through median sternotomy.

Inclusion criteria included

Myasthenia Gravis patients of any age of both sex with compliance to medical treatment who had elective thymectomy.

Exclusion criteria included

Patients with myasthenic crisis, previous sternotomy for any surgery and patients with skeletal abnormalities of the chest.

Both groups of patients were subjected to

Preoperative management: Clinical data and medical history have been obtained from the patients of both groups. The patients were submitted to:

1. Clinical examination.
2. Chest X-ray and CT chest
3. Routine preoperative laboratory investigations
4. Routine 3 cycles of plasmapheresis before the surgery.

Operative technique: Thymectomy through Manubriotomy approach.

Skin incision: Skin incision is made from the sternal notch in the midline down to the level of the second or third intercostal space. The retrosternal space directly behind the manubrium is bluntly dissected by the surgeon's gloved index finger.

Sternal splitting: The sternum is splitted by using pneumatic or electric saw down to the level of the second or third intercostal space. The incision is made in the midline of the sternum. Using a bone cutter, the sternal incision is extended laterally towards the left second or third intercostal space resulting in making the upper partial sternotomy L-shaped and if the extension is made toward the left and right intercostal space, it will be inverted T-shaped incision.

Sternal retraction and Hemostasis: A small sternal retractor is used to widen the split sternum for maximal exposure. Bone wax or diathermy is applied to the bleeding edges of the sternum.

Dissection and resection of the thymus gland and thymic fat: Dissection of the thymus and the mediastinal fat begin from downward and going upward, elevation of the thymus gland and the mediastinal fat towards the brachiocephalic trunk (radical resection), opening of the two pleurae to resect all the mediastinal fat without phrenic nerve injury. The draining veins and arterial branches of the thymus are ligated, after resection of the thymus and the mediastinal

fat hemostasis will be done.

Insertion of drain and closure of the sternum and skin wound: one drain is placed through an incision in the epigastrium. Sternal closure by a stainless-steel wire, closure of the pectoralis muscle and subcutaneous tissue by continuous absorbable sutures. Skin closure with subcuticular absorbable suture.

Thymectomy through median sternotomy approach

Skin incision: Skin incision is made median and vertical starting just below the sternal notch to the tip of the xiphoid process.

Sternal splitting: The sternum may be divided by using pneumatic or electric saw, the osteotomy is made vertical and median and may be done from above downwards, or from down upwards. When splitting of the sternum occurred. The bleeding periosteum should be controlled by diathermy or bone wax.

Sternal retraction: A small retractor is used to allow opening of the sternum.

Dissection and resection of the thymus gland and thymic fat: The same as in manubriotomy (radical resection of the thymus gland).

Insertion of drain and closure of the sternum and skin wound: The same as in manubriotomy.

Ethical committee approval

The aim and nature of the study were explained for each patient before inclusion. An informed consent was obtained then examinations were performed.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 21 for Windows® (SPSS Inc, Chicago, IL, USA). Comparison between groups was done by Chi-Square test. Quantitative data was presented as mean \pm SD and range. Qualitative data was presented as number and percent. Student t-test was used to compare between two groups. $P < 0.05$ was considered to be statistically significant.

Results

There were 40 patients included in this study and classified randomly into 2 groups:

Group I: It included 20 MG patients (8 males and 12 females) with manubriotomy for resection of the thymus gland while

Group II: It included 20 MG patients (7 males and 13 females) with median sternotomy for resection of the thymus gland.

Table 1 showed that the periods of ICU stay of the two groups differs significantly. ICU stay in manubriotomy group extended up to one day and ranged from one to six days in median sternotomy group. And reveals that there is a high significant difference between hospital stay of the two groups, which extended up to 4 days in manubriotomy group but up to 15 days in median sternotomy group.

Table 2 revealed that pain score of the two groups differs significantly. Patients of median sternotomy group needed extra doses of analgesics.

Table 3 showed that there is a highly significant difference between occurrence of chest infection in the form of Tracheobronchitis and secretions in both groups. Chest infection occurred in one case in manubriotomy group but in 6 cases in median sternotomy group,

Table 1: ICU and Hospital stay.

	Group 1 (N=20)	Group 2 (N=20)		P. value
ICU stay in days	1.00 ± 0.00	1.45 ± 0.83	2.438	0.025*
Hospital stay in days	3.70 ± 0.80	7.35 ± 3.20	4.948	<0.001*

Table 2: Post-operative pain.

	Group 1 (N=20)	Group 2 (N=20)		P. value
Pain score	5.55 ± 0.60	7.60 ± 0.68	10.069	<0.001*

Table 3: Post-operative chest infection (trachea-bronchitis and secretions).

	Group				χ ²	P. value
	Group 1 (N:20)		Group 2 (N:20)			
	No	%	No	%		
Post-operative chest infection (trachea-bronchitis and secretions)	1	5%	6	30%	4.33	0.037*

Table 4: Post-operative myasthenic crisis.

	Group				χ ²	P
	Group 1 (N:20)		Group 2 (N:20)			
	No	%	No	%		
Crisis	0	0%	2	10%	2.105	0.147

Table 5: Post-operative plasmapheresis.

	Group				χ ²	P
	Group 1 (N:20)		Group 2 (N:20)			
	No	%	No	%		
Post-op plasmapheresis	0	0%	2	10%	2.11	0.147

there were no detected cases of atelectasis and pneumonia in both groups.

Table 4 showed that there is no significant difference between both groups as regard post-operative crisis. There was no crisis in manubriotomy cases but there was crisis in 2 cases in median sternotomy group who re-intubated in the ICU.

Table 5 showed that there is no significant difference between post-operative need for plasmapheresis in both groups. There were no cases in manubriotomy group needed post-operative plasmapheresis but in median sternotomy group there were 2 cases needed post-operative plasmapheresis.

Discussion

The treatment of MG may be medical or surgical. The medical treatment includes anticholinesterase agents, immunotherapy, and plasmapheresis. Surgical removal of the thymus gland (thymectomy) is indicated when there is no improvement after medications. Historically, thymectomy was carried out either by transcervical or trans-sternal approaches [8]. Less invasive techniques may be used nowadays for thymectomy, e.g. upper partial sternotomy (manubriotomy) or Video Assisted Thoracoscopy (VATS) [9]. In view of the above, this study was conducted to assess manubriotomy in comparison with the standard median sternotomy for thymectomy surgery in MG cases. In this study, there was a significant difference between ICU stay of both groups. Mean period of ICU stay of manubriotomy group was 1 day while that of median sternotomy group was 1.45 ± 0.83 (1 to 4) days. This is consistent with the study of Nagre & Bhosle [10], with mean ICU stay, 1 day for manubriotomy group and 2 days for median sternotomy group. ICU stay was

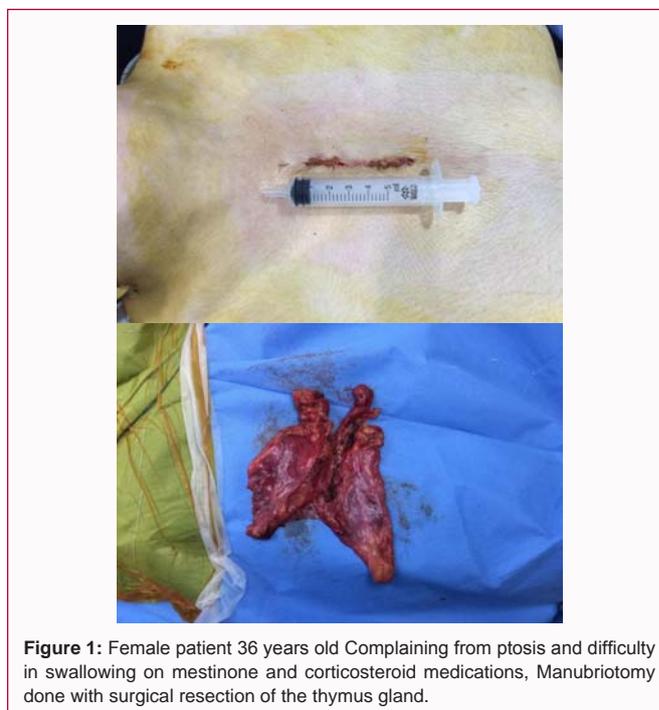


Figure 1: Female patient 36 years old Complaining from ptosis and difficulty in swallowing on mestinone and corticosteroid medications, Manubriotomy done with surgical resection of the thymus gland.

longer in median sternotomy group due the longer post-operative mechanical ventilation time and more incidence of chest infection than manubriotomy group, with pulmonary secretions which needed frequent suctioning and chest physiotherapy. In this study there was a significant difference between hospital stay of both groups. Mean period of hospital stay in manubriotomy group was 3.70 ±

0.80 (3 to 6 days) and the mean period of hospital stay in median sternotomy group is 7.35 ± 3.20 (5 to 15 days). Other studies have different duration of hospital stay, in the study of Sadrizadeh [11], the mean duration of hospital stay was 6.1 (5 to 10 days) for patients with manubriotomy, and in the study of Wagner et al. the mean duration of hospital stay was 10.6 days (range, 3-41 days) for median sternotomy group.

In our study there is significant difference in post-operative pain of both groups. The mean of pain score in manubriotomy group was 5.55 ± 0.60 and for median sternotomy group was 7.60 ± 0.68 . This goes with the study of Nagre & Bhosle [10], as post-operative pain of manubriotomy group was less than that of median sternotomy group and controlled by non-steroidal analgesics only. Pain score in median sternotomy group is more than in manubriotomy group mostly due to the longer incision in the skin, subcutaneous tissue, muscle and sternum and during retraction of the splitted sternum by the sternal retractor the whole costal cartilages bilaterally are retracted laterally which cause post-operative pain. In our study there is significant difference between post-operative chest infection in the form of tracheobronchitis and secretions in both groups. Chest infection occurred in one case in manubriotomy group but in 6 cases in median sternotomy group. The study of Nagre & Bhosle [10] shows that there was no post-operative chest infection in both groups.

There are more cases with post-operative chest infection in median sternotomy group and this is mostly attributed for the higher pain score in this group which cause limitation of the respiratory movement and the coughing reflex which cause accumulation of secretions and chest infection. In the study of Nagre & Bhosle [10], there was no myasthenic crisis post operatively in manubriotomy and median sternotomy group. In the study of Sadrizadeh [11] there was no post-operative myasthenic crisis in patients with Manubriotomy. In the study of Pêgo-Fernandes et al. [12], there were 4 patients required mechanical ventilation due to post-operative crisis in patients with manubriotomy. In the study of Hussain [13], there was no post-operative crisis in median sternotomy group. Post-operative myasthenic crisis may be attributed for post-operative stress, post-operative pain or incomplete removal of the thymus gland which may induce exacerbation and myasthenic crisis [14].

Conclusion & Recommendations

Manubriotomy is better than median sternotomy for Thymectomy in MG patients as regard:

- Less postoperative pain.
- Shorter hospital stays.
- Faster return to normal daily activity.

- Lower rate of postoperative complications as regard wound and chest infections.

- Better cosmetic appearance of the post-operative scar.

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