Trans-sternal Thymectomy in Myasthenia Gravis Patients with Laryngeal Mask Airway

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ABSTRACT

Objective — *To demonstrate the safety and efficacy of laryngeal mask airway (Proseal™) in patients undergoing trans-sternal thymectomy for myasthenia gravis.*

Study design — *A descriptive case series.*

Place & Duration of study — *Department of Anaesthesia, Jinnah Postgraduate Medical Centre Karachi, from June 2006 to December 2010.*

Methodology — *All patients who underwent trans-sternal thymectomy for myasthenia gravis under laryngeal mask airway (Proseal™) were included. They were maintained with inhalation agent and analgesics. Muscle relaxants were avoided in all the patients. The haemodynamics and blood gases were monitored perioperatively.*

Results — *A total of sixteen patients underwent the procedure using laryngeal mask airway (Proseal™). There were ten females and 6 males. Mean age at presentation was 26.5±10.4 year. The haemodynamics and blood gases were well maintained perioperatively. Fourteen patients (87.5%) could be extubated successfully. Two patients needed intubation and ventilation; one for 9 hours and other for 24 hours. These patients were identified as those who were on higher doses of pyridostigmine (>240 mg) and had severe pre-operative muscle weakness.*

Conclusions — *The use of laryngeal mask airway (Proseal™) for patients undergoing trans-sternal thymectomy is a satisfactory alternative to tracheal intubation for those patients of myasthenia gravis who do not require airway protection. Avoidance of muscle relaxants and use of laryngeal mask airway (proseal™) in facilitate rapid emergence and allowed early extubation.*

Key words — *Trans-sternal thymectomy, Myasthenia gravis, Laryngeal mask airway.*

INTRODUCTION:

Myasthenia gravis (MG) is the prototype of antibody mediated autoimmune disease and results from the production of autoantibodies against the acetylcholine receptor (AchR) of the neuromuscular synapse.[1] The presence of acetylcholine antibodies in the serum detected by radioimmunossay is diagnostic for myasthenia gravis.[2] Osserman and Genkins, suggested a classification of myasthenia gravis that is still widely used.[3] Myasthenia gravis is a challenging condition for anasethesiologists due to neuromuscular involvement. The main concerns are respiratory muscle weakness and side effects due to heavy dose of anticholinesterase. This limits the use of sedatives, hypnotics and muscle relaxants. Inhalational anaesthetics are best suited for these patients.[4,5] Inhalation anaesthetics may produce muscle relaxation in myasthenia patients. Isoflurane and sevoflurane were reported to produce muscle relaxant effect in MG patients.[6]

Patients with myasthenia gravis may require thymectomy. In most cases, patients undergoing thymectomy require tracheal intubation for airway protection and positive pressure ventilation.

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However, achieving satisfactory intubation conditions often require the use of muscle relaxant, which may be problematic in myasthenia gravis patients.[7] Patients with myasthenia gravis demonstrate resistance to suxamethonium and have an increased sensitivity to non-depolarizing muscle relaxants, which is often variable and unpredictable. Avoidance of muscle paralysis facilitates perioperative management, allowing early recovery of muscle function. Laryngeal mask airways are less invasive than endotracheal tubes and allow the avoidance of paralysis.[8]

The laryngeal mask airway (LMA) when compared with endotracheal tube causes less airway resistance, which in turn may lead to a decreased bronchoconstrictive reflex, less atelectasis and fewer pulmonary infections.[9] The potential for respiratory compromise in these patients requires the anaesthesiologist to be familiar with the underlying disease state, as well as the interaction of anaesthetic and non-anaesthetic drugs in MG.[1] The most important preoperative factor predicting the need for postoperative mechanical ventilation is the severity of bulbar involvement (Osserman group 3 and 4), usually indicated by significant dysphagia and dysarthria associated with borderline respiratory dysfunction.[10]

Data in Pakistan regarding the use of laryngeal mask airways in patients with MG undergoing trans-sternal thymectomy is limited. We report a case series of the anaesthetic management of patients with myasthenia gravis undergoing trans-sternal thymectomy with a combination of intravenous anaesthetics and inhalational agents and laryngeal mask airway.

METHODOLOGY:

Medical records of patients who underwent selective trans-sternal thymectomy for myasthenia gravis from July 2006 to December 2010 at the Department of Anaesthesia, Pain Management & Surgical Intensive Care Unit, Jinnah Postgraduate Medical Centre, Karachi were reviewed. The study was approved by the Ethics Committee of the Hospital. The following variables were obtained: demographic data (age, weight, gender), duration of disease, antibody status and previous medical management. Anaesthetic management (use of induction agent, airway management agents and other drugs like analgesics, anticholinesterases). Perioperative course was also recorded which included haemodynamic stability, arterial blood gases, extubation success, postoperative analgesia duration of postoperative mechanical ventilation, and length of ICU stay. Patients with critical heart and lung disease were excluded. All patients had undergone medical treatment and presented for surgery because of inadequate symptom control with the medical treatment.

On the morning of surgery, patients had usual dose of pyridostigmine. Those on long term corticosteroids as part of myasthenia gravis management, received supplemental steroids perioperatively to take care of any potential adrenal suppression. After induction of anaesthesia with propofol and tramadol HCl, an appropriate size of LMA (Proseal™) was inserted. After confirming a satisfactory seal (up to 30 cm H_2O) and ability to ventilate the lungs manually, mechanical positive pressure ventilation was commenced using tidal volume of 8 mg/Kg. Anaesthesia was maintained using sevoflurane and 50% nitrous oxide in oxygen. All patients were given injection glycopyrolate. Injection ketorolac and tramadol were used for analgesia.

None of the patients received muscle relaxants. Intraoperative monitoring included routine ECG, non-invasive blood pressure monitoring, SpO_2, end tidal CO_2, temperature and arterial blood gases. Arterial and central venous pressure monitoring was done (if indicated).

The haemodynamics and blood gases were well maintained perioperatively. At the end of surgery the patients were allowed to breathe 100% oxygen spontaneously and LMA removed when patient was awake and could make adequate tidal volume. For postoperative pain relief, local anaesthetics at the surgical site incision and NSAIDS with acetaminophen were used.

Statistical software SPSS (Statistical Package of Social Sciences) 16.0 was used for data feeding and analysis. In the results mean±SD reported for quantitative variables (age, weight, duration of disease and ICU stay, number and percentage for qualitative variables like gender, age grouping, treatment etc.

RESULTS:

Sixteen patients underwent selective trans-sternal thymectomy for myasthenia gravis. The age ranged from 14 year to 45 year (mean 26.5±10.4 year). They were in American Society of Anaesthesiologist (ASA) grade I and II with weight range of 38-72 Kg (mean 53.5±12.3 Kg). Patients' demographics, duration of disease and presence of antibodies are summarized in table-I. The Osserman category assigned to patients is given in table II.

Table I: General Characteristics (n=16)		
Variables	**Number (n)**	**Percentage (%)**
Gender		
Male	06	37.5
Female	10	62.5
Age (year) Mean ± S.D	Range (14 – 45) 26.5 ± 10.4	
Weight (kg) Mean ± S.D	Range (38 –72) 54.3 ± 12.2	
Duration of disease (months) Mean ± S.D	Range (9 –18) 13.9 ± 2.77	
Antibodies		
Positive	14	87.5
Negative	02	12.5

Table II: Patients in Different Stages of Osserman Classification			
Osserman Grade	Number of patients	Remission	Improvement
I	05	3 (60.0%)	2 (40.0%)
II A	07	4 (57.1%)	3 (42.8%)
II B	03	2 (66.7%)	1 (33.3%)
III	01	1 (6.2%)	-
IV	-	-	-

Fourteen patients were antibody positive. All patients had 2 to 3 sessions of plasmapharesis as part of preoperative preparation to decrease the load of antibodies against acetylcholine. Anaesthesia and surgery were uneventful. Surgical duration ranged from 4-6 hours. All patients were admitted to Surgical ICU postoperatively. Two patients needed to be ventilated postoperatively (one for 9 hours and other for 24 hours). These patients were on high doses of pyridostigmine >240 mg preoperatively (Table III). There were no operative or postoperative mortality. One patient (6.2%) manifested gastrointestinal bleed (despite of being on injection omeprazole) and 3 (18.7%) patients had pneumothorax (iatrogenic).

DISCUSSION:

Myasthenia gravis is an autoimmune neuromuscular disease affecting the postsynaptic acetylcholine receptors that are blocked by specific antibodies with resultant muscle weakness and fatigue. Myasthenia gravis is of particular interest to anesthesiologists because of the muscle groups affected, the pharmacological manipulation of neuromuscular junction and interaction of both the disease and treatment with many anaesthetic drugs.[11] Medical management including cholinesterase inhibitor medications, intravenous immunoglobulin therapy and plasma exchange are effective in treating and alleviating myasthenia gravis symptoms. Patients presenting for thymectomy must be prepared maximally for surgery.[12,13]

Anaesthesia for thymectomy in myasthenia gravis is challenging. Early surgical management is not considered to be an important therapeutic intervention for most of the patients of myasthenia gravis. The anaesthetic management involves either muscle relaxant or non-muscle relaxant techniques. However, the literature is deficient on standard anaesthetic technique for thymectomy.[14] Non-muscle relaxant technique has got widespread acceptance and use of this technique for trans-sternal thymectomy is recommended.[15]

The laryngeal mask airway, when compared with the endotracheal tube causes less airway resistance, which in turn may lead to decreased bronchoconstrictive reflex, less atelectasis, and fewer pulmonary infections.[2] Since non-muscle relaxant technique is superior and for achieving

Table III: Intra and Postoperative Course

Variables	Number (n)	Percentage (%)
Medical treatment		
Pyridostigmine	04	25.0
Pyridostigmine with Corticosteroids	08	50.0
Pyridostigmine with Azathioprine	04	25.0
Plasmapharesis	16	100.0
Post-op extubation in O.R.	14	87.5
Post-op ventilated O.R.	02	12.5
ICU stay (days)		
01	06	25.0
02	06	37.5
3 & above	04	37.5
ICU stay (days) Mean ± S.D	Range (1 –4), 1.2 ± 0.40	

satisfactory intubation conditions a muscle relaxant is often required; we used LMA rather than endotracheal tube. The use of LMA may allow anaesthetists to avoid muscle relaxation completely in these patients[7]. Hwang NC showed similar satisfactory results and uneventful anaesthesia with use of laryngeal mask airway proseal. [7] Gardner et al also showed similar satisfactory results.[8] Avoidance of muscle paralysis facilitates perioperative management, allowing early recovery of muscle function. Use of inhalational agent alone with analgesics provided adequate muscle relaxation. Rocca D demonstrated that patients maintained during anaesthesia with either sevoflurane compared to those maintained with propofol were equally successful at being immediately extubated postoperatively.[12] The rate and type of postoperative complications were both minimal and similar in both the groups. Both groups did not receive muscle relaxants during anaesthesia.

Postoperative pain relief was given by non-steroidal analgesic (NSAIDS) and acetaminophen. Robina et al also used tramadol and ketorolac for analgesia with good results. [16] The need for high preoperative doses of pyridostigmine and reduced preoperative pulmonary function was associated with postoperative respiratory complications in patients with myasthenia gravis.[17] Mori T showed risk of postoperative reintubation and ventilatory support to be strongly related to a dose of 240 mg/day and above. [17] Similarly, all of our patients, with no or only mild systemic weakness were extubated successfully. Two patients, who had more severe systemic weakness and were on higher preoperative doses of pyridostigmine, required brief postoperative ventilation. All of our patients were taken to ICU for postoperative monitoring and respiratory support with oxygen.

The exact agent used is not as important as the conduct of anaesthesia. The foundation is to avoid muscle relaxants and preserve ventilatory function throughout anaesthesia. The ability to both ventilate effectively, as well as protect one's airway by having intact reflexes and sufficient coughing strength are usual endpoints. [18]

CONCLUSIONS:

Avoidance of muscle relaxants and use of laryngeal mask airway (Proseal™) can provide stable intraoperative course, rapid emergence and early extubation in patients with myasthenia gravis undergoing trans-sternal thymectomy.

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