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Anaesthetic management in a known case of myasthenia gravis posted for sternotomy with thymectomy

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Abstract
Myasthenia gravis (MG) is a chronic disorder of the neuromuscular junction. It is characterized by circulating antibodies against the acetylcholine receptors resulting in a decrease in the functional acetylcholine receptors at the neuromuscular junction. Hence the anaesthetic management is challenging in these cases due to unpredictable susceptibility of acetylcholine receptors to muscle relaxants.
In this case report, we are describing the successful anaesthetic management of a patient with myasthenia gravis undergoing sternotomy with thymectomy for a swelling on left side of the neck. We concluded that it is possible to provide anaesthesia and pain relief without the use of skeletal muscle relaxants during general anaesthesia and without the need of prolonged postoperative ventilation in a patient of MG.

Keywords: Myasthenia gravis, thymectomy, thoracic epidural, flexometallic endotracheal tube, ropivacaine infusion.

Introduction
Myasthenia Gravis is a neuromuscular disorder characterized by weakness and fatigability of skeletal muscles due to antibody mediated autoimmune destruction of acetylcholine receptors [2], hence decreasing the number of available acetylcholine receptors at the neuromuscular junction for transmission of action potential. Management of MG includes improving neuromuscular transmission by anticholinesterases, suppressing the immune system with corticosteroids and immunosuppressants, removal of circulating antibodies via plasmapheresis and thymectomy [1]. Patients with generalized MG and patients with ocular symptoms poorly controlled by anticholinesterases often benefit from thymectomy [1]. This case report describes anaesthesia management in a known case of myasthenia gravis posted for thymectomy.

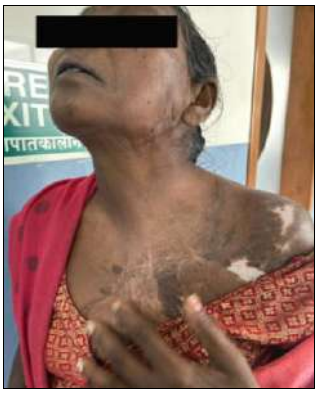

Fig 1: Pre-operative examination of the neck swelling along with upper torso contractures.

Case report
A 70 year old female presented to MGM Hospital Surgery OPD with a swelling on left side of neck since 3 months.

The patient was a known case of ocular onset MG (ocular muscle weakness, drooping of eyelids and mild ptosis), diagnosed 5 years ago and was started on T. Neostigmine 15 mg BD, the patient complained of mild breathlessness for which she was on T. Deryphylline 150 mg SOS on acute exacerbation.

The patient had significant history of burns in childhood, which lead to extensive contractures of the upper torso extending to the arms.

Pre-operative assessment

- General examination – Within Normal Limits
- Airway – Modified Mallampati classification Class IV
- Neck contractures present making extension and flexion of neck difficult.
- Local examination: A left sided neck swelling measuring approximately 4cm x 3cm.
- CT scan of head and neck showed evidence of malignant mass arising from thyroid extending retrosternally and compressing the brachiocephalic vein s/o parathyroid carcinoma.
- Fine Needle Aspiration Cytology: suggestive of Thymoma.
- Routine blood investigations – within normal limits
- Chest X ray & Electrocardiogram – normal
- 2 D Echogram – LVEF 60%, no sign of diastolic dysfunction or any other abnormality.
- Pulmonary Function Test - severe impairment of lung function with poor response to bronchodilator therapy.
    - Patient was asked to take the morning dose of T. Neostigmine
    - An ICU bed along with a ventilator was reserved for the patient for intensive postoperative care.
    - Four units of PRBC were reserved.
    - High risk and procedure explained, need for postoperative ventilation requirement explained and informed written consent taken.

Intra-operative preparation

The OT was prepared for routine General Anaesthesia, Epidural anaesthesia kit and

- For anticipated difficult intubation:

1. Difficult airway cart

Contents:

- Nasaopharyngeal and oropharyngeal Airway of appropriate size.
- Polyvinylchloride Endotracheal tube number 6.5, 7 & 7.5
- Armoured endotracheal tube number 6.5, 7 & 7.5
- Magils forceps
- Stylet
- Ventilating bougie
- Videolaryngoscope
- Macintosh laryngoscope blade 3, 4 & 5
- Mc Coys laryngoscope blade 3 & 4

2. Tracheostopy set
3. Cricothyrodotomy set

- For invasive monitoring:

1. Four French vygon Arterial line.
2. Seven French Central Venous Triple Lumen Catheter
3. Double Lumen Transducer.
4. USG for guidance.

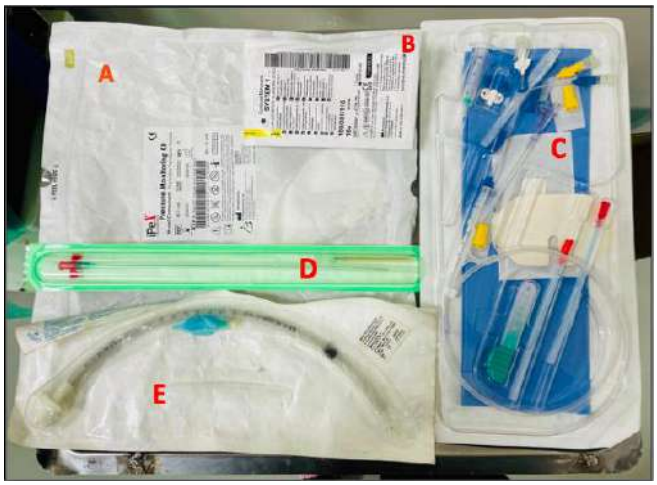

Fig 2: Intraoperative trolley (A- Pressure monitoring Kit, B – Epidural kit, C – & French Central Venous catheter kit, D – 4 French Arterial line, E – Flexometallic Endotracheal tube size7)

Pre-operative preparation

- Twenty Gauge intravenous cannula in left arm.
- EMLA (Eutectic Mixture of Local Anaesthetic) applied at insertion for left radial artery and right internal jugular vein 1 hour prior to insertion of CVC and arterial line.
- Preoperative vitals were measured, were within normal limits.

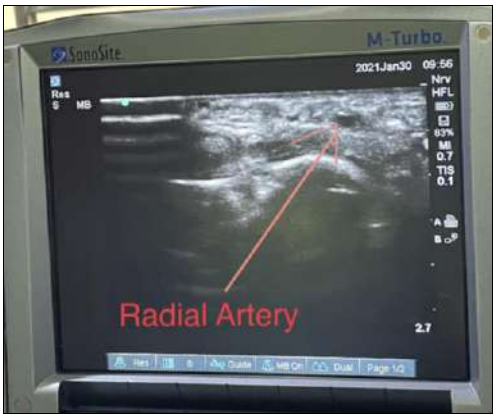

Fig 3: Ultrasound image of left radial artery.

Intra-operative management

- Standard monitors were attached.
- ECG leads were applied on the back and were secured with adequate padding.
- Local Anaesthetic was given in form of 2% lignocaine at site of insertion of CVC and arterial line.
- USG guided lines were taken. Arterial line could not be inserted in the right radial artery due to excessive contractures and hence left radial artery was chosen.
- She was given for insertion of a thoracic epidural catheter. The epidural catheter was inserted in T6-T7 intervertebral space and was fixed at 9 mark.

Induction

- Pre-oxygenation was done with nasal prongs at 2l/min O_2.
- Premedication with 1 mg Inj. Midazolam, 0.2 mg Inj. Glycopyrrolate and 50mcg Inj. Fentanyl.
- Induced with 100 mg Inj. Propofol intravenous very

slowly while doing bag and mask ventilation.
- Sixty milligram Inj. Propofol was given just prior to intubation.
- Mc Coys blade number 4 was used to do direct laryngoscopy. Successful intubation was achieved after 2 attempts. Intubation was done with a flexometallic endotracheal tube number 7 with assistance of a gum elastic bougie and was fixed at 19 mark.

Fig 4: Endotracheal intubation with armoured tube with assistance of gum elastic bougie and Sellick manoeuvre.

Intraoperative monitoring
- Events of hypotension were managed by Inj. Phenylephrine bolus doses and hypertension was managed by giving a higher MAC of volatile anaesthetic Sevofluorane.
- Deep plane of anaesthesia was maintained by inhalational anaesthetic sevoflurane and Inj. Dexmedetomidine 100mcg at 4ml/hr.
- She was started on infusion Inj. Ropivacaine 0.2% + 50 mcg Inj. Fentanyl via epidural at 5ml/hr for analgesia.
- There was blood loss of approximately 700 ml and 1 pint PCV was transfused intra-operatively.
- The total intraoperative urine output was 500 ml.

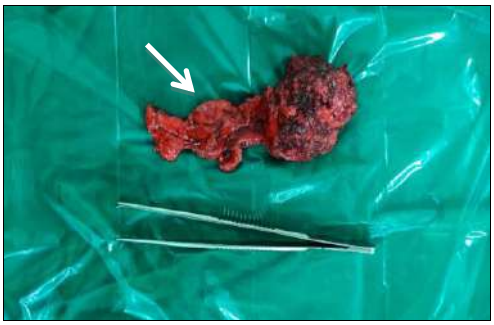

Fig 5: Specimen resected
(Enlarged thymus gland along with its extensions – white arrow)

Intra-operative finding
On sternotomy, it was found that the mass has reterosternal extension and it was adhered to the carotid artery and the vagus nerve. A frozen section was sent intra-operatively which confirmed it was a thymic mass.
The operation was otherwise uneventful.

Post-operative ICU management
- The patient was shifted to ICU intubated
- To keep the patient sedated and to avoid agitation, she was started on infusion Inj. Fentanyl 6mcg/ml + Inj. Midazolam 0.4mg/ml at 4 to 6 ml/hr.
- She was kept on continuous mechanical ventilation (500/16/100/3) then was weaned to spontaneous invasive mechanical ventilation followed by CPAP.
- Once patient started maintaining a good enough tidal volume, extubation was planned and sedation was weaned off and after knowing the blood gases the patient was shifted to T-piece on 6L/min O2.
- Prior to extubation following things were done:
  1. A leak test was performed by deflating the ET cuff and using a bains circuit to rule out tracheal edema.
  2. Nebulization with duolin and budecort.
  3. Bolus dose of Inj. Dexamethasone and Inj. Hydrocortisone.
  4. The crash cart and an ENT specialist was kept on standby with a tracheostomy and a cricothyroidectomy set ready in case the patient went into respiratory failure post operatively.

After assessing all parameters for extubation, an ABG was done and patient was given 2.5 mg Inj. Neostigmine + 0.2mg Inj. Glycopyrrolate
Post extubation patient was put on 6L/min O_2 via Hudson mask. And following medications were started
- T. Neostigmine 15 mg
- Infusion Inj. Ropivacaine at 4ml/hr for postoperative analgesia which was tapered slowly and stopped in the morning
- Inj. Fentanyl infusion at 20mcg/hr next day.
- Patient had no postoperative complications and was monitored in ICU for next 6 hours and then was shifted to ward for further management.

Fig 6: Thoracic epidural insertion

Discussion
Patients with MG require a tailor made approach of anaesthesia depending on the stage and severity of the disease. Assessing the patient perioperatively and making sure the patient is compliant with her MG medication even on coming morning of surgery is of atmost importance to

achieve the acetylcholine receptor state as close to normal as possible. Certain studies have shown that using one-tenth of the dose of vecuronium does not cause respiratory depression or delay extubation [4]. The possible interaction between anticholinesterases (in this case neostigmine) with both the depolarizing and non-depolarizing muscle relaxants is also a cause of concern [1]. The respiratory insufficiency caused by them known as myasthenic crisis is one of the most common causes of prolonged ventilator requirement in patients of MG [1]. However, the safe dose of muscle relaxant varies with each patient and hence its use in a case of MG remains controversial. Peri-operative use of benzodiazepines may also cause myasthenic crisis [3] and hence should be cautiously used.

Multimodal analgesia and anesthesia is preferred in form of inhalational agent along with thoracic epidural analgesia. Thoracic epidural analgesia suppresses hormonal metabolic stress induced pain and provides stable hemodynamics for the surgery [1]. It is also helpful in providing postoperative pain relief without affecting respiration [1].

Traditionally, great reliance has been placed on the volatile anesthetic agents for induction and maintenance of anesthesia in MG patients [4].

In this case, high MAC Sevoflurane along with Inj. Ropivacaine infusion via thoracic epidural and intravenous infusion of Inj. Dexmedetomidine proved to be successful. Sevoflurane was preferred due to its low blood/gas and tissue/gas solubility [4]. Muscle relaxants were not used. Hence, the Propofol requirement at induction was much higher compared to normal healthy patient.

Propofol has the advantages of short duration of action without effect on neuromuscular transmission. Opioid analgesics in therapeutic concentrations do not appear to depress neuromuscular transmission in myasthenic muscle [4].

Dexmedetomidine is an alpha-2 adrenergic agonist. It is used as sedative agent. Its property of causing sedation and analgesia with no to minimal respiratory depression is advantageous in patients of MG [7]. Although it is noted that its context sensitive half-life increases with increase in duration of infusion which can delay recovery. Hence even though it is proven to be safe in a case of MG it should be used cautiously [6].

Ropivacaine is a long-acting amide local anaesthetic agent that produces effects similar to other local anaesthetics via reversible inhibition of sodium ion influx in nerve fibres. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres, resulting in a relatively reduced motor blockade. Thus, ropivacaine has a greater degree of motor sensory differentiation, which could be useful when motor blockade is undesirable. The reduced lipophilicity is also associated with decreased potential for central nervous system toxicity and cardiotoxicity [9].

Based on the preoperative condition of the patient, the surgical procedure, and the residual anesthetic effects, a carefully planned extubation is carried out. Adequate postoperative pain control, pulmonary toilet, and the avoidance of drugs that interfere with neuromuscular transmission will facilitate tracheal extubation [5]. Even though the respiratory effort might be good post operatively, respiratory muscle weakness usually develops few ours later and hence it is necessary to postpone the extubation for such patients. It is also essential that these patients receive their medication as per previous orders after the surgery.

The patient had a near normal recovery probably due to good control of her MG and her compliance with medication.

Conclusion

There are multiple implications for safe anaesthesia and respiratory depression in patients of MG. Hence, comprehensive understanding of this disorder is vital prior to any intervention. In the postoperative period, ventilatory parameters need vigilant monitoring as these patients have propensity to develop respiratory failure [4].

The combination of volatile anaesthetic, Inj. Dexmetodomidine and thoracic epidural analgesic infusion was tolerated well for intubation as well as for quick transition to spontaneous breathing and good post-operative analgesia and an uneventful recovery.

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Conflicts of Interest: Nil

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