Use of ProSeal® LMA and thoracic epidural in myasthenia patients for trans-sternal thymectomy: A case series

INTRODUCTION

Myasthenia gravis is an autoimmune disease, resulting from the production of antibodies against the acetylcholine receptors of the neuromuscular endplate. Muscular weakness and fatigability are the hallmarks of myasthenia gravis. Myasthenic patients are sensitive to non-depolarising relaxants and post-operative ventilatory support may be required in high-risk patients. This can be attributed partly to endotracheal intubation and use of intermediate or long-acting muscle relaxants in such cases. The rate of post-operative ventilation after a trans-sternal thymectomy has been reported to be more than 50% in myasthenia gravis patients.[1]

Two techniques have been recommended for general anaesthesia in the myasthenic patient. Due to the unpredictable response to succinylcholine and the marked sensitivity to non-depolarising muscle relaxants, some anaesthesiologists avoid muscle relaxants and depend on deep inhalational anaesthesia for tracheal intubation and maintenance of anaesthesia.[2,3] However, others utilise a balanced technique which includes the use of muscle relaxants, without the need for deep inhalational anaesthesia with its concomitant respiratory and cardiovascular side effects, provided neuromuscular transmission is monitored.

In this paper, we would like to describe a new and successful technique of using ProSeal® laryngeal mask airway (LMA) with thoracic epidural for three cases who underwent trans-sternal thymectomy. We avoided muscle relaxant during the entire course of surgery and none of our cases required post-operative ventilation.

CASE REPORT

Three myasthenic patients posted for trans-sternal thymectomy were briefed about the anaesthetic plan and their consent obtained. They were of ages 22, 30 and 46 years. All of them had generalised weakness of more than 1½ years duration, ptosis, diplopia with positive acetylcholine receptor antibody and were included in Osserman classification type II A or B. They were on treatment with pyridostigmine, azathioprine and prednisolone. Pre-operative informed consent obtained. All patients were pre-medicated with oral ranitidine, pyridostigmine and azathioprine.

Thoracic epidural catheter was inserted between thoracic spine T4 and T5 in the induction room and a test dose of 3 ml of 0.5% bupivacaine with 100 μg fentanyl was administered. Monitors used include

pulse oximetry, end tidal carbon dioxide ($EtCO_2$), electrocardiogram, end-tidal anaesthetic gases concentration and invasive monitoring by arterial line.

After pre-oxygenation with oxygen at 6 L/min, anaesthesia was induced with propofol 2–3 mg/kg. Intravenous opioids used were either fentanyl 2 μg/kg or alfentanil 20 μ/kg. A ProSeal® LMA of size 4 was inserted using 90° rotation technique after confirming the adequate depth of anaesthesia. Patients were ventilated on circle absorber Drager Fabius® GS premium in volume control mode. Mechanical ventilation was adjusted to maintain the $EtCO_2$ between 30 and 35 mmHg with a respiratory rate of 14 breaths/min, a tidal volume of 8 mL/kg and an inspiration: expiration ratio of 1:1. The airway pressure ranged from 16 cm of H_2O to a maximum of 24 cm of H_2O. Anaesthesia was maintained with oxygen, nitrous oxide and isoflurane. A nasogastric tube was inserted through the drain port of ProSeal® LMA and the position was confirmed. The thoracic epidural consisted of a bolus dose of 5–7 ml of 0.5% bupivacaine before sternotomy and infusion of ropivacaine 0.2% and fentanyl 2 μg/mL, at a rate of 5 to 6 mL/h intraoperatively using infusion pump.

The average duration of surgery was 2 h and none of the patients had any significant change in haemodynamic parameters during sternotomy or later. During the closing stage of surgery as the respiratory attempts commenced, ventilation was switched to pressure support mode. At the end of surgery, the nasogastric tube was removed. Once adequate spontaneous breathing was established, they were shifted to recovery with ProSeal® LMA *in situ*. Oxygen at 5 L/min flow was administered through T-piece in the recovery room. LMA was removed in the recovery room once patients were fully awake with effortless breathing and adequate muscle tone. The average length of stay in recovery room ranged from 40 min to 1 h. From the recovery room, they were shifted to surgical Intensive Care Unit (ICU) for overnight monitoring. None of the patients required post-operative ventilation. Epidural infusion of 0.2% ropivacaine with fentanyl 2 μg/mL was continued in surgical ICU and post-operative ward for post-operative analgesia, the rate titrated according to the patient needs. The estimated blood loss ranged from 400 to 900 mL and the estimated intraoperative intravenous fluid infused ranged from 1 to 2 L.

DISCUSSION

Trans-sternal thymectomy is a treatment modality for patients with generalised myasthenia gravis. In myasthenic patients, the speed of onset of neuromuscular block is accelerated.[3] One-tenth of the normal paralysing dose may be sufficient in most patients.[3] Volatile anaesthetics have also been reported to reinforce the effects of non-depolarising neuromuscular blocking agents.[4] The rate of recovery from muscle relaxant is decreased in such cases leading to post-operative ventilation and ICU admission.

Leventhal *et al*.[5] identified four risk factors in predicting the need for post-operative mechanical ventilation; duration of myasthenia gravis >6 years, chronic respiratory disease, pyridostigmine dosage >750 mg/day and vital capacity <2.9 L.

The duration of disease in our three patients ranged from 1½ to 10 years and all of them were on pyridostigmine at a dose of 240 mg/day. None of them had a chronic respiratory illness. Such issues made us think of an anaesthetic regime without using muscle relaxant. There are studies published using non-muscle relaxant anaesthetic techniques in myasthenic patients undergoing trans-sternal thymectomy.[6] In almost all the studies that we searched, the airway was secured using the endotracheal tube.

We decided to use ProSeal® LMA as an appropriate airway device along with thoracic epidural drugs which could markedly reduce our anaesthetic requirement intraoperatively and totally avoid muscle relaxant use. The ProSeal® LMA is a major advance over the classic LMA because of the following reasons: It allows ventilation at much higher airway pressures; it protects the lungs from aspiration, the stomach from gastric insufflation and it facilitates passage of a gastric tube.[7] There are similar successful case reports using ProSeal® LMA,[8,9] but our technique remains unique in employing a thoracic epidural for optimising the analgesic requirement and early extubation.

CONCLUSION

We successfully used ProSeal® LMA for trans-sternal thymectomy in myasthenic patients. We observed absent haemodynamic response or patient movement in response to skin incision or sternotomy. A pain-free, fully awake patient with minimal or no residual neuromuscular block, was the end result. We could successfully extubate all patients in the recovery room and none of them needed post-operative ventilation.

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