Propofol or sevoflurane anesthesia without muscle relaxants for thymectomy in myasthenia gravis

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Abstract

**Background:** Myasthenia gravis is a challenging clinical condition due to its neuromuscular involvement. We sought to compare two non-muscle relaxant anesthetic techniques in patients undergoing trans-sternal thymectomy, evaluating the intra and postoperative conditions including extubation in the operating room.

**Methods:** Eight consecutive myasthenic patients undergoing trans-sternal thymectomy were prospectively randomized into two groups: propofol and sevoflurane. In both groups anesthesia was induced with propofol (2mg. Kg⁻¹) and intubation performed after topical anesthesia of the airway with lignocaine. Anesthesia was maintained in the propofol group (4 patients) with continuous propofol infusion (3-10 mg. Kg⁻¹, hr⁻¹) with oxygen and nitrous oxide and in the sevoflurane group (4 patients), with sevoflurane (end tidal 1-1.5%) in oxygen and nitrous oxide. Fentanyl was used for analgesia in both the groups. Intubating conditions, haemodynamic changes, neuromuscular transmission along with postoperative intensive care unit stay were evaluated. Data were evaluated using ANOVA, Chi-square test and Student's t test.

**Results:** Intubating conditions were good in all patients. There were no significant haemodynamic changes. All patients were extubated in the operating room and none had to be re-intubated for postoperative respiratory depression. Neuromuscular transmission showed minimal changes and at the end of the procedure the recovery was complete in all the patients. There were no other significant differences between the two groups studied.

**Conclusion:** These two anesthetic techniques allow early extubation of myasthenic patients in the operating room. (Ind J Thorac Cardiovasc Surg, 2004; 20: 83–87)

**Key words:** Propofol, Sevoflurane, Thymectomy, Myasthenia gravis

Introduction

Myasthenia gravis (MG) is a rare autoimmune disease characterized by fluctuating muscle weakness and fatigability due to a reduction in availability of acetylcholine receptors at the neuromuscular junction. The role of the thymus gland has been suggested by the presence of tumors and germinal centers in a majority of patients with MG and by the beneficial effects of thymectomy in about 40-90% of patients. Besides thymectomy, therapy with anticholinesterase drugs is of partial clinical benefit whereas use of corticosteroids, immunosuppressive drugs and plasmapheresis often improve the prognosis of those patients resistant to anticholinesterase drugs or with life threatening symptoms.

Clinicians are well aware of the risk of postoperative respiratory failure that may result from stress-induced exacerbation of MG (myasthenic crisis), an overdose of anticholinesterases (cholinergic crisis), or other adverse drug interactions (antibiotics or antiarrhythmics). Therefore routine postoperative ventilatory support and planned extubation in the intensive care unit (ICU) have been recommended in high-risk patients. Various anesthetic approaches have been reported in MG patients. In this study we compared two non-muscle relaxant anesthetic techniques, the first with propofol and the second with sevoflurane in myasthenic patients undergoing trans-sternal thymectomy. The first objective was to evaluate the feasibility to extubate...
patients in the operating room and the second was to document perioperative complications.

Methods

After obtaining institutional ethical committee approval 8 consecutive myasthenic patients undergoing trans-sternal thymectomy were randomly assigned to one of the treatment groups. No patient in either group was premedicated. Before induction of anesthesia 10% Xylocaine spray was used for topical anesthesia of the pharynx and larynx. After 3 minutes of pre-oxygenation with 100% oxygen by facemask, anesthesia was induced with fentanyl (2 mg. Kg\(^{-1}\)) and propofol (2mg. Kg\(^{-1}\)). During laryngoscopy topical anesthesia of the vocal cords and trachea was obtained with the application of 4% Xylocaine following which the trachea was intubated with an adequate sized single lumen endo-tracheal tube. All patients received Ringer's Lactate solution (7-8 ml. Kg\(^{-1}\). hr\(^{-1}\)) during the procedure. Mechanical ventilation was adjusted to maintain the End tidal CO\(_2\) (EtCO\(_2\)) between 30-35 mmHg with a respiratory rate of 12 breaths. min\(^{-1}\), tidal volume of 10 ml. Kg\(^{-1}\) and an inspiration expiration ratio of 1:2.

In the propofol group, anesthesia was maintained with nitrous oxide and oxygen (60:40) and a continuous infusion of propofol (3-10 mg. Kg\(^{-1}\). hr\(^{-1}\)) and supplemented by fentanyl boluses (0.5 μg. Kg\(^{-1}\)) as required. In the sevoflurane group, anesthesia was maintained with sevoflurane (end-tidal 1-1.5%), nitrous oxide and oxygen (60:40) and fentanyl boluses (0.5 μg. Kg\(^{-1}\)) as required.

Intraoperative monitoring included electrocardiogram, invasive radial artery blood pressure monitoring, pulse oxymetry, EtCO\(_2\), and expiratory gas analysis. Neuromuscular transmission was monitored with TOF Guard (Organon Teknika, Belgium). The forearm was immobilized in order to prevent interfering movements. The ulnar nerve was stimulated supra maximally at the wrist with train of four stimuli (60mA for 200 μsec) at 30 second intervals and the acceleration of the thumb was measured. Baseline twitch amplitude was established after the induction of anesthesia. T1 was recorded as a percentage of baseline measure and TR was recorded as ratio between the fourth and the first twitch (T4/ T1). Nasopharyngeal and skin temperature was monitored and maintained above 32°C.

The evaluation of intraoperative conditions included intubating condition (jaw relaxation, laryngoscopy and vocal cord abduction) as reported by Viby-Mogenson and colleagues\(^{11}\). Intraoperatively haemodynamic changes and neuromuscular transmission were continuously monitored and were recorded at times 0/ baseline, 30, 60, 90, 120, 150 minutes and at the end of anesthesia. At the end of surgery, time from the end of anesthesia to extubation (\(^{\wedge}\)T extubation), time from end of anesthesia to eye opening and recovery of consciousness (\(^{\wedge}\)T awake) were recorded. All major complications (respiratory depression, respiratory failure and cardiovascular events) or other minor postoperative complications were recorded in both groups. At the end of surgery all patients were extubated in the operating room and transferred to the intensive care unit (ICU) for monitoring.

Patient age, body surface area (BSA), preoperative pyridostigmine dosage (mg. day\(^{-1}\)), intraoperative propofol and sevoflurane administration, mean arterial pressure (MAP) and heart rate (HR), intraoperative neuromuscular transmission are recorded as mean (SD). Preoperative FEV\(_1\), duration of surgery and anesthesia, \(^{\wedge}\)T extubation, \(^{\wedge}\)T awake, ICU stay are expressed as mean and range. Differences between groups in preoperative Osserman classes and preoperative treatment are analyzed with Chi square test. Differences in demographic patient characteristics (age and BSA), preoperative treatment with pyridostigmine, preoperative treatment with pyridostigmine, preoperative FEV\(_1\), duration of surgery and anesthesia, \(^{\wedge}\)T extubation and \(^{\wedge}\)T awake were analyzed with the students T test. Neuromuscular transmission variables and intraoperative MAP and HR at different times between groups and within groups were analyzed with repeated measure two-way analysis of variance (ANOVA). All the statistical analysis was computed by SPSS (version 10.0). A p value of < 0.05 was deemed significant.

Results

Demographic and preoperative patient characteristics are depicted in Table 1. Intubating conditions were excellent in all the propofol group patients and 3 out of the 4 sevoflurane group patients. Duration of surgery and anesthesia, time to extubation and to awakening, and postoperative complications are presented in Table 2. No haemodynamic response to skin incision or sternotomy occurred and no patient movement in response to surgery was observed in both groups.

In the propofol group the mean continuous infusion of propofol was 5.2 mg. Kg\(^{-1}\). hr\(^{-1}\), equal to 772 (58) mg of propofol per patient with a mean number of fentanyl boluses of 2. During anesthesia HR did not change, while MAP decreased 15% compared to the baseline