CASE REPORTS

ANESTHESIA FOR THYMECTOMY IN MYASTHENIA GRAVIS

- A report of 115 cases -

ABDELAZEEM EL-DAWLATLY*, AHMED TURKISTANI**, KHALID ALKATTAN***, WASEEM HAJJAR****, MOHAMED BILAL DELVI*****, AHMED ALSHAER******, WADHA ALOTAIBI******* AND FATMA DAMAS********

Introduction

Myasthenia Gravis (MG) in an autoimmune disease associated with acetylcholine receptor deficiency at the motor endplate. This deficiency is thought to be due to circulating acetylcholine antibodies that result in the deposition of immune complexes (IgG and complement) on the post synaptic membrane of the neuromuscular junction[1]. Osserman and Genkins, both physicians at Mount Sinai Hospital, published a clinical classification of MG that is still widely used[2].

The diagnosis of MG can be confirmed with several test. Edrophonium (Tensilon) test is confirmative, usually administered I.V in small (2-8 mg) doses. Electromyography (EMG) is also could be used for the diagnosis of

From King Saud Univ. Riyadh, SA
* MD, Prof. of Anesth.
** FFCM, Assoc. Prof. & Chairman Anesth.
*** FRCS, Prof. Thoracic Surg.
**** FRCS, Assist. Prof. Thoracic Surg.
***** MD, Assist. Prof. Anesth.
******* KSUF, Assist. Prof. Anesth.
From King Fahad Cardiac Center.
****** MD, Consult. Anesth.
From King Khalid Univ. Hosp.
******** KSUF, Consult. Anesth.
Address for correspondence: Abdelazeem Ali-El-Dawlatly, Riyadh 11461, P.O. Box: 2925, Saudia Arabia. E-mail: dawlatly@ksu.edu.sa. http://faculty.ksu.edu.sa/dawlatly.

MG. Repetitive stimulation of a peripheral motor nerve leads to decreasing responses by innervated muscle in a patient with MG. The presence of anti-acetylcholine antibodies in the serum detected by radioimmunoassay is diagnostic for MG[3].

The treatment of MG could be either medical or surgical. Anticholinesterse drug like pyridostigmine is commonly used as oral preparation. Immune suppression with corticosteroids is another medical modality to prevent or attenuate the destruction of acetylcholine receptors at the motor end plate. Plasmapheresis is indicated in severe bulbar symptoms patients. Thymectomy is practiced to treat MG.

Different approaches are used. Maximal thymectomy is commonly practiced in our setup through cervical and sternotomy approaches[4]. Recently, thoracoscopic thymectomy has been practiced with encouraging results.

Anesthesia for thymectomy in MG is challenging. We have adopted a non-muscle relaxant anesthetic technique which is widely used nowadays[5].

In this report we reviewed our experience with anesthesia for thymectomy in MG with respect to anesthetic technique, incidence of postoperative ventilation in relation to preoperative condition and severity of the disease.

Patients and Methods

The computerized data base and medical records of 115 patients who underwent thymectomy between July 1988 and January 2007 were reviewed. There were 110 adult patients (age >12 yr) and 5 pediatric patients with age <12 yr. The mean age was 27 ± 12 yr with range between 4 and 61 yr. There were 73 female and 42 male patients.

The following variables were obtained: demographic data, duration of the disease, Osserman scale, technique of anesthesia and drugs used. Also, the preoperative preparation of patients including drugs used to

control myasthenia crisis and number of plasmapheresis sessions were obtained. The diagnosis of myasthenia gravis was based upon clinical picture and response to edrophonium chloride (Tensilon), decremented response on electrophysiological study and high antibody serum titer against acetylcholine receptors.

All patients underwent transcervical-transsternal "maximal" thymectomy except five who underwent thoracoscopic thymectomy.

Anesthesia was managed according to preference of attending anesthetist. The other variables obtained were: type of anesthetic, use of neuromuscular blocking drugs, duration of anesthesia, and duration of postoperative mechanical ventilation.

Depending on postoperative outcome, patients were divided into two groups: group 1 who were extubated at end of surgery in OR, and group 2 who remained ventilated postoperatively.

Data were analyzed using a statistical software package (Graph pad, version 3 for windows, San Diego, California, USA). Data was presented as mean ± sd, percentage or ratio as appropriate. Data was compared using parametric or non parametric paired student T-test. P value <0.05 was considered significant. Correlation performed using spearman non parametric method.

Results

The percentage of patients in relation to the duration of the disease in months, is given in Table 1. The percentage of patients in relation to the Osserman classes is given in Table 2.

Table 1

The duration of myasthenia gravis disease

Duration (Months)	%
1-6	35%
7-12	20%
13-24	17%
25-48	10%
>48	18%

Table 2

Osserman classes

Class	n	%
1	8	7%
2	36	31%
3	52	45%
4	19	17%

There were 55 patients who had positive antibody titer against acetylcholine receptors, versus 60 patients who showed negative test. Three sessions of plasmapheresis were performed in 72 patients (63%).

Premedication was achieved either with diazepam or lorazepam to 67 (58%) patients 2 hr preoperatively. Pyridostigmine alone was given to 42 (36%) patients and combined with steroids to 73 (63%) patients and continued till day of surgery.

Anesthesia was induced using fentanyl-thiopentone in 45 patients and with sufentanil-propofol in 70 patients. Combined general anesthesia and thoracic epidural analgesia was used in 75 patients. In 89 patients (77%) tracheal intubation was performed using topical analgesia using laryngo-tracheal analgesia kit (Abbott, USA) without neuromuscular blocking drugs. In 26 patients (23%) different neuromuscular blockers were used. Anesthesia was maintained with N_2O/O_2 and isoflurane in 28 patients and with sevoflurane in 87 patients.

Intraoperative monitoring included, routine ECG, arterial and central venous pressure, pulse oximetry, end-tidal carbon dioxide and temperature. For those patients who received neuromuscular blocking drugs, peripheral nerve stimulator was used.

After completion of surgery, respiratory status was assessed and tracheal extubation was performed using the following criteria: recovery of neuromuscular junction using nerve stimulator in patients who received muscle relaxants, adequate tidal volume (>5 ml/kg), triggering of ventilator with inspiratory force >-20 cm H_2O.

In 100 patients (87%) the trachea was extubated in the immediate postoperative period. In this group the trachea was extubated in the OR in 83 patients while in the rest the trachea was extubated 1-6 hr later in the surgical intensive care unit. Fifteen patients in group 2 (13%) required postoperative ventilation for a period ranged from 6 to 48 hr. Surgical duration ranged from four to five hours. All patients were admitted to SICU postoperatively.

There were no operative or postoperative mortality. In this series there was positive correlation between patient age, Osserman class, and postoperative ventilation ($P<0.05$).

Discussion

Anesthesia for thymectomy in myasthenia gravis is challenging. The different anesthetic techniques for thymectomy are classified into: muscle relaxant and non-muscle relaxant techniques. It is well known that myasthenic patient is sensitive to non-depolarizing neuromuscular blockers (NMBs) and resistant to depolarizing NMBs. Intermediate and short acting non-depolarizing NMBs can be used in myasthenic patients monitored with mechanomyogram.

Inhalation anesthetics may produce muscle relaxation in myasthenic patients. Isoflurane and sevoflurane were reported to produce muscle relaxant effect in myasthenic patient. Desflurane in myasthenic patients was not reported, however in normal patients, it reduces the requirements of NMBs[6].

Currently we are using non-muscle relaxant technique (NMRT) which we adopted in 1994, for maximal thymectomy. The technique consists of the insertion of thoracic epidural analgesia (TEA) in an awake patient prior to induction of general anesthesia (GA). After placement of routine monitoring and insertion of arterial cannula, anesthesia induced with sufentanil 0.1 mcg/kg b.w followed with propofol 3 mg/kg b.w while the patient breathing via face mask 60% nitrous oxide in oxygen through Magill circuit. Direct laryngoscopy then attempted and the larynx is sprayed with 4% lignocaine

2-4 ml using laryngotracheal analgesia cannula (LTA, 24 laser pores, Abott, USA). Tow minutes later the trachea is intubated. Anesthesia is maintained using 60% N_2O/O_2, propofol infusion 6-12 mg/kg b.w and epidural bupivacaine 0.125% infusion 4-6 ml/hr. This technique eliminates the need of NMBs and epidural offers better intra and postoperative pain control in addition to on table extubation of the trachea. Nasogastric tube (NGT) is also inserted and kept during the postoperative period. Recently the same technique, without use of TEA, has been verified and supported by Sanjay et al, in their study on the use of propofol or Sevoflurane without muscle relaxants in thymectomy for MG with encouraging results[7]. Furthermore, the same technique, without use of TEA, was also supported by Rocca et al, in their published report on the use of propofol or sevoflurane without muscle relaxants which allowed early extubation of myasthenic patients[8].

In our series we have an established protocol for preoperative preparation of our patients scheduled to undergo thymectomy. It includes clinical diagnosis which is supported by laboratory confirmative tests which involves the use of electrophysiological studies besides serum level of antibodies against acetylcholine enzyme. Also medical treatment for all patients is part of our standard protocol in the form of anticholinesterase drugs and corticosteroids depending on the severity of the disease. Our preoperative protocol also includes three sessions of plasmapheresis. One of the important preoperative tests is pulmonary function test. In one study we have demonstrated that preoperative forced vital capacity (FVC) and forced mid-expiratory flow rate between 25 and 75% of FVC (FEF25-75%) were noted to have large discrimination coefficient value to predict the need for postoperative ventilation[9]. In the current series 89 patients received no muscle relaxant for endotracheal intubation and in all of them the trachea was extubated in the immediate postoperative period. Among patients who received muscle relaxant, in 11 patients, the trachea was extubated in the immediate postoperative period and in 15 patients they required short term postoperative ventilation. In our series we have also reported 5 cases who underwent video-assisted thoracoscopic thymectomy (VATT).

Currently, there is increasing interest in VATT in MG. Thoracoscopic

thymectomy offers several advantages compared to open technique, namely, les postoperative morbidity, minimal discomfort, rapid functional recovery, shorter postoperative hospital stays and reduction of hospitalization cost. Also, it offers excellent cosmetic healing compared to sternotomy[10]. In the literature there are many publications on the anesthetic management of trans-sternal thymectomy. However, very few on VATT. During earlier phases of VATT, we have used the same non-muscle relaxant technique combined with TEA, on the assumption that it could be converted to open surgical technique at any time during the procedure. However, later we have modified our technique to be non-muscle relaxant without TEA[11]. Our current anesthetic technique for VATT includes, non-muscle relaxant approach, intubating the trachea with double lumen tube (DLT) after topical spray to vocal cords, and continuous infusion of propofol and sufentanil. In that case one lung ventilation (OLV) should be established.

In conclusion, anesthesia for thymectomy is challenging. From this experience we have developed certain beliefs conducive to improved management of MG: that the use of NMRT provides excellent intubating conditions, the use of NMRT promotes early tracheal extubation of patients in the operation room; the use of propofol infusion and TEA in trans-sternal thymectomy provides good operative and postoperative conditions, and the use of modified non-muscle relaxant technique in VATT surgery provides excellent intubating, operative and postoperative conditions. We also believe that for such procedure an established protocol which involves perioperative management is essential for better outcome.

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