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Management and Anesthesia Consideration of Patient with Multiple Sclerosis

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Abstract: ***Multiple sclerosis (MS) is an autoimmune disease which causes multifocal inflammation and central nerve system demyelinisation. Repeated acute incidence will worsen prognosis dan reduce survival rate. Anesthesia and surgery trauma, hyperpyrexia, emotional stress and infection is the trigger factor of repeated severe frequency. Therefore an MS patient exposed to anesthesia has higher morbidity and mortality. The anesthesia management which includes anesthesia evaluation and choice of anesthesia technique needs particular attention by an anesthesiologist to assure optimal anesthesia recovery. In our reported case, a female with MS had an urgent surgery of cellulitis abscess debridement of the right leg with general anesthesia.***

Keywords: Multiple sclerosis, anesthesia management, surgery

1. Introduction

Multiple sclerosis (MS) is an autoimmune disease presumably caused by interaction between genetic and environmental factor, generating multifocal inflammation and central nerve system (brain and medulla spinalis) demyelination [1,2,3,4]. Destruction of myelin and axon causes disorder of nerve conduction transmission. The prevalence of MS is approximately 2-150 per 100.000 people, respectively in Europe, Canada, USA, Australia and New Zealand, more affecting female aged 20-50 years old than the male with a ratio of 2:1 [5,6]. The symptom of MS includes visual disturbances, sensory deficit, motor deficit, depression and chronic pain [3,7]. Almost 90% MS patients are the relapsing-remitting type (RRMS), 65% of them will develop to secondary progressive MS (SPMS), the remission episodes diminish and the symptoms become more progressive [3,8].

The repeated acute incidences worsen the prognosis and reduce survival rate. Anesthesia and surgery trauma, infection, hyperpyrexia, puerperal period and emotional stress may trigger an acute exacerbation [3,4]. The multidirectional management for MS is reduced frequency and duration of episodes, minimalize neurological deficit and extend the progressivity of the disease [3,5].

2. Case Presentation

A 63-year-old Australian female, complained of pain with extensive abscess cellulitis of the right foot, planed for abscess drainage debridement surgery. On pre-anesthetic evaluation, the patient has been treated MS for 16 years. The patient had a history of intermittent weakness and numbness in both legs followed by stiffness in all extremities, and persisted since the last four years, with a history of chronic pain and depression. Patient has had urination disorder for eight months resulting regular urinary catheterization. Visual disturbances, history of seizure, speech disorder, swallow or breathing disturbances was denied. The last crisis was two years ago. Currently, the patient is under neurologist supervision. The patient has treated with amitriptyline 25 mg daily, escitalopram (SSRI) 10 mg daily and baclofen 15 mg 3 times daily. The patient denied any history of allergy, smoking and alcohol consumption. She had a history of hysterectomy with general anesthesia ten years ago without any complication.

Her physical exam revealed the body weight was 54 kg; blood pressure was 100/70 mmHg, pulse was 96 beat per minute, spontaneous respiration of 14 times per minute, the temperature was 38.2-degree Celsius, with a Visual Analog Scale of 60-70 cm. On neurological examination, the patient was fully alert with mental depression, spasticity, paraparesis, and paresthesia on all four extremities, coordination disorder of the upper and lower extremities.

On laboratory examination, the complete blood count, liver function, kidney function and electrolytes, ECG and chest x-ray was within normal limits. The patient was given Paracetamol 1 g intravenous (iv), Fentanyl drip of 20 mcg per hour after a bolus of 25 mcg, midazolam 0.5 mg tablet and loading 500 ml Ringer Lactate on a perioperative visit. Premedication of midazolam 2 mg iv, fentanyl 50 mcg iv given at the operating theater preparation room, and noninvasive monitoring (pulse oximetry, blood pressure, ECG and temperature) was applied in the operating theater. Following was the administration of general anesthesia Laryngeal Mask Airway (LMA) balance. Induction was with propofol 100 mg iv, 0.02 mg per kg body wight (BW) midazolam iv, 50 mcg fentanyl iv, followed by maintenance with 10 mcg/kgBW/hour propofol iv, sevoflurane 0.5 MAC with LMA.

Surgical duration was 90 minutes, without any complication during or post surgery. In the recovery room patient was fully

awake, adequate spontaneous breathing, the hemodynamic tend to be hypotensive during and post surgery. Analgetic fentanyl 20 mcg/h administered by continuous intravenous access, 1 g Paracetamol iv every 8 hourly. There was no acute exacerbation of multiple sclerosis during surgery or in hospital treatment.

3. Discussion

Multiple sclerosis is an autoimmune disease caused by interactions of genetic and environmental factors which activate autoreactive T cell and cytokine affecting destruction of the blood-brain barrier [2,3,5]. The multifocal inflammation process results in demyelination and scarring of the glial cell axon (sclerosis) of the central nervous system (brain and spinal cord) manifested as the disorder of nerve conduction transmission [3,7]. In the reported case there was a sign of nerve conduction transmission problem manifested by weakness and paresthesia on both legs, followed by all four extremities, urination disorder, depression and chronic pain.

Factors which may provoke exacerbation crisis in multiple sclerosis is anesthesia and surgery stress, infection, perioperative stress and hyperthermia. Therefore MS patient undergoing anesthesia and surgical procedures have a higher risk for neurological dysfunction compared to patients without MS history [2,3,4]. In the perioperative period a detailed history, physical examination and MS type identification, the presence of acute exacerbation, medication history, and the degree of neurological dysfunction should be checked. The reported case was an MS (SPMS) type with a history of medication with baclofen, amitriptyline, and escitalopram. Escitalopram is a serotonin reuptake inhibitor (SSRI) antidepressant, baclofen is a central nervous system depressant used as a muscle relaxant or antispastic, and amitriptyline is a tricyclic antidepressant as an analgesic. These three medication needs consideration in the anesthesia management.

Perioperative hyperthermia may cause recurrence and exacerbation in MS because it can affect the nerve conduction in the area with demyelination [9,10]. The mechanism is not understood well, possibly from the combined structure and axon physiology change in the CNS. The increase in temperature and nerve demyelination will provoke potential action and increase the refractory period of the electrical nerve system mediated by potassium pump activation, and sodium pump inactivation [10]. Every increase in temperature of 0.5-degree Celsius will decelerate the impulse along the demyelinated nerve segment [2,8]. Intraoperative temperature monitoring, avoidance of surface warming, a cooling device, room temperature modification, antibiotic and antipyretic administration needs particular attention [3,8,9]. In the reported case, during the perioperative period the patient had hyperthermia. Paracetamol 1 g iv was administered, and volume replacement for fasting was given in the perioperative period, temperature monitoring during surgery and postoperative while also avoiding blanket warmer with aggressive temperature therefor during and after surgery there was no worsening with a mean temperature of 36.4-36.9 degree Celcius.

In earlier days anesthesia was thought not affecting demyelinisation lesion in MS since there were limited studies and case reports presenting the effect of anesthesia technique and perioperative management in MS [4,11]. However, now is known that all anesthesia technique may cause MS exacerbation symptoms. Spinal anesthesia is still a controversial relative contraindication for MS [2,3,8]. Direct toxicity, mechanical trauma, and neural ischemia is the concern for a neuraxial block in MS patients. 11 High pentapeptide an oligopeptide in the CSF causes sodium pump block responsible for the muscle weakness and acute exacerbation of MS [3,12,13]. In our reported case, the patient was managed with general anesthesia. The guideline for central neuraxial is still ambiguous for the decision; it does not confirm or decline neuraxial block in peripheral or central nervous system disorder and also does not decide if spinal or epidural is recommended. Some clinical recommendations state that epidural anesthesia is safer than spinal anesthesia because the steady penetration of local anesthesia in the subarachnoid space is lower and the prevalence of hypotension is lower than spinal anesthesia [14,15]. Other considerations in the central neuraxial block are the trauma and stress during injection and hypotension, which may provoke acute exacerbation.

General anesthesia has its advantages and disadvantages in MS patients. Intravenous induction medication and inhalation do not have side effects on the nerve conduction and MS progressivity [16,17]. The caution should be in the respiratory system dysfunction in the end stage MS, although in some cases it may occur in the early phase. Respiratory dysfunction is the leading cause of death in MS. Demyelination of the respiratory center and the cervical segment of the spinal chord causes various degrees of respiratory function failure in MS patients due to disturbance of respiratory muscle coordination and an increase of the CO2 sensitivity threshold at the respiratory center [18]. The respiratory muscle weakness not only causes the decrease of the lung volumes and respiratory failure due to inefficient ventilation, but sleep disorder breathing also reduces the cough effectivity [16]. Grasio MG et al. reported more than 80% of nonambulatory MS and almost one-third of ambulatory MS is followed by coordination disturbances of the respiratory muscles [19]. Forced maximal expiration is decreased to 50% of the normal values in MS, which also reduces the functional residual capacity. Therefore preoxygenation during anesthesia induction is very important and should be longer than an average patient [3,8]. Early evaluation of the respiratory muscle function in MS may avoid respiratory complication [16]. Pulmonary function test examination and blood gas analysis is recommended for perioperative examination, but clinical signs such as the ability to expectorate pulmonary secretion, cough ability and long exhale is a more important predictor to know any respiratory muscle dysfunction [20]. In our reported case, no spirometry respiration function test of blood gas analysis was examined although there was respiratory muscle dysfunction indicated by the decrease of cough ability, long exhale and the difficulty in acquiring adequate spontaneous breathing

before extubation. This was also possibly worsened by the drug history of baclofen and SSRI.

Upper spinal chord lesion will affect the autonomic nervous system and cause hemodynamic stability disturbances in many degrees. There are reports of severe hypotension unresponsive to fluid and vasopressors in spinal anesthesia [3,21]. Syncope, impotence, bladder and bowel dysfunction, cardiac dysrhythmia are indicators of autonomic dysfunction [20,21]. There are several tests to evaluate the cardiovascular autonomic system, however, it's application in MS is still questioned [3]. Valsalva maneuver test is used as a parasympathetic test, the variability of abnormal heart rate is found in active or inactive MS [22]. In our reported case, there were signs of autonomic dysfunction of bladder dysfunction and the tendency of hypotension in the perioperative and during the operative period even after efforts of the administration of perioperative fluid, administration of vasopressors and a titrated induction. Valsalva test should be performed in the perioperative period to confirm any autonomic dysfunction. The management of premedication of alprazolam tablet 0.5 mg the night prior surgery and midazolam 2 mg intravenously just before surgery was intended to prevent anxiety which may trigger an acute exacerbation. Midazolam is an anxiolytic and decreases core temperature by the thermoregulation system. 17 Induction with titrated propofol 100 mg and fentanyl 50 mcg intravenous followed by maintenance with sevoflurane 1 vol% and N20 by LMA. Arzu car et al. reported in their study of induction with propofol and remifentanil followed by maintenance with sevoflurane, N2O, remifentanil, and atracurium did not induce acute exacerbation of MS in a patient undergoing nephrectomy laparoscopy surgery for 7.5 hours [6]. The choice of muscle relaxant in MS cases must be carefully considered. Succinylcholine should be avoided due to the risk of muscle denervated hyperkalemia associated with MS progressivity. Denervation of the acetylcholine upregulation receptor system will increase the numbers of postjunctional receptor then decrease the resistance of nondepolarisation muscle relaxant which may be aggravated by the history of muscle relaxant medications such as baclofen and dantrolene [3]. A non-depolarisation muscle relaxant drug given in titration with monitoring can be administered when muscle relaxant is necessary. In our reported case, relaxation of the surgery field what not essential and the airway management was not with endotracheal intubation. Therefore, muscle relaxant was not given.

MS patients significantly have a higher risk of thromboembolic compared to non-MS patients [22]. Limitation of extremity mobility causes venous stasis, the release of inflammation mediator associated with prothrombin factor and endothelial dysfunction linked to atherosclerosis and thrombo-emboli [22]. In our case, the d-dimer was prolonged, and the ultrasound examination showed there was venous thrombosis. Stocking was preferred for the long term considering the side effect of thrombolytic drugs as thromboembolic prophylaxis in MS due to the complexity of MS patients. In the reported case enoxaparin 1 mg/kgBW SC was administered preoperative and continued postoperatively.

4. Conclusion

MS is an autoimmune disease affecting myelin and axon destruction, therefore, cases nerve transmission disorders with its various manifestation. The acute recurrent episode triggered by anesthesia trauma, surgery trauma, infection, hyperpyrexia and emotional stress is an adverse prognosis in this case. The multidirectional management is reducing the frequency and duration of attacks, minimalize neurological deficit, decelerate the progressivity. The anesthesiologist must understand the perioperative issues in an MS patient to make optimal preparation for the patient for surgery and anesthesia. The choice and management of anesthesia should be according to the patient's condition because all anesthesia technique has their advantage and disadvantages in this case. The high risk of autonomic dysfunction with their manifestation needs further evaluation.

5. Conflicts of Interest

The authors declare that they have no conflicts of interest.

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