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CASE REPORT

Uhthoff's phenomenon in a patient with multiple sclerosis during the perioperative period for hip surgery. Case report

Fenómeno de Uhthoff en paciente con esclerosis múltiple durante perioperatorio de cirugía de cadera. Reporte de un caso

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Palabras clave: Anestesia, Esclerosis múltiple, Cambios en la temperatura corporal, Fracturas de cadera, Insuficiencia respiratoria

Abstract

Increase in body temperature is associated with neurological deficit exacerbations in patients with multiple sclerosis (MS). These are corrected with the resolution of hyperthermia, in what is known as Uhthoff's phenomenon. A 65-year-old patient with primary progressive MS, admitted because of hip fracture, developed acute respiratory failure in association with elevation in body temperature (38°C) due to an increase in room temperature. Additional tests ruled out infection, pulmonary thromboembolism, or other concomitant processes. The patient's respiratory condition improved following a change in room temperature and the use of pharmacological treatment for hyperthermia. She was taken to surgery under general anesthesia 3 days after admission, with tight temperature monitoring, and surgery proceeded uneventfully. Anesthetic management in patients with MS is important, requiring close control of body temperature to avoid comorbidities and perioperative complications.

Resumen

El aumento de la temperatura corporal se asocia a exacerbación de déficits neurológicos en pacientes con esclerosis múltiple (EM) que se corrigen con la resolución de la hipertermia, proceso denominado fenómeno de Uhthoff. Una paciente de 65 años con EM primaria progresiva, hospitalizada por fractura de cadera, presentó un cuadro de insuficiencia respiratoria aguda en relación al aumento de temperatura corporal (38°C) debido a un incremento en la temperatura ambiental. Las pruebas complementarias descartaron patología infecciosa, tromboembolismo pulmonar y otros procesos intercurrentes. La paciente presentó mejoría respiratoria tras modificar la temperatura de la habitación y recibir tratamiento farmacológico para la hipertermia. Al tercer día de ingreso fue operada bajo anestesia general con control estricto de temperatura corporal, sin incidencias. Es importante el manejo anestésico en pacientes con EM, siendo el control estricto de la temperatura corporal necesario para evitar comorbilidad y complicaciones perioperatorias.

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CASE REPORT

Introduction

Multiple sclerosis (MS) is a demyelinating autoimmune disease of the central nervous system. There are certain considerations that need to be borne in mind during anesthetic management of these patients. Sensitivity to elevations in body temperature (Uhthoff's phenomenon) is a classical characteristic in MS, found in 60 to 80% of patients. Increases in body temperature result in transient worsening of pre-existing signs and symptoms in these patients.[1,2] The following is a case in which this phenomenon had clinical repercussions for perioperative management.[3]

Clinical case

A 65-year-old woman (weight, 61 kg; height, 165; body mass index, 20.2), grade III of the American Society Anaesthesiologists, with a history of depression and primary progressive MS diagnosed 22 years ago, who presented with abnormal gait, spastic tetraparesis, and progressive pyramidal dysfunction, with no pharmacological treatment at the present time. She was admitted to the hospital because of accidental hip trauma with left pertrochanteric fracture, and was scheduled for surgery following anesthesia assessment.

During anesthesia assessment, the patient was found in good general condition, conscious, oriented, with normal cognitive function, normal cranial nerve findings with no dysphagia, or gastroesophageal reflux. She exhibited spastic tetraparesis, with strength of 1/5 in the left side of the body and 3/5 in the right side on the Medical Research Council scale. Cardiopulmonary and abdominal auscultation showed no abnormality, no predictors of a difficult airway were present, and the rest of the physical examination was normal. No relevant findings were identified on the chest X-ray or electrocardiogram (EKG). The patient was informed of the anesthetic options available and the decision was made to employ general anesthesia (GA) plus femoral and lateral femoral cutaneous nerve blocks for postoperative pain management, and the informed consent was signed.

On the night before surgery, coinciding with high temperature in the room, the patient developed dyspnea with rapid desaturation, with no chest pain or other symptoms. Vital sign measurements showed blood pressure (BP) of 110/67 mmHg, arterial oxygen saturation (SaO_2) of 88%, axillary temperature of 38 °C and 28 bpm. On exploration, the only relevant findings were the use of accessory respiratory muscles and a heart rate of 110 bpm. The rest of the tests (complete blood count, biochemistry, and coagulation) and chest X-ray, were all normal. The EKG revealed sinus tachycardia. Pulmonary thromboembolism and other lung abnormalities were ruled out by angio-computerized tomography.

Counter measures included antipyretics (paracetamol and metamizol), Ventimask oxygen therapy with a 60% fraction of inspired oxygen (FiO_2) and lowering of room temperature. Respiratory symptoms improved within the following 6 hours. The surgical intervention was postponed for 24 hours until the patient was found to be asymptomatic and stable.

Before the procedure, the patient was pre-medicated with metoclopramide 10 mg and ranitidine 50 mg. Monitoring included EKG, non-invasive BP, pulse oximetry (baseline SaO_2 of 90%) and bispectral index. She was pre-oxygenated with 100% FiO_2 and GA induction included propofol (1.5 mg/kg), fentanyl (2 μg/kg), and rocuronium (1 mg/kg), with rapid-sequence intubation (due to the risk of aspiration in these patients). Ultrasound-guided femoral nerve block with 10 mL of 0.125% bupivacaine and 2 mg of dexamethasone and lateral femoral cutaneous nerve block with 5 mL of bupivacaine at the same concentration were performed for postoperative analgesic control. Target controlled infusion (TCI) with propofol and remifentanil was used for anesthetic maintenance according to the Schnider (Ce 2–3 μg/mL) and Minto (Ce 1–2 ng/mL) modes, respectively. Body temperature was tightly controlled during surgery using a nasopharyngeal thermometer and thermal blanket at 36 °C to maintain temperature between 36 and 37 °C. There were no cardiac rhythm alterations or hemodynamic or respiratory repercussions.

The patient was extubated after 70 minutes of uneventful intervention following verification of absence of muscle relaxation (99% train-of-four ratio). There were no complications during the postoperative period in the recovery room, with good pain control. The patient was discharged 6 days after admission with no changes in her baseline neurological condition (Fig. 1).

Discussion

Heat sensitivity (Uhthoff's phenomenon) is a characteristic of MS and other demyelinating disorders, and it is defined as stereotypical and reversible neurological decline, secondary to hyperthermia. From the pathophysiological point of view, it is stipulated that even slight increases in body temperature (starting at 0.8 °C) result in a reduced conduction velocity in the form of blockade to the action potential of the demyelinated axons, exacerbating the existing clinical situation. This phenomenon is characterized by its clinical reversibility within a variable period of time, once normal temperature is restored.[4]

Triggering factors associated with the rise in temperature include infection, inflammation, baths or exposure to high environmental temperatures, physical exertion, or menstruation.[5] Surgical stress is a known trigger, hence the need for exquisite perioperative management in these patients. Continuous monitoring of body temperature is recommended, together with antipyretics, antibiotics (in case an infectious cause is suspected), modification of

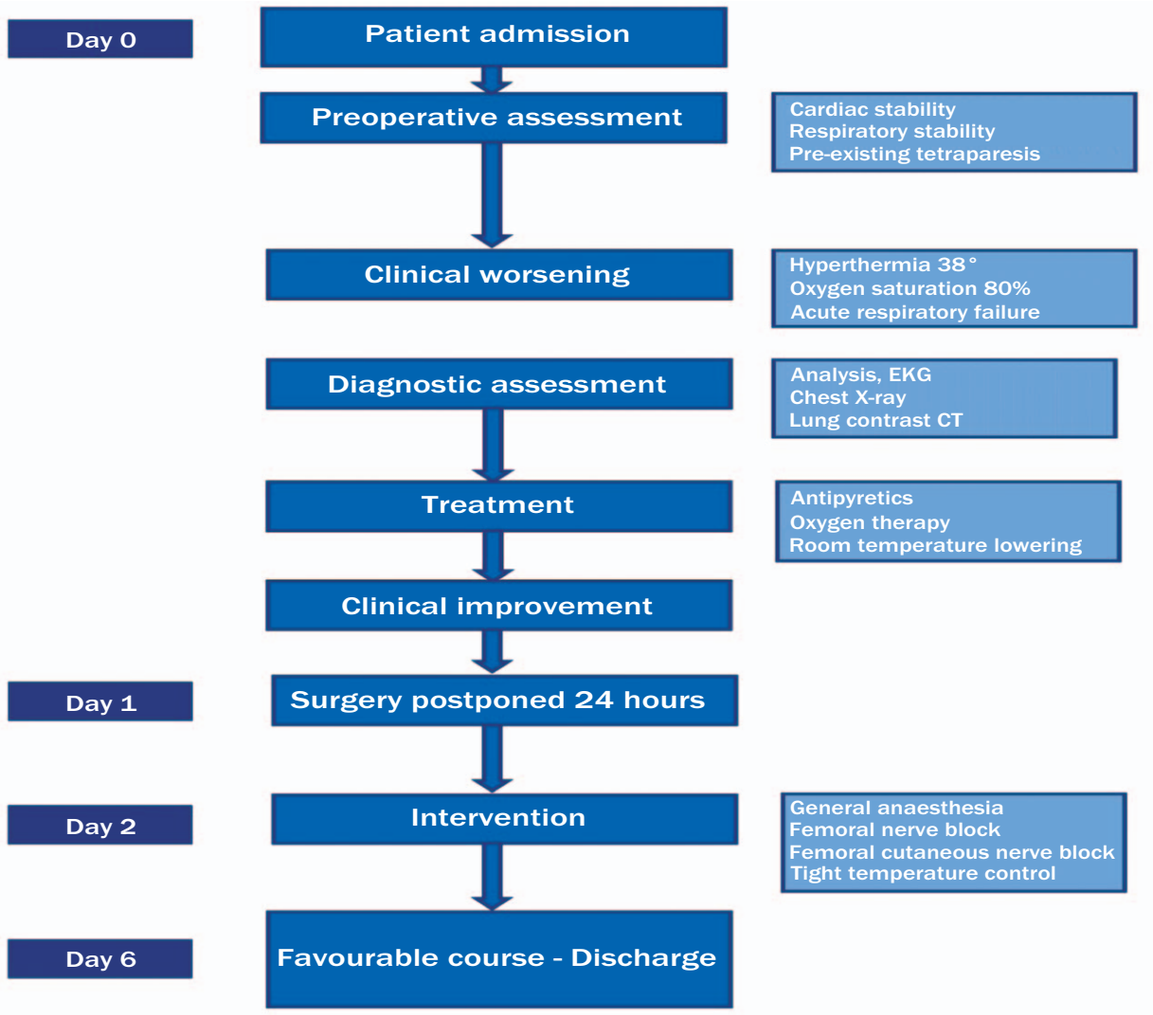

Figure 1. Patient evolution from day 0 to 6.
Source: Authors.

room temperature, the use of cooling devices, and administration of cold fluids. Using thermal blankets with these patients requires caution. During the perioperative period, it is critical to be able to distinguish this phenomenon from true inflammatory flares of the disease due to the clinical and management implications, to make the right decisions and not delay priority surgeries.[3] In our case, pulmonary thromboembolism was considered as a possibility and the surgery was postponed for 24 hours because of our lack of specific knowledge about this phenomenon. However, given that it is an infrequent occurrence, the diagnosis must be made after ruling out potentially severe pathologies.

Other anesthetic consideration in patients with MS are shown in Table 1. GA and the epidural technique with low-dose local anesthetics (LAs) are considered safe, as is the case with obstetric anesthesia in patients with a diagnosis of MS and other neurodegenerative diseases.[3,6–8] However, intradural and epidural anesthesia with high concentrations of LAs have been implicated in exacerbations.[9] No superiority has been found of inhaled versus intravenous anesthesia. Avoiding depolarizing muscle blockers is recommended.[10] Regarding non-depolarizing muscle blockade, there may be resistance or increased sensitivity due to the loss of muscle mass and the use of muscle relaxants like baclofen.[9,11] The low incidence of thrombophlebitis and pulmonary embolism in these patients could be explained by the presence of spasticity and lower limb spasms, which might prevent venous stasis.[12]

In the case presented here, the patient had advanced-stage primary progressive MS, with significant baseline neurological sequelae. An environmental temperature increase triggered a quantifiable rise in body temperature, leading to worsening of pre-existing muscle weakness that affected respiratory muscles. This resulted in respiratory failure which was resolved when hyperthermia was addressed. The patient was taken to the surgical procedure under tight control of body temperature with no further incidents.

Table 1. Anesthetic considerations in patients with multiple sclerosis.

Pre-operative period	• Assess cardiac and respiratory function (echocardiography, spirometry) • Assess the risk of aspiration of gastric contents (cranial nerve assessment) • Assess degree of spasticity and its repercussion on positioning for surgery • Assess for potential difficult airway • Assess pharmacological interactions
Intraoperative period	• Protection of support points • Tight temperature control • Avoid drugs with long half-life, in particular opioids and benzodiazepines • Avoid depolarizing muscle relaxants and use of non-depolarizing agents with caution • Perform a rapid sequence intubation if at all possible • Select the regional anesthetic technique according to individual risk-benefit • Use the epidural technique with low concentrations of LAs and avoid prolonged exposure • Consider the use of peripheral locoregional blockades for analgesia
Postoperative period	• Consider continuation with mechanical ventilation in the Intensive Care Unit in case of prior respiratory failure • Continue temperature management and hemodynamic control

LA = local anesthetic.
Source: Authors.

Conclusion

Patients with MS require special consideration from the perspective of anesthesia. Heat sensitivity is a peculiarity that results in transient clinical worsening of the neurological condition, and awareness of this fact allows to distinguish this situation from a demyelinating exacerbation. Tight control and management of body temperature is critical in these patients to avoid comorbidities and unnecessary delays in surgery.

Ethical responsibilities

Human and animal protection: The authors declare that no experiments were conducted in humans or animals for this research.

Data confidentiality: The authors declare that no patient data appear in this article.

Right to privacy and informed consent: The authors obtained the informed consent from the patient and/or subjects mentioned in this article. The informed consent form is available from the corresponding author.

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Conflict of interest

The authors declare having no conflict of interest.

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