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Case Report

Ketamine for Management of Refractory Shivering During Spinal Anaesthesia

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Abstract

Shivering following spinal anaesthesia is common. It is associated with increase in physiological stress, plasma catecholamine and cardiac output. Various pharmacological agents have been shown to be effective for preventing and managing postanaesthesia shivering. However, little is known about management of refractory shivering. Here we present a case of intraoperative refractory shivering following spinal anaesthesia, which was effectively managed with ketamine.

Keywords: Ketamine; Postanaesthesia Shivering; Spinal Anaesthesia

Introduction

Shivering may occur following neuraxial anaesthesia. The reported incidence varies between 40 to 64%. Although shivering may have beneficial thermoregulatory effects, it increases physiological stress, plasma catecholamine and cardiac output. Shivering may interfere with monitoring of blood pressure, electrocardiogram and pulse oximetry and may reduce patient comfort and satisfaction [1]. Several pharmacologic and non-pharmacologic measures have been studied to prevent or treat shivering during anaesthesia with variable results. Clonidine, pethidine, tramadol, nefopam and ketamine are the most frequently studied and efficacious medications [2]. Studies have evaluated the role of various agents for prevention or management of shivering during anesthesia [3-6]. Little is known about the management of patients who remain refractory to one or more of these agents and continue to shiver.

Here we present a case of refractory shivering during spinal anaesthesia, who developed shivering despite prophylaxis with pethidine and warming and did not respond to Ondansetron and supplemental dose of pethidine. Shivering was successfully controlled with Ketamine.

Case Description

A 42 years old gentleman, weighing around 50 Kg, was planned for emergency appendectomy. Patient had no comorbidities. His baseline vital parameters were within normal limits. Patient was premedicated with Ranitidine 50 mg and Metoclopramide 10 mg i.v. Ambient room temperature of operating room was maintained at 24°C. All the intravenous fluids were warmed before administration. Hyperbaric bupivacaine (3.8 ml of 0.5% solution) was administered intrathecally for subarachnoid block. After attaining the T4 level of sensory block to pin prick sensation, surgery was initiated. Midazolam 2 mg i.v. was administered for sedation. Pethidine 25 mg i.v. was administered as a prophylaxis for

shivering. After about 15 minutes of surgical incision, patient started to develop shivering. Patient was afebrile and was pain free. Shivering progressively worsened to grade 3. Ondansetron 8 mg i.v. was administered, followed by Pethidine 15 mg i.v. Patient continued to shiver. Patient complained of discomfort, heart rate increased to 142 beats/minute and respiratory rate increased to 30/minute. Ketamine 25 mg i.v. was administered slowly. After around 3 minutes, shivering was controlled and his heart rate decreased to 84 beats/minute and respiratory rate to 14/minute. His oxygen saturation was maintained above 94%. He was sedated, but responding to verbal commands with Ramsay sedation scale of 3. Surgery was conducted uneventfully. The remaining intraoperative and post-operative period was uneventful.

Discussion

Spinal anaesthesia impairs the thermoregulation system by inhibiting the tonic vasoconstriction, which plays a role in temperature regulation. Loss of thermoregulatory vasoconstriction below the blockage results in increased heat loss from body surface in excess of metabolic heat production. Heat is internally redistributed from core to peripheral compartment [7]. A number of factors including age, level of sensory block, operating room temperature, amount of blood loss and duration of surgery are risk factors for hypothermia during regional anaesthesia [8]. In our case, the operating room temperature was maintained at 24^{o}C and all fluids were pre-heated to body temperature.

Reduction in the shivering threshold is proportional to spinal block height [9]. We anticipated shivering as we attained the high sensory blockade to the level of T4 dermatome. Pethidine was administered prophylactically to prevent shivering. At the dose of 12.5-35 mg, pethidine was shown to be effective in preventing shivering [10]. So we used pethidine 25 mg i.v. as prophylaxis. As ondansetron has been shown to be effective in reducing postanaesthesia shivering, without increasing risk of bradycardia, [5] we used Ondansetron 8 mg i.v. in an attempt to control shivering. The shivering persisted. We administered pethidine 15 mg i.v. as a supplemental dose to control shivering as there is some evidence of dose responsiveness of pethidine [10].

Shivering is associated with increase in oxygen consumption (by 100-600%), cardiac output, carbondioxide production and circulating catecholamines [3]. Our patient got tachycardic and tachypnoic as the shivering persisted and remained refractory. Ketamine may decrease core-to-peripheral redistribution of heat by direct sympathetic stimulation and inhibition of norepinephrine uptake into postganglionic sympathetic nerve endings [7]. Although the mechanism of action of ketamine is not completely understood, it probably acts directly on thermoregulatory centre [11] and on opioid receptors. The N-methyl-D-aspartate (NMDA) receptor is thought to play a role in transmission of thermal signals to the brain and spinal cord. NMDA receptor antagonism modulates thermoregulation at multiple levels [8]. Various studies have shown ketamine to be effective in preventing or treating shivering [2-4,7]. We administered 0.5mg/kg of ketamine, as this dose was not associated with significant adverse effects [3,4]. Shivering was effectively controlled and both the heart rate and respiratory rate settled.

To conclude, low dose intravenous ketamine may be helpful for management of refractory shivering during spinal anaesthesia without significant side effects.

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