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SHORT COMMUNICATION

Effect of previous scorpion bite on the action of local anaesthetic agents: A case report

Uma Hariharan^{1,a}, Sonali Tripathi^{2,b}

¹Dr Ram Manohar Hospital and Post Graduate Institute of Medical Education & Research, Baba Kharak Singh Marg, New Delhi 110001, India

²Government Medical College, Chhindwara, Madhya Pradesh, India

^{a,b}E-mail address: uma1708@gmail.com , dr.sonali.tripathi@gmail.com

ABSTRACT

Scorpion bites are a relatively common phenomenon in the Indian subcontinent, especially in the countryside. Past history of scorpion bite, as a relevant and significant factor, during pre-anesthetic evaluation is infrequently taken, when patient comes for unrelated medical/surgical conditions. We hereby report a case of failure of subarachnoid block in an adult male, posted for lower limb orthopedic surgery. A 45-year-old, ASA grade 1 male patient was posted for elective right tibial nailing. Single-shot subarachnoid block was planned for the procedure, which failed. Sub-arachnoid block was repeated and again, there were no signs of sensory or motor blockade. At this point, on specific enquiry, the patient gave history of scorpion bite twice; first, at the age of 32 years, and the second time, about 10 months back. Thereafter, it was decided to give standard balanced general anaesthesia for the procedure. The surgery lasted for 90 min and was uneventful. Postoperatively, neurological examination of the lower limbs revealed incomplete sensory block by pin prick method and grade I motor block on Bromage scale (just able to flex/move knees). Scorpion venom may be responsible for the development of resistance to the action of local anesthetic agents. This case report discusses the possible correlations between scorpion bite and the failure of sub-arachnoid block.

Keywords: Scorpion Bite, Neurotoxic Venom, Local Anaesthetic Action, Bromage Scale, Subarachnoid block, Country-side

1. INTRODUCTION

Regional anaesthesia for the orthopedic surgeries is very popular in view of excellent anaesthesia, good postoperative analgesia, reduced side effects, decreased blood loss, lower incidence of deep vein thrombosis, and shortened stay in post anaesthesia care unit (PACU) [1-4]. Subarachnoid block is a common anaesthetic technique used for various short to intermediate duration lower limb orthopedic surgeries [5]. Failure of subarachnoid block may occur even in expert hands [6, 7].

Causes of failure of spinal anaesthesia may be poor patient positioning, incorrect insertion of spinal needle, spine abnormalities, obesity, errors in drug injection, inaccurate dose of drug, misplaced injection, inadequate intrathecal spread, inadequate drug action, local anaesthetic resistance etc. [8-10]. The scorpion venom is known to affect the pumping mechanism of sodium channels in the nerve fibers, which are involved in the basic mechanism of action of local anesthetic agents. It may be responsible for the development of 'resistance' to the action of local anesthetic agents [11, 12].

Envenomation by scorpion is not an uncommon occurrence in subtropical countries like India. We are hereby reporting a case of 'failure or delayed' action of local anesthetics administered via subarachnoid block in patient giving late history of scorpion bite.

2. CASE REPORT

A 45-year-old male patient with fracture tibia right leg was admitted for tibia nailing. Regular pre-anaesthetic checkup was done. General physical examination and all routine laboratory investigations were within normal limits. He was accepted for planned surgery as ASA grade I. Informed and written consent was obtained for the surgery and anaesthesia.

Inside the operation room, intravenous infusion of ringer lactate was started. Standard ASA monitoring was applied, including ECG, SPO2 and NIBP. Under all aseptic precautions, subarachnoid block was performed at the level of L3-L4 interspace with a 25-gauge Quincke's needle in sitting position. After confirming the free flow of CSF on aspiration, 3.5 ml 0.5% hyperbaric bupivacaine was injected into the subarachnoid space.

Thereafter the patient was made supine. In spite of waiting for 20 min, the patient did not show any signs or symptoms of sensory block, as confirmed by pin prick method or of motor block, as confirmed by continued full-range movements of lower limbs or toes.

The patient was made to sit up again and spinal anaesthesia was repeated at L2-L3 interspace. A total volume of 3.5 ml of 0.5% hyperbaric bupivacaine was injected after confirming the free flow of CSF on aspiration. The patient was made supine and slight head down tilt was given. Again, there was neither sensory nor motor block in spite of waiting for 30 min. The patient also did not show any signs of autonomic block (hypotension). At this point, after very specific enquiry into the past history, the patient gave history of scorpion bite twice; first, at the age of 32 years, and the second time, about 10 months back.

Thereafter, it was decided to give standard balanced general anaesthesia for the procedure. After cautious intravenous induction, endotracheal intubation was done and patient put on controlled mechanical ventilation. Anaesthesia was maintained with oxygen and nitrous oxide with isoflurane (1%). The surgery lasted for 90 minutes and was uneventful. At the end of surgery and adequate reversal, the patient was extubated according to standard protocol.

In the immediate postoperative period, patient had incomplete sensory block as tested by pin prick method and grade I motor block on Bromage scale (just able to flex/move knees). The patient was observed closely for the next 48 hours in a High dependency unit, where the course was uneventful. After satisfactory recovery from the surgical procedure, he was discharged from the hospital.

3. DISCUSSION

Spinal anaesthesia failure is known, but uncommon phenomenon. The reported incidence of spinal anaesthesia failure is 0.72% - 16% [13]. The explanation for spinal block failure that occurs despite the apparent technically correct injection of the correct drug can be mystifying. As a result, true local anesthetic resistance is difficult to diagnose and may be greeted with skepticism [14]. An extensive literature search revealed isolated case reports of local anesthetic resistance [15, 16]. The resistance to local anesthetics may be attributed to mutation in the receptors located in sodium channels [9, 17].

The sodium channel has been shown to consist of alpha, beta-1 and beta-2 subunits. The alpha subunit involves four homologous domains (I-IV) and each of these domains is made up of six transmembrane segments (S1-S6). Local anesthetic action is believed to be due to an interaction with the sixth segment of domain four of the alpha subunit (IV-S6) [9, 17].

Resistance to local anesthetic may be related to the alpha subunit of the sodium channel and more specifically to the sixth segment of the domain four of this subunit [9, 18].

Scorpion venom contains neurotoxic proteins. Alpha and Beta toxins act on sodium channels. Scyllatoxin, charybdotoxin and tityus toxin present in scorpion venom inhibits calcium dependent potassium channels and also causes opening of sodium channels at presynaptic nerve terminals [10, 19]. Scorpion Beta toxin binds to receptor site 4 of voltage gated sodium channels, thereby modifying the activation process of the channels [10, 20, 21]. The possible mechanism of resistance to local anesthetic agents following scorpion sting could be antibody mediated. Scorpion venom due to its antigenic nature may produce an antigen-antibody response. This results in formation of antibodies to scorpion venom. When local anesthetic was administered, these circulating antibodies may produce competitive antagonism at sixth segment of domain four of the alpha subunit (IV-S6) of the sodium channels where the local anaesthetics are supposed to act [10, 17]. The literature search also suggests that there is enough evidence, that irreversible inhibition of scorpion venom may be partially protected by bupivacaine, suggesting a common binding site [9, 22].

4. CONCLUSIONS

Patients with a history of scorpion bite exhibited apparent resistance to bupivacaine spinal block. This resistance manifested as inadequate block or block failure requiring conversion to general anaesthesia. The management of pain is challenging in such cases as local anaesthetics may not produce the desired effect in regional nerve blocks. Use of adjuvants like opioids and alpha-2 agonists can be tried for pain management. Anaesthesiologists should always keep in mind the possibility of past history of scorpion bite for failed regional blocks, in all patients

hailing from geographical regions where scorpion sting is common. Patients with previous history of scorpion bite need to further evaluated carefully.

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