

SUCCESSFUL TREATMENT OF EARLY ROPIVACAINE TOXICITY WITH INTRALIPID IN A PATIENT WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Case Report

A 16 year old male underwent right shoulder arthroscopy and Bankart procedure. The patient weighed 58 Kg and had a BMI of 19.6. He had a history of attention deficit hyperactive disorder (ADHD) treated with atomoxetine, a newer drug that works by selectively inhibiting the re-uptake of norepinephrine (1). We planned for a general endotracheal anesthetic with interscalene block for postoperative analgesia. Monitors were applied in the preoperative block room including: ECG, non-invasive blood pressure, and pulse oximeter. Nasal oxygen was administered at 2 L/min. Sedation was provided with 2 mg of midazolam IV. The patient was positioned in right lateral decubitus. After sterile preparation of the skin with chlorhexidine, a high frequency US probe 12-15 Hz (HD 11 XE, Phillips, Bothell, WA, USA) was used to localize the brachial plexus roots. A nerve stimulator was set at 0.4 mA with a frequency of 2 Hz and 0.3 ms. Skin and subcutaneous tissue anesthesia was obtained with injection of 3 ml of 1% lidocaine. Using a posterior approach, the interscalene block was performed in plane, using a 90 mm 21 guage nerve stimulator needle (Arrow, StimuQuik, Reading, PA, USA). The C6 root stimulation was confirmed with a biceps twitch, and 20 ml of 0.75% ropivacaine was injected after negative aspiration and negative test dose (D5W with 1:200,000 epinephrine, 3 ml). The C5 root stimulation was confirmed with a brisk deltoid twitch, and 20 ml of 0.75% ropivacaine was injected after negative aspiration and negative test dose. A total of 40 ml of 0.75% ropivacaine was given.

Ten minutes after the block, the patient became slightly confused, reported visual hallucinations (purple spots), and was noted to have slower and slightly slurred speech. He also had an intention tremor in his left arm when asked to move it, but no obvious tremor at rest. Cranial nerves 2-12 were grossly intact, but he did have some non-coordinated tremor in his tongue on protrusion. His respiratory rate increased to 25. His heart rate steadily increased from 75 to 156 bpm over 5-7 minutes. He remained in sinus rhythm. His blood pressure increased from 112/62 to 140/80. Suspecting ropivacaine toxicity, we infused 1.5 mg/kg Intralipid 20% (Fresenius Kabi, Uppsala, Sweden) as a bolus over 4-5 minutes. His heart rate and breathing declined rapidly. We then administered 0.5 mg midazolam IV. Intralipid infusion was continued at 0.25 mg/kg/min over 3 hours. After 20-30 minutes of observation, his motor twitching ceased, his speech became more coherent, and his hallucinations were gone. He had a full motor and sensory block of the operative arm. He was taken to the operating room and underwent an uneventful general anesthetic with endotracheal intubation. He was maintained on propofol (150-200 mcg/kg/min) and sevoflurane 1.2% in air: oxygen mixture of 1:1.

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The postoperative course was uneventful; he reported minimal pain in his elbow. He had some recollections of the events, including remembering the purple spots he had seen. A month after the surgery the patient was called and he reported that he was doing well.

Discussion

Ropivacaine has been shown to be a safe long-acting local anesthetic. In both animal studies and case reports, investigators have shown that ropivacaine cardiac toxicity is more responsive to standard ACLS recommended resuscitation procedures in comparison with other local anesthetics^{2,3}. The estimated incidence of ropivacaine-induced toxic events is 6-8 in 1000,000 patients⁴. The manufacturer's maximum recommended dose of ropivacaine (300 mg) for brachial plexus blockade is not evidence based^{5,6}. Total dose is an important consideration, but we must weigh it against other factors such as the pharmacokinetics of the drug, block site, patient characteristics and drug interactions. Used collectively, these considerations provide the greatest margin of safety against local anesthetic toxicity^{6,7}.

In our case, direct intravascular injection is unlikely as the block was performed under visualization with ultrasound, there was no blood visualized after aspiration, the HR did not change with test dose, and signs and symptoms of local anesthetic toxicity occurred 10 minutes after completion of the block. We believe that the observed symptoms were the result of ongoing systemic absorption of the drug. The administered dose of ropivacaine was 5.3 mg/kg which can be considered in the toxic range for a brachial plexus block (4-8 mg/kg)⁷⁻¹². Other factors may have played a role in the development of toxicity

in our patient. These include the high vascularity associated with the interscalene approach, the lean body mass of the patient and potentially his ADHD diagnosis. There is a bidirectional relationship between ADHD and epilepsy. In one study children diagnosed with ADHD have been shown to have greater incidence of EEG abnormalities in comparison to general population (6.1% vs 3.5%). In another study of children with ADHD, 30.1% of them were found to have pathological EEG findings^{13,14}. If we consider that his ADHD was a contributing factor to the development of CNS symptoms, the cardiovascular and respiratory symptoms we observed may have been due to sympathetic stimulation from global CNS excitation¹⁵. It is also likely that these symptoms can be explained as direct cardiac toxicity resulting from the excessive local anesthetic in the blood.

There have been two reported cases of early CNS symptoms induced by local anesthetic toxicity successfully treated by lipid infusion^{16,17}. Our case highlights the concept that early administration of Intralipid for treatment of local anesthetic-induced early CNS toxicity prior to development of seizure and cardiac arrest is a safe and viable option for anesthesiologists. Our case also highlights the diversity of symptoms that may be present in patients with local anesthetic toxicity. These symptoms may be different or masked in populations with ongoing mental disease or in those taking pharmaceuticals for those diseases.

The patient's BMI, associated co-morbidities and type of block are important in determining local anesthetic dosage. Furthermore, we found Intralipid infusion was safe and successful in reversing local anesthetic-induced early CNS and cardiac abnormalities when administered early prior to the development of seizure and cardiac arrest.

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