Case Report

Ropivacaine Induced Seizures

Sudharshan Balaji S G*, Vijaya Raghavan*, Lailu Mathews**, Thilaka Muthiah***

*Postgraduate student, ** Prof. & HOD, ,***Assistant Professor, Department of Anaesthesiology & Critical Care, Chettinad Hospital & Research Institute, Chennai, India.

Dr.S.G.Sudharshan Balaji graduated from Sree Balaji Medical College and Hospital, Chennai (2004-2010)and currently pursuing post graduation (MD Anaesthesiology) in Chettinad Hospital & Research Institute, Chennai. He has special interest in the field of Pain management, Intensive care Unit management, Cardiac and Robotic Anaesthesia.

Corresponding author - Sudharshan Balaji S G (Leu.sudharshan@gmail.com)

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Introduction

Ropivacaine- a relatively new long acting local anaesthetic agent is a pure S-enantiomer.Local anesthetic toxicity commonly affects the cardiovascular and central nervous systems(CNS), with CNS symptoms being more diverse varying from numbness of tongue,visual disturbance and muscular twitching to more serious manifestations like convulsions, coma, respiratory arrest, and cardiovascular arrest. Brachial plexus block is a frequently used technique for upper limb procedures and is more desirable to use a longer acting local anesthetic for the same. Among the long acting local anaesthetics, ropivacaine is less toxic compared to bupivacaine with only few cases of cardiac or central nervous system toxicity being reported. We report a case of generalised tonic clonic seizure (GTCS) that occurred in a patient during administration of ropivacaine for brachial plexus block.

Case Details

A 35-year-old male (65 kg, 160 cm) was scheduled for open reduction and internal fixation of fracture of right radius and ulna. He had no significant medical or surgical history and also was not allergic to any drugs or food. All the blood investigations were within normal limits. In the operation theatre standard monitoring of electrocardiograph, oxygen saturation and non invasive blood pressure was instituted. Peripheral venous access was established and IV midazolam 2 mg was given.

Under strict aseptic precaution, after infiltrating skin with 2% lignocaine, nerve stimulator guided brachial plexus block was performed. After confirming negative aspiration of blood, 35 ml of 0.4% (150 mg in 35 ml) ropivacaine was injected over 10 minutes.

Patient was responding to commands during administration of ropivacaine. However after 20 ml of administration of drug, patient had generalized tonic clonic seizures, during which heart rate increased from 75/min to 90/min and NIBP increased from 126/78 mm Hg to 144/84 mm Hg. Immediately administration of ropivacaine was stopped, 100% oxygen was administered, midazolam 3mg was given and general anaethesia was induced with thiopentone 250 mg, fentanyl 100 mcg, succinylcholine 100 mg and trachea was intubated. Seizures stopped after induction of general anaesthesia and maintained with 02:air at 1:1 and isoflurane at 1.2 MAC with ivatracurium bolus doses.

Table 1 - Cases of adverse effects with Ropivacaine after regional anaesthesia with the technique and dosage used; ND-not determined(3–8)(Concise of all case reports)

Regional Anaesthetic Technique	Amount of Ropivacaine injected	Plasma Concentration	CNS effects	CVS effects
Epidural	2.0 mg/kg	ND	GTCS	Tachycardia
Epidural	0.5 mg/kg	1.4 mg/litre	GTCS	None
Brachial Plexus Block	300 mg	2.7 mg/litre	GTCS	None
Brachial Plexus Block	4.5 mg/kg	2.0-4.0 mg/litre	Oral Numbness	Tachycardia and Hypertension
Sciatic Block	2.5 mg/kg	1.6-3.6 mg/litre	GTCS	Bradycardia
Interscalene Block	6 mg/kg	4.0-6.0 mg/litre	Oral Numbness	Tachycardia
Interscalene Block	2.3 mg/kg	ND	GTCS	None

There were no cardiovascular changes observed in ECG except sinus tachycardia. Patient was observed for next 30 minutes and after ruling out other causes of generalized tonic clonic seizures like hypoxemia, hypercarbia, hypoglycemia, electrolyte abnormality and acidosis, surgery was commenced under general anaesthesia. Intra operative period was uneventful and surgery lasted for 170 minutes. After neuromuscular antagonism, patient's trachea was extubated uneventfully. Effect of brachial plexus block lasted for 240 minutes, with no further episodes of seizures and complications for the next 24 hours. Patient was discharged after 7 days of uneventful postoperative period.

Though ropivacaine has been used extensively in brachial plexus block and other regional anesthesia techniques, only a few reports of ropivacaine induced seizures are available. In all these cases plasma levels of ropivacaine was measured but the toxic dose of ropivacaine could not be ascertained[1–5]. In our case we used ropivacaine at a dose of 2.30 mg/kg, which is below the standard toxic dose of ropivacaine (3 mg/kg), but still patient had central neurological complication (GTCS), showing individual variation in the threshold causing symptoms in healthy individuals[1–8].

Though brachial plexus block with 0.5% or 0.75% ropivacaine with a volume of 40 ml was found to be safe,administering the minimal clinical effective dose reduces the risk of toxic effects[5]. In one study using nerve stimulator it was shown that 30 ml of local anaesthetic was effective in brachial plexus block[9]. The choice of local anesthetic was important and we chose ropivacaine because of its longer duration of action and better safety profile than bupivacaine. A summary of all case reports is given in table 1.

In this case, the serum drug concentration was not determined as the facility was not available in our hospital. However with no history of any illness like epilepsy or previous history of convulsions, with the presence of sensory and motor block which lasted for 240 minutes and the timing of seizures in relation to the administration of ropivacaine,the possibility of an intravascular injection, despite repeated negative aspiration of blood, could not be ruled out. Ultra sound guided nerve block is the method followed to visualize the structures before safe and effective administration of drug, so that accidental intravascular injection can be prevented.

Conclusion

Though the adverse effects reported by ropivacaine are rare, precautions to be taken to prevent such events include—fractionating the total dose (two ml increments) of the drug and addition of epinephrine at a concentration of 1:2,00,000 (prepared and added separately) to local anesthetic solution thereby detecting accidental intravascular injection even if repeated negative aspiration was not confirmatory.

Recent advances like ultrasound guided nerve blocks with colour flow doppler, where we can visualize the structures more precisely can still reduce adverse reactions.

Repeated plasma concentration of ropivacaine can confirm the diagnosis, but its rarely done because of its limited availability.

Summary

We report a case of generalized tonic clonic seizure without cardiovascular toxicity that was most probably due to ropivacaine used for brachial plexus block, which was effectively managed without any squealae. It emphasizes that regional anesthetic techniques need to be applied very carefully and in appropriate settings with proper monitoring and all measures for early detection of intravascular placement of drug must be followed.

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