Local and Regional Anesthesia

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CASE REPORT

Prolonged nerve blockade in a patient treated with lithium

This article was published in the following Dove Press journal:
Local and Regional Anesthesia
30 March 2012
Number of times this article has been viewed

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Abstract: We report a case of a patient, chronically treated with oral lithium, who presented with an extremely prolonged (42-hour) duration of sensory and motor paralysis following an uneventful infraclavicular block for hand surgery that was performed under ultrasound guidance using bupivacaine and lidocaine. Due to its direct effect on nerve conduction of action potential, we propose that lithium may have had a role in the unusually prolonged duration of a peripheral nerve block.

Keywords: nerve blockade, lithium, duration, anesthesia

Introduction

Peripheral nerve blocks are of great importance in anesthesia and may provide painless, safe, and inexpensive anesthesia with long-lasting analgesia. Numerous systemic and local effecting medications, many of which are still in daily clinical use, may alter the onset, analgesic effect, and duration of peripheral nerve blocks. Here, we describe the case of a patient, chronically treated with oral lithium, who had an extremely prolonged (42-hour) duration of sensory and motor paralysis following an uneventful infraclavicular block for hand surgery that was performed under ultrasound guidance using lidocaine and bupivacaine.

Case report

A 46-year-old woman was scheduled for elective hand surgery. Her medical history was significant for bipolar disorder, chronically treated with oral lithium carbonate 750 mg/day during the 4 years prior to the surgery. Blood lithium levels 2 days prior to the surgery were 0.45 mEq/L (therapeutic values usually considered are between 0.6 and 1.2 mEq/L). She had had no previous surgery, except minor dental procedures under local anesthesia, and no known allergies.

Due to patient preference for regional anesthesia, an infraclavicular block was performed under ultrasound guidance using a 22 G stimulating needle (Polymedic®; te me na SAS, Carrieres-sur-Seine, France). Each one of the three cords of the brachial plexus was separately visualized using an in-plane short axis approach and concomitantly electrically stimulated by nerve stimulator, after which a local anesthetic "cuff" was injected individually around each cord, using 10 mL of plain bupivacaine 0.25% (Kamada, Beit-Kama, Israel) and lidocaine 1.5% (Rafa Laboratories Ltd, Jerusalem, Israel) solution (0.1 mg/kg and 0.075 mg/kg, respectively, totaling 30 mL). Neither paresthesia nor pain was elicited during the injection. Sensory block was evaluated

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using pinprick and was satisfactory 12 minutes following the injection. No adverse effects were observed.

In the ward, the patient complained of residual intense block, both motor and sensory, which persisted for approximately 20 hours and wore off slowly until it was absent 42 hours following the injection of the local anesthetic solution.

Follow-up at 1 week and 1 month revealed no motor or sensory deficit, no paresthesia, and no sign of nerve damage.

No ethical issues arose from the medical management of this case.

Discussion

Lithium is an alkali metal with a long history of clinical use for bipolar disorders[1] and has been utilized as an adjuvant for neuropathic pain[2] and fibromyalgia.[3]

The conduction of action potentials through nerve fibers is dictated by the intra- and extracellular concentrations of ions, as well as being a result of the adequate function of the ion channels within the cell membrane. Based on the Goldman–Hodgkin–Katz voltage equation, a permanent presence of the lithium ion in the extracellular fluid alters the membrane resting potential[4] and, hence, might significantly alter the conduction of action potentials.

The period of arrested action potentials induced by local anesthetics is reliant upon the reversibility of the voltage-gated sodium channel blockade. Gold and Thut[5] showed that if the concentration of lithium ions increases, the potency of local anesthetics conduction block increases concomitantly in an in vitro rat model. In this study, the effective dose of lidocaine-induced block on the voltage-gated sodium channel TTX-S INa in the presence of physiologic concentrations of Na^+ (35 mM) was lowered by approximately 80% with the presence of Li^+ ions. Lilley and Robbins[6] demonstrated an increased potency of local anesthetics (procaine, lidocaine, and benzocaine) in an isolated frog sciatic nerve with the presence of Li^+ compared with Na^+.

In the present case, the motor and sensory block lasted 42 hours, although the literature and our experience show that using this dose of local anesthetic usually provides an effect that lasts 10–16 hours[7] or less.[8] We suggest that lithium could have elicited the prolonged duration of the peripheral nerve block. This relation may exist, despite subtherapeutic levels of lithium, due to different effects of the ion on the central and peripheral nervous systems.

Since the length of analgesia is of great significance when a single-injection nerve block is applied, further studies are needed to evaluate the effects of lithium on the duration of motor and sensory nerve block in humans.

Disclosure

The authors report no conflicts of interest in this work.

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