Ropivacaine induced acute neurotoxicity after epidural injection

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Abstract. – Ropivacaine is an amide-type long acting local anaesthetic. According to experimental and human data, its toxicity for Central Nervous System (CNS) and Cardiovascular System (CVS) is considered lower than toxicity related to bupivacaine, the nowadays accepted golden standard for long acting local anaesthetics. Nevertheless, reports about this kind of accidents are fairly numerous. Aim of this short paper is to describe, primarily from a subjective point of view, CNS symptoms a patient (one of the Authors) suffered by an acute toxic reaction during an epidural block, and to stress the need to pay attention to safety measures in the practice of loco-regional anaesthesia and epidural blockade.

Key Words: Ropivacaine, Neurotoxicity, Regional anaesthesia.

Introduction

Reports about neurotoxic accidents following ropivacaine administration are now fairly numerous, and a variety of symptoms have been described. Peripheral and epidural blocks, and i.v. administration in healthy volunteers or even following an unintentional infusion bag swap1 have been involved in more or less severe CNS adverse reactions.

CNS toxicity related to ropivacaine administration is reported between dosages as low as 20 mg2 and as high as 400 mg3; aim of this short report is to describe in detail both objective and impressive subjective symptoms a patient suffered by an acute neurotoxic reaction during an epidural block, due, very likely, to the unintentional intravascular injection of 100 mg (or most of) of 1% plain ropivacaine. There seems to be a lack of this kind of information in more recent literature.

Case Report

The patient involved in this case report was male, caucasian, 52-year-old, ASA status II, scheduled for a minor perineal operation. Interestingly, he was an anaesthesiologist himself.

He was assessed by physical examination, routine blood tests including haemogenic tests, and ECG. Blood tests showed a moderate hyperlipidemia, and a minor right conduction disturbance was detected on ECG. The patient used to assume beta-blockers and Ca++-antagonists to control a mild hypertension, with good clinical results.

Combined needle-through-needle spinal-epidural technique was chosen for anaesthesia, in order to fulfil the intraoperative need of surgical anaesthesia and to ensure postoperative analgesia. The patient never received a spinal anaesthesia or an epidural block before, but underwent without any complication three minor operations and the drawing of a tooth under local anaesthesia.

At the time of surgery he was quiet and refused any sedative premedication, and took only his daily medication against hypertension as he woke up in the morning; the operation was scheduled at 11.30 a.m.

Routine non-invasive monitoring was applied before the beginning of the procedure: 5-lead ECG, NIBP, and pulse oximetry. HR was 78 bpm, BP 145/85 mmHg, and pulse oximetry 98%.

The patient was placed in a sitting position directly on the operating table and, after routine skin disinfection and topical anaesthesia with 2% lidocaine, a 18-gauge Tuohy needle was placed, using the loss-of-resistance technique, in the L3-4 intervertebral space to a depth of 6 cm. A 27-gauge Whitacre atraumatic spinal needle was inserted trough the Tuohy needle, and after back-
flow of cerebrospinal fluid, 1% hyperbaric bupivacaine 15 mg (1.5 mL) was injected intratecally, with immediate signs of an effective spinal block.

After removal of the spinal needle a 20-gauge catheter was placed inside the epidural space through the Tuohy needle, which was withdrawn. The physician performing the block had to exert twice a traction to the catheter, after two positive aspiration tests for blood, and, after a final negative aspiration test, left the last 4 cm of the catheter inside the epidural space, securing it to the skin with opaque adhesive tape, and administered 10 mL of 1% plain ropivacaine.

It is unclear, from the anaesthesia record, whether a test dose was administered before full ropivacaine injection, or not; moreover, rate and modality of injection are not known.

The patient was subjectively unaware of the start of ropivacaine injection, but very quickly noticed an intense tingling sensation in the lumbar region rapidly spreading upwards to the neck, the scruff and the vertex of the skull. Then he experienced a strange feeling in his tongue and lacked the quality of speech, but did not feel any metallic taste (he was asked about it). The floor started to roll and pitch to his eyes but he did not feel dizzy, and described the sensation as “fishing from a small boat in a rough sea”. He was shivering, stiff in his muscles, and asked for help to lay down.

The patient’s field of vision became dark, and he started to see a quick sequence of very bright monochromatic flashes, strangely rectangular as huge transparencies. He vocalized subcontinuously, and was unable to stop. All was happening was so unique to the patient that, as reported a little later by him, he wondered whether he was passing away.

In the meanwhile he could hear ambient sounds very clearly, e.g. the anaesthesiologist ordering to give him supplemental oxygen and propofol. He became unconscious for a while, and all the symptoms ceased. The critical episode lasted less than 5 min: the patient always maintained his airway, and stable haemodynamics during and after CNS signs, with only a small increase of blood pressure and heart rate (about 10% more than basal values); cardiac arrhythmias were not detected at any time. Pupils remained isochoric and responsive to light, and no major convulsive activity was noted, nor any behavioural change was noticed. Plasma ropivacaine concentration was not unfortunately measured at any time.

The operation was normally performed, and the patient described his experience during the operation itself; it is worth to note that all witnesses were astonished by the accuracy of the patient’s account, both about subjective and objective symptoms, the latter very easy to be observed by everybody.

The epidural catheter was removed after surgery, and inspection revealed the presence of blood in its last 12 cm portion. Postoperative analgesia was assured by i.v. NSAIDs, and needed less than three hours after the operation; at that time the patient was able to walk without any difficulty, and could urinate.

Up till now, the patient’s health in the whole seems to have been not affected.

**Discussion**

Neurological signs by local anaesthetic intoxication may be impressive, especially when major symptoms occur, but reports seem to deserve poor attention to the actual feelings of the patient, that may range from strange slight sensations to a dramatic experience.

The episode herein described leads once more to pay attention to some aspects of the use of ropivacaine and to loco-regional anaesthesia practice itself.

As patient’s symptoms suggest, together with the lack of any significant postoperative analgesia attributable to an effective epidural blockade, it is likely to suppose that all injected ropivacaine, or most of, was administered intravascularly in the epidural space. It has been postulated that the use of ropivacaine may result in unusual symptoms of CNS toxicity; yet, local anaesthetics other than ropivacaine seem to cause unusual CNS symptoms as well.

In this case, the progression of CNS toxicity (intense upward tingling from the site of injection, a visual hallucinatory state, a state of good consciousness without hearing loss, muscular rigidity, a subcontinuous vocalization with useless attempts to stop it, the sensation to be about to die) seems to follow a chaotic model. As Mather et al. observed, patients progressively seem to reach new CNS “state” levels, that finally may lead to grand mal con-
vulsions or to extinguish the symptoms, as in this case.

The episode seems to confirm a good cardiovascular stability even during accidents following ropivacaine pronounced overdose or intravascular injection, and no signs of direct toxicity to CVS were observed; anyway, a drug-drug interaction with the medication the patient used to assume may have also contributed to the negligible indirect CNS-mediated myocardial stimulation due to the outpouring of sympathetic mediators produced by the onset of CNS toxicity.

Despite the awareness of the risks of epidural blockade, a small share of unavoidable accidents seems still to remain: a negative aspiration test and even an uneventful test dose injection do not preclude the possibility of injection in relative low pressure vessels, that can collapse when a negative pressure is applied. It has been stressed the need to use or add to the anaesthetic solution a reliable agent, which could act as a marker for unintentional intravascular administration, eliciting prodromal symptoms without any significant adverse effect. The use of epinephrine containing test doses has sometimes limitations (pregnancy, advanced age, general anaesthesia, and beta blockade, as in this case); using a local anaesthetic itself as a marker (e.g. lidocaine) may be a valuable alternative. But incremental injection is the main step of a safe regional anaesthesia practice: unfortunately, in this report, the modality of injection is not well documented, and, moreover, it may be questionable whether, after two positive aspiration tests for blood, changing intervertebral space would have been better, as suggested by Ryan since 1973. If safety steps, one or more, were omitted, technical errors by the physician who performed the anaesthesia are to be admitted.

Finally, although CNS toxicity may occur even despite pharmacologic prophylactic measures (a controversial issue, since initial CNS symptoms could be masked by a heavy pre-medication), the refusal by the patient of a benzodiazepine based sedation might not have been a good idea.

References