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CASE REPORT

Combined General and Spinal Anesthesia for Lumbar decompression in an Opioid-intolerant Patient: Intra-operative Administration of Intrathecal Bupivacaine *via* the Surgical Incision

Stephen D. Wilkins, Theodore A. Alston and Jingping Wang*

Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Harvard Medical School, 55 Fruit Street, Boston, MA 02114, USA

Abstract: We illustrate repeat dosing of spinal anesthesia as a means to avoid opioids during lumbar surgery for a patient intolerant of opioids.

A patient required redo lumbar surgery but had a marked history of nausea, vomiting and retching in response to opioids. A propofol-based anesthetic was supplemented with intravenous ketamine and intrathecal bupivacaine. The first dose of bupivacaine receded during the lengthy surgical procedure but was supplemented by means of a 25-gauge pencil-point needle passed through the exposed dura. Postoperatively, there was no spinal fluid leak, no headache, and no nausea.

Supplementation of intrathecal anesthesia under direct dural vision during lengthy lumbar surgery is facile, can help to obviate a need for opioids, and can aid in avoidance of postoperative nausea and vomiting.

Keywords: Postoperative nausea and vomiting, opiate intolerance, spinal anesthesia, spine surgery.

1. INTRODUCTION

A patient required lumbar spine surgery. Because of history of severe postoperative nausea and vomiting (PONV), she requested the analgesia plan to lack opiates.

We successfully applied a combination of intravenous general and intrathecal anesthesia. A repeat dose of intrathecal bupivacaine was indicated intraoperatively, and this was achieved *via* the surgical wound. "One-shot" regional anesthesia has been used for spine surgery [1-6], and epidural catheters have been employed either intra-operatively or postoperatively [7-11]. However, the useful option of re-dosing spinal anesthesia intraoperatively by means of needles passed *via* lumbar surgical wounds has not been previously described.

2. CASE REPORT

A 67-year-old woman with degenerative lumbar spondylolisthesis presented for anterior and posterior spinal fusion with decompression at the level of L4-L5. She reported a past history of severe nausea with projectile vomiting in response to a variety of opiate medications *via* intravenous and oral routes. Failed anti-emetic drugs included ondansetron, prochlorperazine, dexamethasone and haloperidol. Additionally, scopolamine caused dizziness and nausea, and tramadol caused hives. She had benefited from acetaminophen for analgesia.

Past medical history included hypertension, asthma, and gastroesophageal reflux. Prior surgeries include cholecystectomy, hysterectomy, Eustachian tube instrumentation, and L4-L5 microdiscectomy. Prior surgeries were performed under general anesthesia with opiate and concomitant antiemetic medications. Nausea and vomiting were the only problems encountered. Her medication regimen at home included valsartan, amlodipine, omeprazole, mometasone nasal spray, and inhaled budesonide.

Evoked response monitoring was not planned, so pharmacological blockade was permissible. A combination of total intravenous anesthetic technique with propofol and spinal anesthesia with bupivacaine was thus planned. If necessary, the surgeons were to re-dose the spinal intraoperatively within the surgical field.

Standard monitors included pulse oximeter and electrocardiogram, and a radial arterial catheter was placed. After premedication with 2 mg of midazolam intravenously, 4 mL of 0.5% bupivacaine was administered at the level of L3-L4 *via* a 25-gauge Whitacre needle. Isobaric bupivacaine was selected in view of patient positioning. Spinal anesthesia was effective to a T5 level. General anesthesia was induced with propofol, and the trachea was intubated with the aid of succinylcholine. A propofol infusion was run at 120-160 mcg/kg/min. Dexamethasone, 4 mg, was given at induction in order to inhibit postoperative nausea. Mean arterial pressure was maintained >70 mmHg with a phenylephrine infusion. The patient was positioned supine for the initial anterior spinal fusion portion of the surgery. The anterior spinal fusion was completed, and the patient was ready for prone positioning after approximately 2 hours of surgical

*Address correspondence to this author at the Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Harvard Medical School, 55 Fruit Street, Boston, MA 02114, USA; Tel: +1 617 643 2729; Fax: +1 617 726 7536; E-mail: jwang23@partners.org

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time. Shortly after prone positioning, the patient's arterial pressure and heart rate increased by 10-15%, and the spinal anesthetic was suspected to be insufficient for surgical analgesia. The surgeons reported that they would have direct visual access to the dura mater in 20-30 minutes in order to re-dose the spinal. The propofol infusion was increased, and a ketamine infusion was started at 5 mcg/kg/min. The surgeons obtained access to the dura mater and were provided 3 mL of 0.5% (isobaric) bupivacaine in a sterile syringe bearing a 25-gauge Whitacre needle. The drug was administered under direct visualization of the dura mater at the level of L4-L5. The systemic agents precluded assessment of block level, but vital signs improved and the ketamine infusion was stopped. The surgeons completed posterior spinal fusion and decompression 45 minutes later. The patient was given 4 mg of ondansetron and 1 mg of haloperidol intravenously. The surgeons infiltrated 10 mL of 0.5% bupivacaine into the wound. The propofol infusion was turned off as the patient was repositioned supine. Emergence and extubation were uneventful. The patient denied experiencing pain or nausea in the immediate postoperative period. The spinal anesthesia was effective until approximately 1 h postoperatively.

3. DISCUSSION

Postoperative nausea is common, occurring in 20-30% of patients undergoing general anesthesia. It is multifactorial in origin, involving anesthetic, surgical, and individual risk factors [12]. Compared to a regional anesthesia group, severe nausea was more common in the general anesthesia group in the PACU and during the 24 h after surgery [3]. Highest risk patients are often treated with a propofol-based anesthetic, multiple anti-emetic medications, and regional analgesia while avoiding opioid medications [13, 14].

Our patient would be stratified among the highest risk patients for PONV with a severe history despite anti-emetic administration. With these patients, every effort should be made to reduce the modifiable risk factors for PONV. Total intravenous anesthesia combined with multiple antiemetic medications is the preferred anesthetic as a means to eliminate the inhalation anesthetic component of the risk factors for PONV [15]. Benzodiazepines are helpful in reducing anxiety that can contribute to PONV risk [16]. Opioid administration increases the risk for PONV, and our patient voiced her desire to eliminate this as a risk factor.

With the elimination of opioids as a means of analgesia, a different pain management technique must be utilized. We chose regional anesthesia and local infiltration in this case [17, 18]. Though it is not free of nausea [5], regional anesthesia can eliminate multiple emetogenic triggers such as inhaled agents and opioids [13, 14]. An epidural anesthetic would not be feasible for this patient given the surgical procedure site and exposure of the epidural space. Spinal anesthesia provides dense surgical analgesia and muscle relaxation for surgery but has limited duration of action (about 2-3 h with bupivacaine). Since micro-bore spinal catheters are no longer available in the US (and because they generally involved 22-gauge needles), an intrathecal catheter would have required a dural puncture wider than that of our 25-gauge ones, and risk of postoperative leak would have been higher. For a much longer operation, a 25-gauge needle might have been left in situ during the surgery, though it could have proven to be in harm's way.

Potential adverse effects of bupivacaine include supratentorial action and cardiotoxicity in event of intra-vascular injection. However, these outcomes are rare after intrathecal administration at the lumbar level. This patient received 20 mg plus 15 mg bupivacaine within 2.5 hours. From widespread clinical experience, the dose was expected to be safe from both local and systemic perspectives. Firstly, bupivacaine is relatively free of lumbar spinal neurotoxicity associated with repeated doses of lidocaine [19]. Secondly, we availed of 0.5% bupivacaine, and the agent is often given intrathecally at a concentration of 0.75%. Thirdly, there is reassuring experience of safety when intrathecal bupivacaine is given chronically [20-23].

We were presented with a surgical procedure that would most likely extend beyond our analgesic period. Therefore, we determined that an intraoperative second dose of spinal bupivacaine would be necessary for analgesia. Before the second spinal dose could be administered with direct vision of the dura mater, we availed of a ketamine infusion for pain control [24].

Our patient had an uneventful emergence and extubation free of immediate pain or nausea. Postoperative neurological examinations revealed no deficits throughout her hospital stay. The immediate postoperative exam was delayed by 1-2 h by the bupivacaine, but the delay was deemed reasonable. Less delay would have been possible with a shorter agent such as mepivacaine. The patient did not encounter intra-operative awareness.

Frequently, there is less PONV with regional anesthesia as compared to general anesthesia with opioids [3]. Regional anesthesia can also be used to reduce the pain after surgery so that less or no opioid medication is needed. The risks for spinal anesthesia may include post-dural-puncture headache, low blood pressure, and nerve damage. Although the result of these can be severe, they are rare. Serial intra-operative spinal anesthetics administered under direct visualization in the surgical field can allow for a regional anesthetic plan in cases too lengthy for a single-dose spinal anesthetic and when a continuous epidural or spinal catheter technique is not a feasible option. It is interesting to suppose that intra-operative dural puncture may be feasible even in patients for whom it proves challenging before the start of surgery.

CONFLICT OF INTEREST

The authors have no commercial associations that might pose a conflict of interest.

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