Case Report

Erector spinae plane block as an alternative to epidural analgesia for post-operative analgesia following video-assisted thoracoscopic surgery: A case study and a literature review on the spread of local anaesthetic in the erector spinae plane

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ABSTRACT

Post-operative pain after minimally invasive video-assisted thoracoscopic surgery (VATS) in adults is commonly managed with oral and parenteral opioids and invasive regional techniques such as thoracic epidural blockade. Emerging research has shown that the novel erector spinae plane (ESP) block, can be employed as a simple and safe alternative analgesic technique for acute post-surgical, post-traumatic and chronic neuropathic thoracic pain in adults. We illustrate this by presenting a paediatric case of VATS, in which an ESP block provided better analgesia, due to greater dermatomal coverage, as well as reduced side-effects when compared with a thoracic epidural that had previously been employed on the same patient for a similar procedure on the opposite side.

Key words: Erector spine block, video-assisted thoracoscopic surgery, epidural analgesia, local anaesthetic spread

INTRODUCTION

Recently, there has been a great focus in using myo-fascial plane blocks for postoperative analgesia for open abdomino-thoracic procedures. Erector spinae block is one such novel technique that has been shown to be beneficial in managing both acute and chronic pain.[1-4] We describe a case of VATS where this block was utilised on a patient who had an epidural analgesia for a similar procedure on the opposite side few months ago and discuss the comparison between the two techniques.

CASE REPORT

A 16-year-old, 165 cm, 62 kg female presented for elective left video-assisted thoracoscopic surgery (VATS) for apical bullae. A preoperative thoracic epidural catheter at T7–T8 interspace achieved a sensory block between T4-T8 dermatomes. Epidural infusion of 0.2% ropivacaine was utilised at 6 ml/h intraoperatively. Ten mL of 0.25% bupivacaine with 5 μg/mL epinephrine were infiltrated at the wound. The procedure was uneventful and she was extubated. In the post-anaesthesia care unit (PACU), epidural infusion was continued at 6 mL/h along with oral acetaminophen. Her pain score at rest over the trocar

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and chest drain site was initially 10/10 on a numerical rating scale (NRS); it decreased to 2/10 after an epidural bolus, achieving bilateral sensory block between T4-T10. Thirty minutes later, she complained of sharp, left-sided upper chest pain above T4, and received 50 mcg of fentanyl and 0.4 mg of hydromorphone over an hour, and her pain scores were 4/10. Overnight, she received 2 doses of 2 mg of IV morphine and 6 doses of 0.5 mg of IV hydromorphone for left-sided chest pain. Mobilisation was limited by pain and nausea, and she required bladder catheterisation for urinary retention. On post-operative day (POD) 1, a T4-T11 sensory block was evident bilaterally, and she continued having left chest pain around the T2 level. As an epidural bolus of 5 ml of 1% lignocaine was unsuccessful, oxycontin 10 mg PO every 12 h and oxycodone 10 mg PO every 4 h along with ibuprofen 600 mg PO every 8 h as needed was commenced. She required 6 additional doses of 0.5 mg IV hydromorphone on POD one. Along with ondansetron, she required scopolamine patch for nausea and diphenhydramine for pruritus. The epidural was discontinued on POD 3, and she required 9 additional doses of 0.5 mg of IV hydromorphone during POD 4. Together with hydromorphone, she was also on regular paracetamol 1 g every 8 h, celecoxib 200 mg every 12 h until POD 5, which was also her 1st day of ambulation and discharge home.

The patient was readmitted 5 months later for elective VATS resection of apical blebs on the opposite side. Due to her previous suboptimal pain experience, the patient was reluctant to have a thoracic epidural again; however, she and her family were open to accept an erector spinae plane (ESP) block when counselled. Pre-operatively, an ESP block was performed on the right side, under US guidance at T5 level with a high-frequency linear ultrasound transducer as described previously.[2] After placement of a 20-gauge catheter under direct vision 3 cm beyond the needle tip in the ESP, a total of 20 mL of 0.5% ropivacaine was administered. Fifteen minutes later, a sensory blockade to cold was evident between T4 and T8 vertebral level in anterior, lateral and posterior part of the right hemithorax without any accompanying haemodynamic changes. General anaesthesia was induced with IV propofol (200 mg), fentanyl (50 μg) and rocuronium (35 mg). Anaesthesia was maintained with sevoflurane in an oxygen–air mixture, and a total of 1000 mg of IV paracetamol and 150 μg additional fentanyl were administered intraoperatively. An infusion of 0.2% ropivacaine was started at 8 mL/h during the surgery. The surgery lasted 2 h, and an additional bolus of 10 mL of 0.5% ropivacaine with 2 mg dexamethasone was administered through the ESP catheter towards the end of surgery. No surgical local infiltration was performed and she was extubated.

In the PACU, a continuous ESP infusion of 0.2% ropivacaine was continued at 8 ml/h along with oral 1 g of paracetamol every 8 h. Our patient had a sensory block to cold approximately between the T2 and T8 vertebral level in anterior, lateral and posterior part of the right hemithorax with a 5/10 NRS at rest. She received a total of 0.5 mg hydromorphone during her 30-minute stay in PACU. During her 4 h stay in phase 2 PACU, she received 1 mg IV hydromorphone, 5 mg PO oxycodone and her NRS at rest was 2/10. Celecoxib 200 mg twice a day was initiated along with regular doses of paracetamol.

Overnight, she received 3 doses each of 1 mg IV morphine and 5 mg PO oxycodone for rescue analgesia for pain on the right side of chest mainly during movement and during cough. She was able to ambulate to void throughout the night. On POD 1, she complained of mild but sharp right chest pain on movement (NRS 4/10) that responded well to a bolus of 15 mL of 0.5% ropivacaine (NRS 2/10). Throughout POD 1, she received 4 additional doses of 5 mg PO oxycodone and a one-time dose of 0.4 mg IV hydromorphone for breakthrough pain until APMS was able to bolus the catheter with 15 mL of 0.5% ropivacaine. On POD 2, the patient reported several NRS (at rest) scores of 0/10 and the ESP catheter was removed on 3rd POD without any complications. She received 1 more dose of 5 mg PO oxycodone before discharge home on the 4th POD.

Institutional review board approval and a written informed consent were obtained from the patient and family for this report.

DISCUSSION

Although thoracic epidural and paravertebral blocks are commonly employed for VATS, it has been argued that minimally invasive surgeries might benefit from a less-invasive analgesic technique in avoiding the adverse effects encountered with invasive techniques.[5,6] This was clearly demonstrated in our patient, where the epidural technique, albeit working well, failed to cover the upper thoracic dermatomes and its functionality was impacted by adverse effects. A failure rate, as defined by either catheter replacement

or supplementing another analgesic regimen such as patient-controlled analgesia, could be as high as 32% with thoracic epidural techniques.[7]

Being a paraspinal technique, the ESP block has a potential to facilitate recovery along with reduced side effects apart from providing good analgesia.[1,2] With the ESP block, our patient reported lower pain scores, had lower perioperative opioid consumption (oral morphine equivalents 218 mg vs. 548 mg), had fewer medication side effects and achieved earlier ambulation, return of appetite and discharge home. Not surprisingly, both the patient and her family relayed a completely different and positive PO experience with the ESP block and stated that they would highly recommend this in future.

Local anaesthetic injected at the thoracic epidural level has been shown to spread caudo-cephaloid at a ratio of 2:1 blocking less dermatomes above the injection site in contrast to the lumbar epidural injections which spread more in a cephalic direction.[8,9] Although it is widely accepted that a sensory block up to four dermatomes would suffice for VATS;[10] some patients may require extended sensory levels. The mass of the drug and the site of injection play a vital role in determining the spread of an epidural.[11] Compared with the ESP, the epidural zone is a limited area surrounded by the spinal column. Local anaesthetic instilled in the myofascial plane deep to the erector spinae muscle and superficial to the tip of the transverse process is likely to provide sensory block at multi-dermatomal levels across the posterior, lateral and anterior thoracic wall.[4] The analgesic effect seems to be due to the diffusion of LA into the paravertebral space, acting at both the dorsal and ventral rami of the thoracic spinal nerves, in addition to its effect at the rami communicans that supply the sympathetic chain.[12] The ESP plane is larger than the epidural space as the erector spinae muscle runs along the length of the thoracolumbar spine, thus providing extensive craniocaudal spread.[4] We have previously shown in a cadaver model that a single injection at T5 level could spread between C7 and T8.[4] A further work on a fresh cadaver revealed that injections at T5 level could spread between T2 cranially and as low as L3 transverse process caudally [Figure 1].

A higher spread from T2 to T10 with partial block of C7–C8 has been reported by us and others in different clinical settings in adults including VATS.[3,4,13] The observation from this report and from other studies highlight that ESP block may be an effective alternative adjuvant analgesic technique when used in conjunction with a multimodal approach.

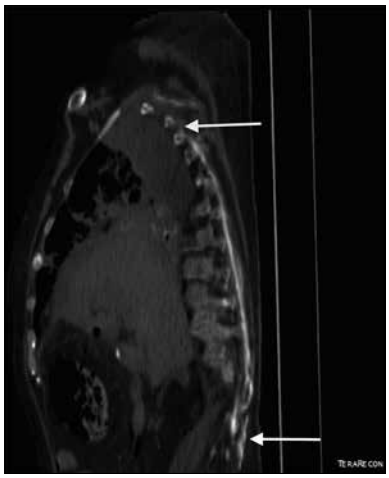

Figure 1: The injection of 20 ml of contrast material at T5 demonstrating the craniocaudal spread between the levels of the T3 and L1 transverse processes (arrows) on the right side. There was lateral spread to the lateral aspect of the erector spinae muscle and slightly beyond into the intercostal spaces at the T7 to T9 levels. There was medial spread as far as the medial border of the erector spinae muscle. Contrast was noted on both the anterior and posterior surfaces of erector spinae muscle

CONCLUSION

Superior analgesia with reduced opioid requirements, along with earlier ambulation and shorter PO length of stay may be achieved utilising continuous infusion and intermittent boluses with ESP block for VATS procedure. Being a single uncontrolled anecdotal observation, further studies are needed to confirm the viability of this approach for appropriate paediatric patients undergoing thoracoscopic surgery. Future studies should also explore whether achieving levels up to lower cervical dermatomes is devoid of any untoward effects.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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