Multimodal opioid-sparing analgesia for posterior cervical spine fusion using erector spinae plane blocks: A case series

Theresa Bowling, MD, Vlad Frenk MD, Robert Suriani MD, David Maduram MD PhD

Department of Anesthesiology, St. Vincent's Medical Center, Bridgeport CT, USA

Introduction

Posterior cervical spine fusions are painful surgeries with opioids as the mainstay of perioperative analgesia. Given the ongoing opioid epidemic and the risk of opioid-related adverse drug events, it is critical to identify and implement opioid-sparing clinical pathways. We report the results of a retrospective case series of patients undergoing posterior cervical fusion in which a multimodal anesthetic regimen including ultrasound-guided erector spinae plane (ESP) blocks was used to provide robust opioid-sparing postoperative analgesia. Our main question was how this multimodal regimen would impact postoperative pain and opioid requirements in patients undergoing posterior cervical fusion surgery. In addition, we looked at the length of hospital stay, as well as the safety profile of erector spinae blocks for cervical posterior spine surgery. This study was approved by the St Vincent's Medical Center Institutional Review Board (Bridgeport, CT).

Case Series

We reviewed medical records of five patients who underwent posterior cervical fusion surgery between August 1, 2020 to November 1, 2020 at St. Vincent's Medical Center.

All patients in this series received general anesthesia with an intraoperative cervical erector spinae block. As part of a multimodal regimen, all patients received intravenous methadone 0.1 mg/kg and ketamine 0.5 mg/kg at the beginning of the case.

Anesthesia was maintained with intravenous propofol 100mg/kg/min and remifentanil 0.15 mcg/kg/min. After induction of general endotracheal anesthesia and preoperative positioning, bilateral ultrasound-guided ESP blocks were performed at the T1 level.

Case Series (continued)

After wide chlorhexidine 4% prep, an ultrasound transducer probe (SonoSite PX, SonoSite Inc, Bothell, WA) was positioned in a longitudinal orientation to obtain a parasagittal view (Figure 1). The transverse process was identified as a hyperechoic structure with acoustic shadowing below it. A hyperechoic 22-gauge needle (B-Braun, Melsungen, Germany), was inserted in a caudal-to-cranial direction using the in-plane technique. When the needle tip came into contact with the transverse process, the correct tip position was confirmed by the visualization of linear fluid spreading in the myofascial plane between the erector spinae muscle and the transverse process (Figure 2 and 3). Further confirmation of both spinal level and needle position was obtained by fluoroscopy (Figure 4). After confirming needle tip position, a total of twenty milliliters of 0.25% bupivacaine with 5mg dexamethasone was injected in 5cc aliquots. This procedure was repeated on the opposite side for a total of 40ml of local anesthetic. No other local anesthetics were used. Intravenous acetaminophen 1000mg and ketorolac 30 mg were given at the end of the procedure. After completion of the surgery, all patients were taken to the postanesthesia care unit (PACU) and then to a dedicated orthopedic inpatient care unit. Post-operative pain was treated with scheduled oral acetaminophen, oral opioids as needed, and IV opioids for breakthrough pain as needed. The median 24h visual analog pain score was 4 [IQR, 4-4.25]. The median 24h postoperative opioid consumption was 24 MME [IQR, 24-33]. None of the patients exhibited signs of local anesthetic systemic toxicity, nor phrenic nerve paresis or paralysis. No sensory loss or motor block of upper extremities were noted.

Subject Number	Age (y)	Sex	LOS	Pain at 6h, 12h, 24h	24h opioid dose (MME)
1	70	M	2.1	0,3,4	8
2	60	M	1.3	3,0,2	36
3	69	M	1.3	2,6,5	32
4	63	F	2.7	2,0,2	8
5	59	M	3.3	5,4,4	24

Discussion

No published case series to date describes ESP block use in major cervical spine surgery. In this retrospective case series, a single-shot injection provided analgesia at multiple cervical levels due to the extensive cranial-caudal spreading of local anesthetic in the musculofascial plane deep into the erector spinae muscle. This procedure is safe, because the needle remains distant from the neuraxis, pleura, major vessels, and nerves at all times. While recent cadaveric studies have described the potential risk of phrenic nerve paralysis, we did not observe this adverse event clinically.

Conclusion

Our findings on efficacy and safety of erector spinae blocks for posterior cervical spine fusion are consistent with other studies of erector spinae blocks for posterior thoracolumbar surgery. The combination of intraoperative conduction blockade with ESP blocks, administration of anti-inflammatory agents, and modulation of nociceptive processing may also explain the robust analgesic effect observed in this case series. The potential that this multimodal anesthetic approach may hold for significantly improving postoperative pain control warrants further investigation.

References

1. Shah A, Hayes CJ, Martin BC. Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use - United States, 2006-2015. *MMWR Morb Mortal Wkly Rep.* 2017;66(10):265-269.
2. Angst MS, Clark JD. Opioid-induced hyperalgesia: a qualitative systematic review. *The Journal of the American Society of Anesthesiologists.* 2006;104(3):570-587.
3. Shafi S, Collinsworth AW, Copeland LA, et al. Association of opioid-related adverse drug events with clinical and cost outcomes among surgical patients in a large integrated health care delivery system. *JAMA surgery.* 2018;153(8):757-763.
4. Qiu Y, Zhang T-J, Hua Z. Erector Spinae Plane Block for Lumbar Spinal Surgery: A Systematic Review. *J Pain Res.* 2020;13:1611-1619.

Figures & Results

Figure 1: Ultrasound position prior to ESP Block

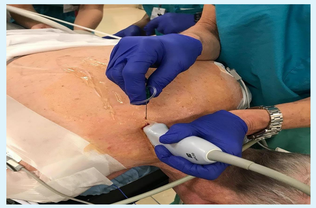

Figure 2: Pre-injection ESP Block ultrasound image

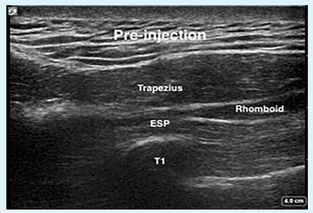

Figure 3: Post-injection ESP Block ultrasound image

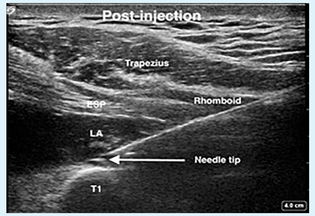

Figure 4: Fluoroscopy image of needle position during ESP Block