International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 409-414 www.ijdmsrjournal.com ISSN: 2582-6018

Ultrasound-Guided Bilateral Erector Spinae Plane Block as aSole Anesthetic Technique for Two-Level Vertebroplasty- A Case Report

Dr. Kartik Sonawane[1], Dr.J.Balavenkatasubramanian[2], Dr.Hrudini Dixit[3]

1. Junior Consultant, Dept. of Anesthesiology, Ganga Medical Centre & Hospitals, Pvt. Ltd., Coimbatore, Tamil Nadu, India

2. Senior Consultant, Dept. of Anesthesiology, Ganga Medical Centre & Hospitals, Pvt. Ltd., Coimbatore, Tamil Nadu, India

3. Fellow in Regional Anesthesia, Dept. of Anesthesiology, Ganga Medical Centre & Hospitals, Pvt. Ltd., Coimbatore, Tamil Nadu, India

Submitted: 1-01-2021 Revised: 13-01-2021 Accepted: 15-01-2021

ABSTRACT: Background: Since the introduction of ultrasonography in regional anesthesia and pain medicine practice, fascial plane blocks have gained popularity. Ultrasound-guided erector spinae plane (ESP) block was first described by Forero et al. in 2016. It involves the injection of local anesthetics between the erector spinae muscles and the transverse process of the vertebrae to block mainly the dorsal rami of spinal nerves.We report a novel indication for ESP block for percutaneous two-level vertebroplasty.Previous literature has emphasized the role of ESP block mainly for perioperative analgesia. This case report focuses on the anesthetic efficacy of ESP block.

Case presentation: An elderly (between 85 to 90-year-old) fragilefemale patient with multiple comorbiditieswas diagnosed with L1 and L4 vertebral body compression fractures with normal neurology. She was scheduled for two-level (L1 and L4) vertebroplasty under ultrasound-guided bilateral ESP block at L2 vertebral level.

Conclusions: Ultrasound-guided bilateral ESP block was successfully used as a sole anesthetic technique in two-level vertebroplasty. It can be considered a suitable alternative or adjunct to general anesthesia for vertebroplasty.

Keywords: Vertebroplasty, Spine surgery, Erector spinae plane block, Bilateral erector spinae plane block, Awake vertebroplasty.

I. INTRODUCTION:

The erector spinae plane (ESP) block is a novel and effective interfascial plane blockfirst described by Forero et al. in 2016 for thoracic and abdominal surgery.[1] It has been used as an analgesic option for a wide range of surgeries, including video-assisted thoracoscopic surgery (VATS), pulmonary lobectomy, mastectomy, axillary sentinel lymph node biopsy, spine surgeries (cervical, thoracic, and lumbar), abdominal surgery, and hip surgery. It also demonstrated a rapid and excellent analgesia profile for posterior traumatic rib fractures. [2]

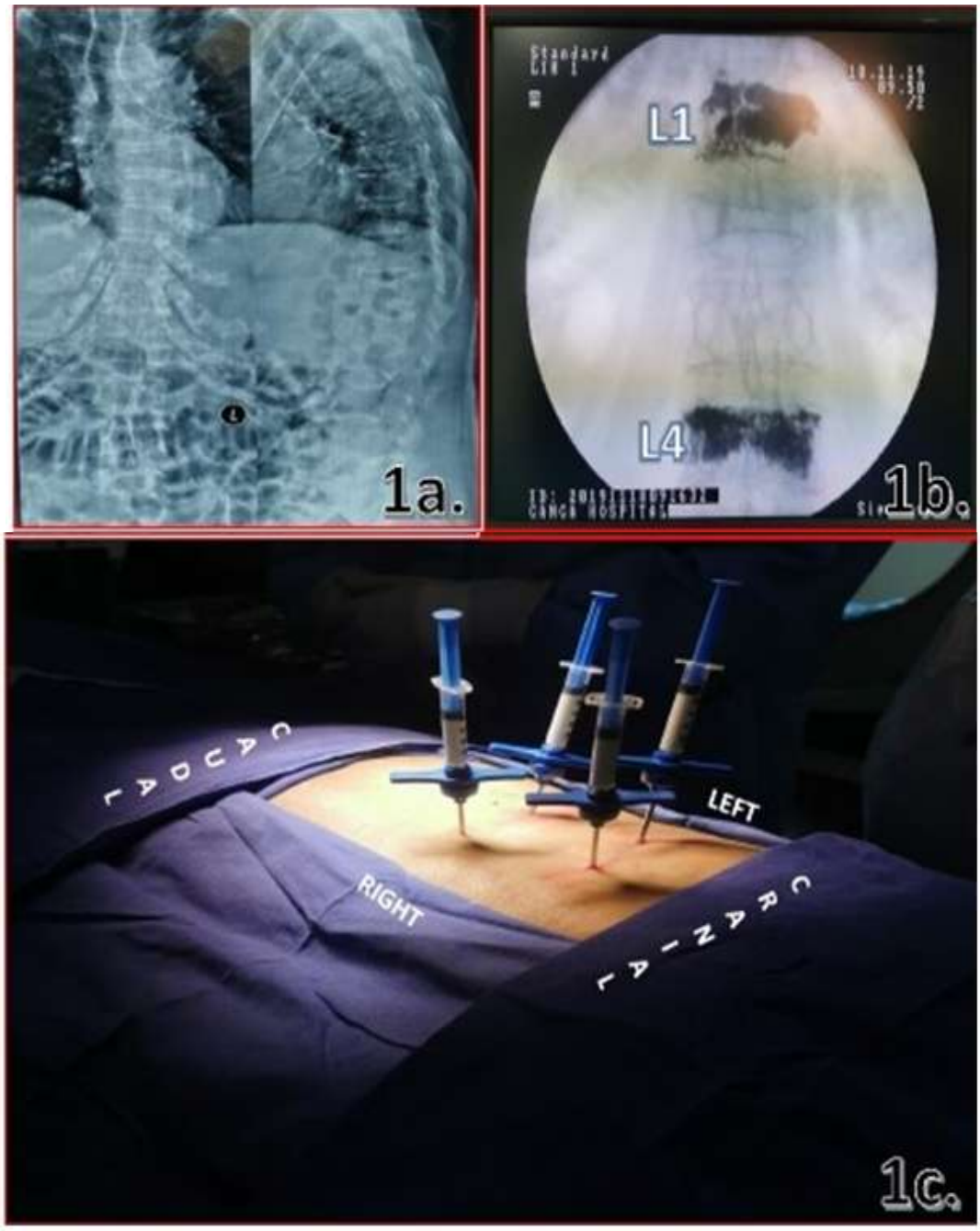
We report a case of an elderly fragilefemale patient with multiple comorbidities diagnosed with superior endplate compressioncollapse of L1 and L4 vertebrae successfully repaired under ultrasound-guided bilateral ESP block.Previous literature has emphasized the role of ESP block mainly for perioperative analgesia. This case report suggests a novel indication for ESP block as a sole anesthetic option for percutaneous two-level vertebroplasty.The patient provided written consent to publish this case report.

II. CASE REPORT:

An elderly (between 85 to 90-year-old)fragilefemale patient with reduced exercise tolerance presented to the hospital with lower back pain for more than 45 days. Her back pain was insidious in onset and gradually progressing. The pain was a dull aching in nature with a score of 8/10 on the numeric rating scale (NRS), aggravated with movement, and relieved with rest.

She was a case of interstitial lung disease with severe pulmonary artery hypertension, congestive cardiac failure, hypothyroidism, anemia, and type 2 diabetes mellitus, for which she was on multiple medications. One week before the surgery, she developed hypovolemic shock due to lower gastrointestinal bleeding thatrequired colonoscopy and multiple blood transfusions. At that time, she also developed transient atrial fibrillation,which required cardioversion.

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 409-414 www.ijdmsrjournal.com ISSN: 2582-6018



On the day of surgery, her general condition was fair with a heart rate of 76/min, blood pressure of 156/86 mmHg, respiratory rate of 24/min, and SpO2 of 87% on room air. Her two-dimensional echocardiography revealed a left ventricular ejection fraction of 64%, severe pulmonary artery hypertension with right ventricular systolic pressure of 108 mmHg, and moderate tricuspid regurgitation. Based on the x-ray (Fig.1a) and computerized tomography scanfindings, she was diagnosed with generalized osteoporosis, degenerative lumbar spondylosis, and superior endplate compression collapse of L1 and L4 vertebrae with normal neurology. She was scheduled for two-level (L1 and L4) vertebroplasty (Fig.1b,1c) under ultrasound-guided bilateral ESP block at L2 vertebral level. A valid, written, and informed high-risk consent was obtained.

Preoperatively, noninvasive blood pressure, pulse oximetry, and electrocardiography were connected to the patient. She was premedicated with intravenous pantoprazole 40 mg, ramosetron 0.3 mg, and intravenous paracetamol 1 gram. A local anesthetic (LA) mixture was prepared using 20 ml

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 409-414 www.ijdmsrjournal.com ISSN: 2582-6018

of 2% lidocaine with epinephrine and 20 ml of 0.5% bupivacaine.

Intraoperatively, with the patient in the prone position, a low-frequency (2-5 MHz) curvilinear ultrasound probe (Sonosite Edge II; Fujifilm SonoSite, Bothell, WA) was positioned 3 cm lateral to the midline in the longitudinal parasagittal plane at the level of L2 vertebra (Fig.2a, 2b). After identifying the tip of the L2 transverse process, 20 ml of LA mixture was injected below the erector spinae muscles using an out-of-plane approach (Fig.2d). This procedure was repeated on the other side.

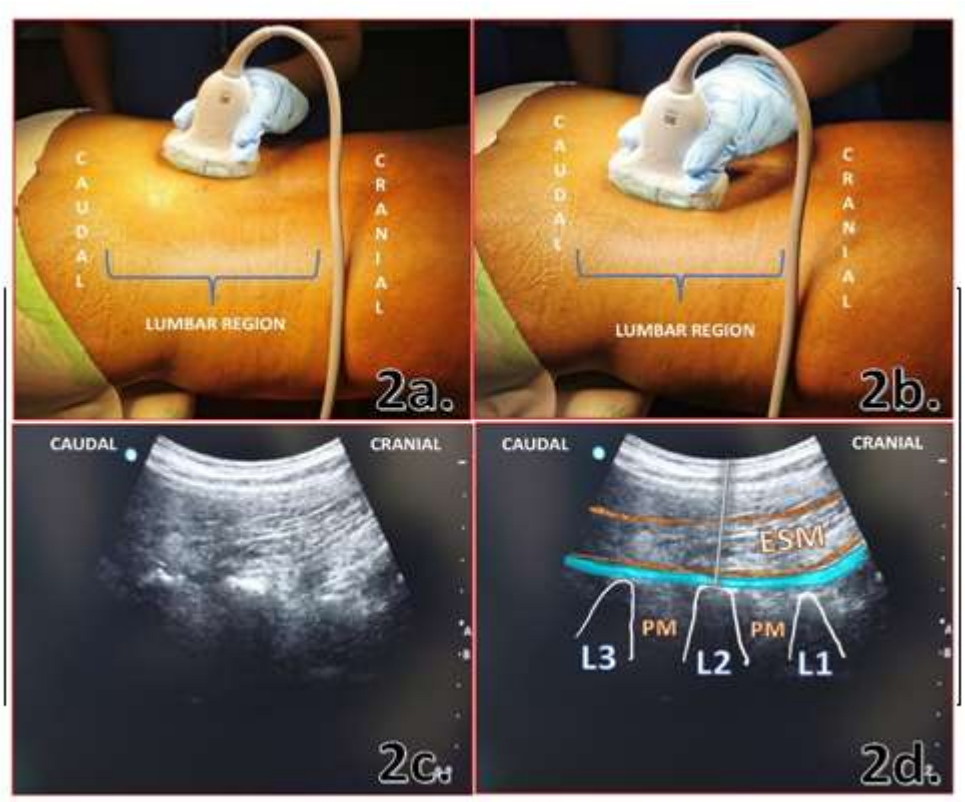


Fig. 2: Probe positions, sonoanatomy, and needle direction of erector spinae plane block
2a.,2b.: Probe positions for bilateral erector spinae plane block at the lumbar level
2c.,2d.: Sonoantomy and needle direction of lumbar erector spinae plane block
(ESM: Erector spinae muscle, PM: Psoas muscle, L1, L2, L3: Lumbar transverse processes, BlueColour: Drug spread below ESM, WhiteColor straight lines: Needle Directions)

Before the block, the patient had a pain score of 8/10 with NRS. The sensory block was assessed every five minutes using pinprick and cold sensation using a 3-point scale (2 = normal sensation, 1 = decreased sensation, 0 = no sensation) in the surgical dermatomal area (T12-L5). Ten minutes after the block, the pain score had decreased to 3/10 with NRS. Twenty minutes after the block, there was a complete loss of pinprick and cold sensation over the surgical site. The sensory block was rechecked by the surgeon using toothed forceps before the insertion of the trocars.The patient was comfortable throughout the procedure without any changes in the hemodynamic parameters and additional analgesics requirements.

Postoperatively, the patient was monitored in the postanesthesia care unit for 2 hours with a pain score of 2/10 with NRS. Her postoperative period was uneventful. She was discharged on postoperative day 1 with a pain score of 2/10 with NRS.

III. DISCUSSION:

Single-level vertebroplasty or kyphoplasty can be performed under either local anesthesia with sedation or general anesthesia (GA). For more than one level, GA is preferred to ensure patient comfort during a prolonged procedure in a prone position andreduce the risk of LA toxicity with larger volumes of drugs. Sedation is usually achieved with benzodiazepines, propofol target-controlled

infusions, or a combination of the two. Analgesia is an essential component of this procedure. The pain generating structures in this procedure include skin and subcutaneous tissue over the trocar insertion sites and the periosteum of the affected vertebrae. The passage of the trocar through the periosteum of the vertebral body is incredibly painful.The efficacy of intraosseous lidocaine in eliminating the pain of the periosteum during trocar insertion is the same asintravenous opiates and paracetamol. Alternatively,short-acting opiates such as alfentanil or fentanyl boluses, or remifentanil infusions can also be used.

For such a minimally invasive procedure, an ultrasound-guided bilateral ESP block was chosen as a plan of anesthesia over GA, considering the patient's old age and decreased functional reserve due to multiple comorbid conditions. Bilateral ESP block is one of the novel options to cover all innervation of the dermatome, myotome, and osteotome of the desired surgical field. Various kinds of literature have reported the use of bilateral ESP block leading to effective perioperative analgesia with decreased opioid requirements in the spine (cervical, thoracic, and lumbosacral) surgery. [3-10]Our case report focuses mainly on the anesthetic efficacy of this block.

The optimal concentration and volume of the LA needed to provide sufficient analgesia with ESP block are unknown. The exact mechanism of action and pattern of drug spread of the ESP block is also still unclear. However, it has been suggested to anesthetize the spinal nerves by passing through the costotransverse foramen of Cruveilhier, accompanying the dorsal ramus and artery to the paravertebral space.[1]Various studies have demonstrated that the drug spreadswidely in the craniocaudal, anterior-posterior, and lateral and medial planes, encompassing the paravertebral space, neural foramina, ipsilateral epidural space, and ipsilateral sympathetic chain.[11-15]

The dermatomal innervation of the back does not correspondprecisely with the respectivevertebral level.The skin over the L1 and L4 vertebral levels is supplied by the cutaneous branches of the posterior rami of T12-L2 and L3-L5 spinal segments, respectively.Similarly, the osteotome innervation of L1 and L4 is derived from the posterior rami of exiting nerve roots of the adjacent segments,i.e.,T12-L2 and L3-L5, respectively. Thus, the target spinal segment covering all innervations of the desired surgical field in this case is T12-L5. Assuming symmetrical cranial and caudal spread of the drug, the center point (level of L2) of this target segment was selected for bilateral ESP block. We chose to give this block using a two-injection approach. However,the bilateral ESP block can also be given using a single-injection approach over the spinous process of the central vertebrae and an advancing needles in medial-to-lateral directions on both sides.[16]

The success of bilateral ESP block depends on many factors like volume and concentration of LA , the spread of the drug, and experience of the anesthesiologist in selecting and locating the correct transverse process level. The fascia under the erector spinae muscle is multilayered, with at least three layers reported.[17] varied anatomy of the erector spinae muscles, and this fascia causes the inconsistent spread of the injected LA solution leading to chances of sparing of either the dermatome or osteotome. For such instances,supplementary infiltration should always be kept ready to avoid discomfort to the patient.

Bone cement implantation syndrome (BCIS) is one of the dreaded complications associated with such a procedure. The incidence of BCISis from 3% to 23% after vertebroplasty and kyphoplasty.[18]This patient with preexisting pulmonary hypertension is at a higher risk of developing right heart failure if BCIS happens. In contrast to GA,early symptoms of BCIS like dyspnoea and altered sensorium can be easily identified in a patient under regional anesthesia (RA).[19-20]This would be yet another advantage in doing this case only under RA. Avoiding GA also helps in reducing hemodynamic imbalance and thusnegating the need for invasive monitoring.

IV. CONCLUSION

This case illustrates the potential role of the ESP blockin patients undergoing vertebroplasty who are at high risk for GA to provide sufficient anesthesia/analgesia. The safety profile, simplicity to perform, negligible side-effect profile, and wide analgesia coverage make the ESP block a RA technique of choice in many surgeries. It can be considered a suitable alternative or adjunct to GA for vertebroplasty. However, further studies/case series are needed to assess the effectiveness of the ESP block for this new indication.

V. ACKNOWLEDGMENTS:

We thank Prof. Dr. S. Rajasekaran, Chairman of the Department of Orthopedics and Spine surgery, for sharing surgical information and radiological images.

Competing Interests:
The authors declare no conflicts of interest.

Funding:
The authors have no source of funding to declare for this manuscript.

REFERENCES:

[1]. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med. 2016;41(5):621–627. http://dx.doi.org/10.1097/AAP.0000000000000451.
[2]. Erector spinae plane block for pain relief in rib fractures, Hamilton, D.L. et al. British Journal of Anaesthesia, Volume 118, Issue 3, 474 – 475.
[3]. Melvin JP, Schrot RJ, Chu GM, Chin KJ. Low thoracic erector spinae plane block for perioperative analgesia in lumbosacral spine surgery: a case series. Can J Anaesth. 2018;65(9):1057–1065. doi:10.1007/s12630-018-1145-8.
[4]. Calandese F,AdduciA. Erector spinae plane block for acute postoperative pain management after anterior thoracolumbar spine surgery. J Clin Anesth. 2019;52:55–56. doi:10.1016/j.jclinane.2018.08.014.
[5]. Ueshima H, Otake H. Clinical experiences of ultrasound-guided erector spinae plane block for thoracic vertebra surgery. J Clin Anesth. 2017;38:137. doi:10.1016/j.jclinane.2016.12.028.
[6]. Ueshima H, Otake H. Blocking of multiple posterior branches of cervical nerves using an erector spinae plane block. J Clin Anesth. 2018;46:44. doi:10.1016/j.jclinane.2018.01.021.
[7]. Singh S, Chaudhary NK. Bilateral ultasound guided erector spinae plane block for postoperative pain management in lumbar spine surgery: a case series. J Neurosurg Anesthesiol [Internet]. 2018. doi:10.1097/ANA.0000000000000518.
[8]. Brandão J, Graça R, Sá M, Cardoso JM, Caramelo S, Correia C. Lumbar erector spinae plane block: successful control of acute pain after lumbar spine surgery - A clinical report. Rev Esp Anestesiol Reanim. 2018. doi:10.1016/j.redar.2018.10.005.
[9]. Cesur S, Yayik AM, Ozturk F, Ahiskalioglu A. Ultrasound-guided low thoracic erector spinae plane block for effective postoperative analgesia after lumbar surgery: report of five cases. Cureus. 2018;10 (11):e3603.
[10]. Chin KJ, Lewis S. Opioid-free analgesia for posterior spinal fusion surgery using erector spinae plane (Esp) blocks in a multimodal anesthetic regimen. Spine. 2018. doi:10.1097/BRS.0000000000002855.
[11]. Adhikary SD, Bernard S, Lopez H, Chin KJ. Erector spinae plane block versus retrolaminar block: a magnetic resonance imaging and anatomical study. Reg Anesth Pain Med 2018; 43: 756-62.
[12]. Vidal E, Giménez H, Forero M, Fajardo M. Erector spinae plane block: a cadaver study to determine its mechanism of action. Rev Esp Anestesiol Reanim 2018; 65: 514-9.
[13]. Schwartzmann A, Peng P, Maciel MA, Forero M. Mechanism of the erector spinae plane block: insights from a magnetic resonance imaging study. Can J Anaesth 2018; 65: 1165-6.
[14]. Yang H, Choi YJ, Kwon H, O J, Cho TH, Kim SH. Comparison of injectate spread and nerve involvement between retrolaminar and erector spinae plane blocks in the thoracic region: a cadaveric study. Anaesthesia 2018; 73: 1244–50.
[15]. Ivanusic J, Konishi Y, Barrington MJA. Cadaveric study investigating the mechanism of action of erector spinae blockade. Regional Anesthesia and Pain Medicine 2018; 43:567–71.
[16]. Yörükoğlu HU, Aksu C, Tor Kılıç C, Gürkan Y. Bilateral erector spinae plane block with single injection. J Clin Monit Comput. 2019. doi:10.1007/s10877-018-00247-y.
[17]. Elsharkawy H, Pawa A, Mariano ER. Interfascial plane blocks: back to basics. Reg Anesth Pain Med. 2018;43(4):341–346. doi:10.1097/AAP.0000000000000750.
[18]. Röllinghoff M, Siewe J, Eysel P, Delank KS. Pulmonary cement embolism after augmentation of pedicle screws with bone cement. Acta Orthop Belg 2010;76:269–73.
[19]. Edmonds CR, Barbut D, Hager D, Sharrock NE. Intraoperative cerebral arterial embolisation during total hip arthroplasty. Anesthesiology 2000; 93: 315–8.
[20]. Duncan JAT. Intra-operative collapse or death related to the use of acrylic cement in hip surgery. Anaesthesia 1989; 44: 149–53.

FIGURE LEGENDS:

Fig. 1: Radiological images and surgical field of vertebroplasty

1a.: X-ray showing collapse of L1 and L4 vertebral body

1b.: Radiological images of vertebroplasty after cement placement
1c.: Surgical field showing four trocars and attached cement syringes

Fig. 2: Probe positions, sonoanatomy, and needle direction of erector spinae plane block
2a.,2b.: Probe positions for bilateral erector spinae plane block at the lumbar level
2c.,2d.: Sonoantomy and needle direction of lumbar erector spinae plane block
(**ESM**: Erector spinae muscle, **PM**: Psoas muscle, **L1, L2, L3:** Lumbar transverse processes, **BlueColour**: Drug spread below ESM, **WhiteColor straight lines**: Needle Directions)

CONTRIBUTORSHIP STATEMENT:

K.S.: This author helped in designing and implementing the strategy for this novel indication of the ESP block. Involved in reference collection and sorting work with the help of HD. Designed manuscript content and co-wrote the paper. Took the lead in manuscript writing. Also, provided clinical images and scientific illustrations required for the manuscript.

J.B.: This author helped in approving ideas by KS and providing scientific guidance for manuscript writing. Guided the content of the manuscript and Co-wrote the paper. Approved final version of the manuscript.

H.D.: This author helped in writing the case description and information collection required for the manuscript writing. Co-wrote and proofread the manuscript.

All authors provided critical feedback and helped shape the manuscript.