



Unilateral, Multi-Level Paravertebral Thoracic Nerve Block for DBS Battery Exchange in a Patient with Pulmonary Hypertension

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Introduction

- Paravertebral nerve blocks are an established regional technique often used as an adjunct to general anesthesia for post-operative pain; here we describe an instance where it was used as the primary anesthetic technique.
- Pulmonary hypertension presents significant anesthetic challenges, increasing morbidity and mortality during surgery under general anesthesia
- Complications include right heart failure, arrhythmias, respiratory instability, and possibly death. (1)

Patient Presentation

- 77 y/o (172.2 cm, 114 kg, BMI 38) M with PMH pertinent for Parkinson's disease, chronic atrial fibrillation, coronary artery disease, and hypertension presenting for a DBS battery exchange implanted under the skin the upper left chest.
- METs > 4
- Pre-operative TTE demonstrated tricuspid regurgitant velocity of 403.3 cm/s. Estimated pulmonary systolic pressure (PASP) of 80 mmHg
 - Calculated using simplified Bernoulli's equation: $(\Delta P = 4 * TRV_{max}^2)$. (2)

Hospital / Intra-Op Course

- Patient presented to first day surgery without complication; withheld all medications/vitamins as requested, and NPO since 2000 the previous night.
- Vitals and access were obtained. BP 154/62, HR 70s, irregularly irregular rhythm.
- Patient given fentanyl 50 mcg and midazolam 2 mg prior to the paravertebral block.
- Given additional ketamine 12.5 mg intraoperatively.
- Regional technique provided adequate anesthesia, allowing the patient to maintain spontaneous ventilation and stable cardiovascular parameters; no intraoperative complications occurred.

Intervention

- Paravertebral space is delineated anterolaterally by parietal pleural, posteriorly by the costotransverse ligament, medially by the vertebrae, and intervertebral foramina, inferior and superior by the ribs. (3)
- Using a linear US probe in the sagittal orientation the left paravertebral spaces at T1-T2, T2-T3, and T3-T4 were identified.
- A 22-gauge, 5.0 cm needle (Pajunk SonoPlex II) needle was inserted using an out of plane US guidance technique.
- Small, intermittent injections of sterile saline were used to identify needle depth during advancement until the pleura was observed being pushed away from the costotransverse ligament.
- 30 mL of 0.5% bupivacaine-epinephrine mixture (10 mL at each level) was injected under US visualization.
- Sensory blockade was confirmed using a pinprick test prior to incision.

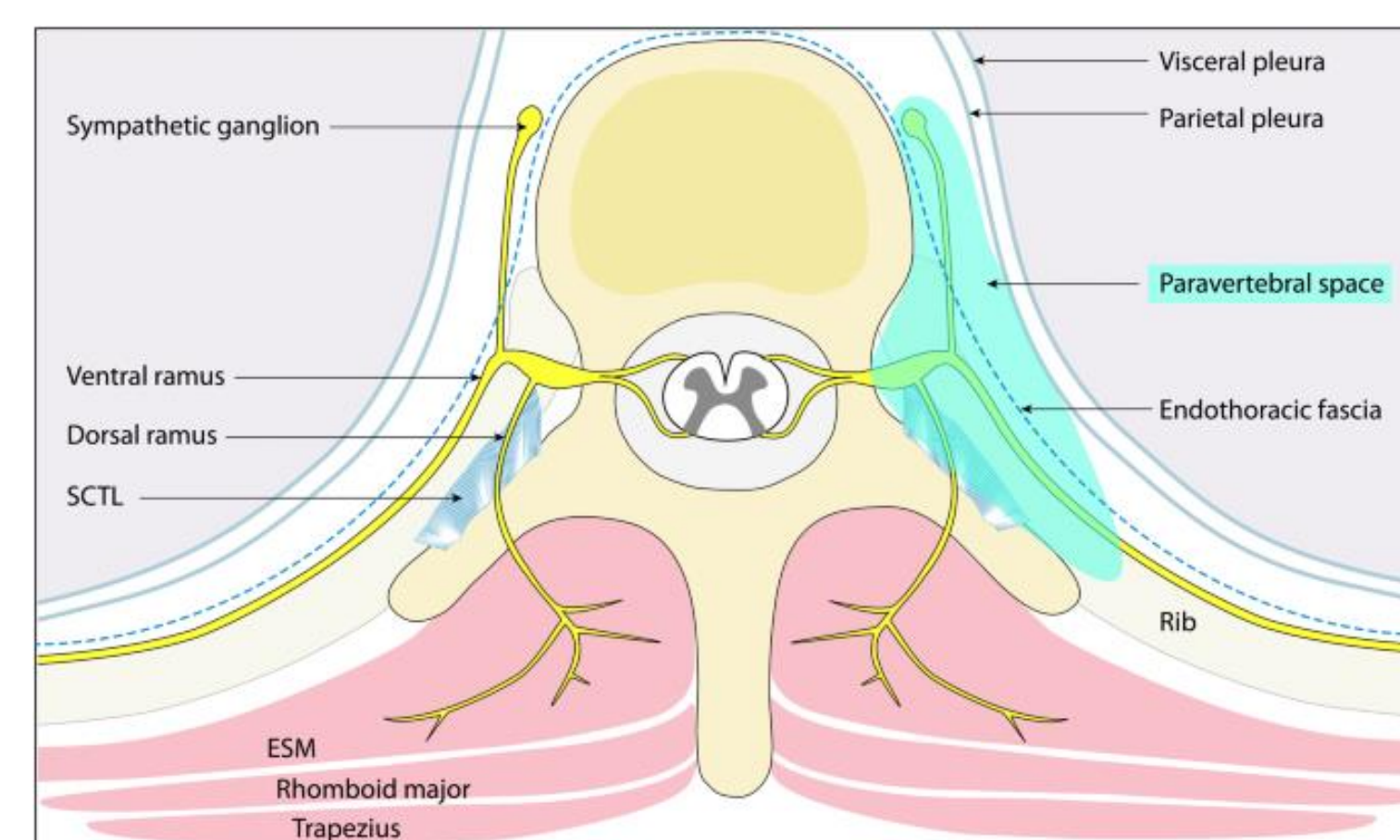


Figure 1. Diagram of the cross-section of a thoracic vertebrae demonstrating key anatomic structures relevant to a thoracic paravertebral block. (3)

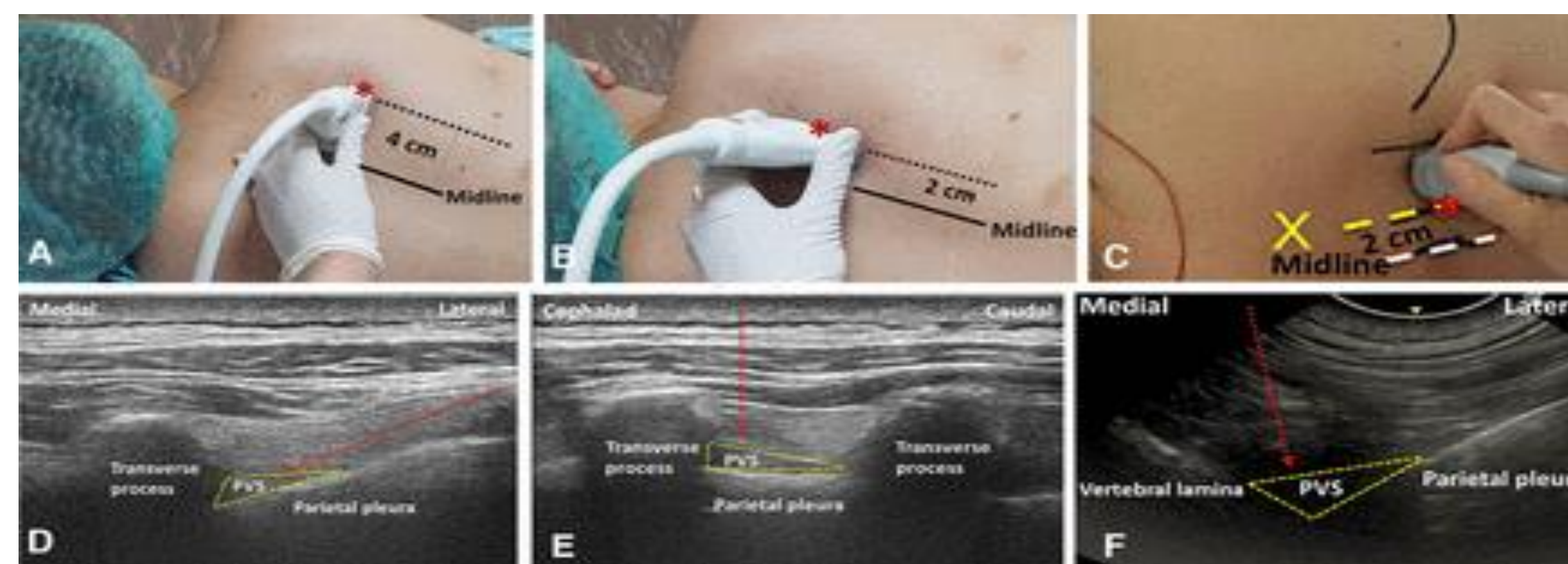


Figure 2. Anatomical landmark and transducer position of intercostal transverse in plane (A), transverse process out-of-plane (B), and paralaminar in-plane (C) approaches. D, E, and F represent sonogram of thoracic paravertebral space and direction of needle insertion respective of the approaches. (4)

Discussion

- Imperative to select a technique optimizing the avoidance of exacerbating factors of pulmonary hypertension, including hypercapnia, hypoxemia, acidosis and hemodynamic effects of positive pressure ventilation.
- This regional technique provided excellent pain management, preserved hemodynamic stability, minimized opioid use, thereby reducing the risk of respiratory depression.

Learning Points

- Unilateral, multi-level paravertebral thoracic nerve blocks should be considered as the primary anesthetic technique in patients with pulmonary hypertension undergoing DBS battery exchange; especially when the pocket is above the left chest.
- Post-operative analgesia was provided with this block.
- It must be noted; however, patient was inherently nervous about the procedure and required some intraoperative dissociation in the form of low dose ketamine.
- Importance of individualized anesthetic strategies in patients with complex medical conditions to improve surgical outcomes and minimize perioperative risks.

References

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