

Optimizing Ventilation and Pain Management: Paravertebral Block for Rib Fractures During Deep Brain Stimulator Insertion

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Introduction

- Awake deep brain stimulation (DBS) surgery presents unique challenges for anesthesiologists.
- It involves delicate manipulation of the brain, requiring micro- and macrostimulation with neurological testing¹.
- Thus, patients must be conscious yet comfortable enough to endure the pain of surgical manipulation.
- This is often accomplished with a combination of anesthetic techniques and requires optimal ventilation.
- This case highlights the use of a paravertebral block (PVB) to manage subacute rib fracture pain during DBS insertion, optimizing ventilation and comfort.
- To our knowledge, there have been no other reports of similar cases.

Case

- 74-year-old male with a history of asthma, Parkinson's Disease, and a mechanical fall 10 days prior found to have 6th and 8-10th anterolateral and lateral rib fractures, who presented for DBS insertion.
- On initial physical exam, the patient had no discomfort at resting tidal volumes or dyspnea on exertion, but experienced pain with deep breaths and tenderness to palpation of the right chest. Breath sounds were clear.
- Baseline oxygen saturation was 99% and EtCO₂ 36.
- Airway exam unremarkable, Mallampati score was 2.
- PVBs at levels T6, T8, and T10 were performed with ultrasound guidance. 75mg of 0.25% bupivacaine and 4mg dexamethasone were injected in aliquots amongst the three levels with negative aspiration.
- The patient reported decreased pain deep breaths and palpation immediately.
- He was repositioned in a semi-sitting position, oxygenated via nasal cannula, and sedated with propofol and remifentanyl infusions during head frame pinning and surgical exposure.
- Sedation was discontinued when neurological function was tested.
- His ventilation remained adequate with no reports of chest pain.
- Oxygen saturation was maintained at 93-99% and EtCO₂ below 31 (Fig. 2).

Methods

- Patient informed consent was obtained. As the case report is devoid of patient identifiable information, it is exempt from IRB review requirements as per University Hospital policy.

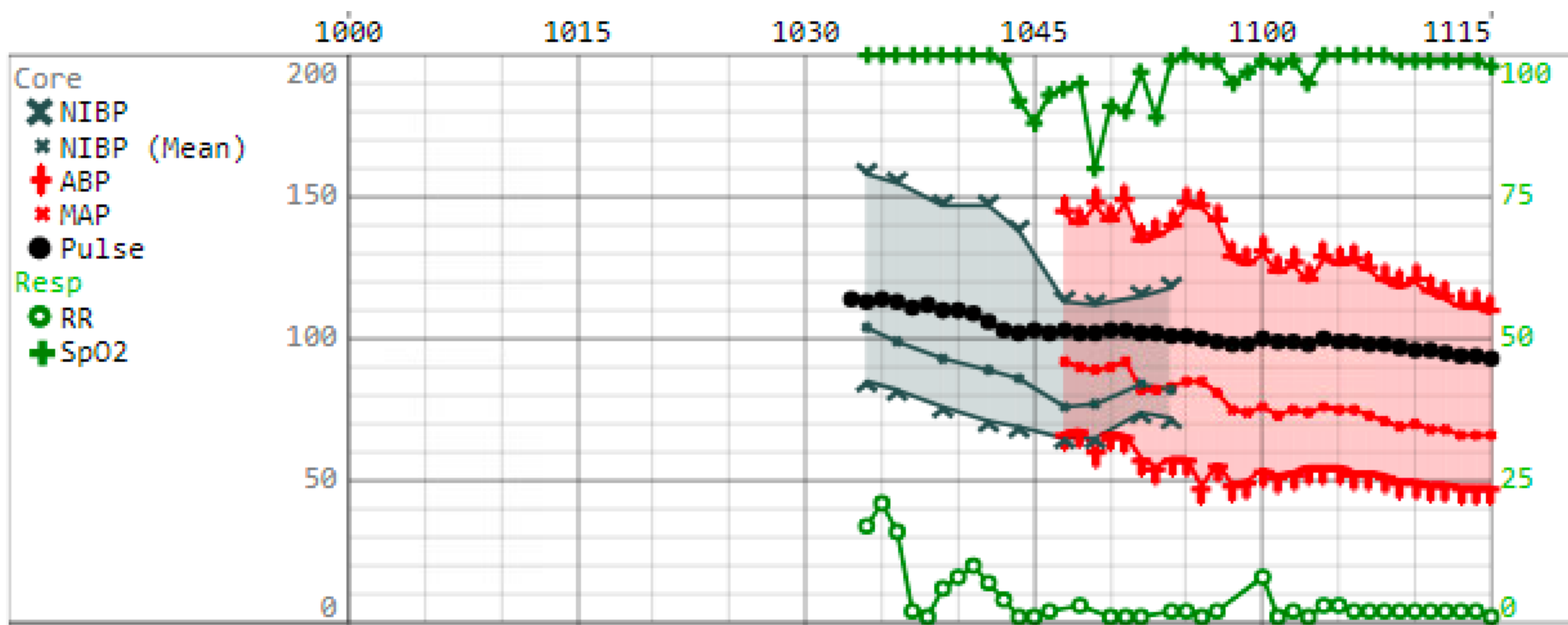


Figure 1: Vitals timeline during preoperative block and induction

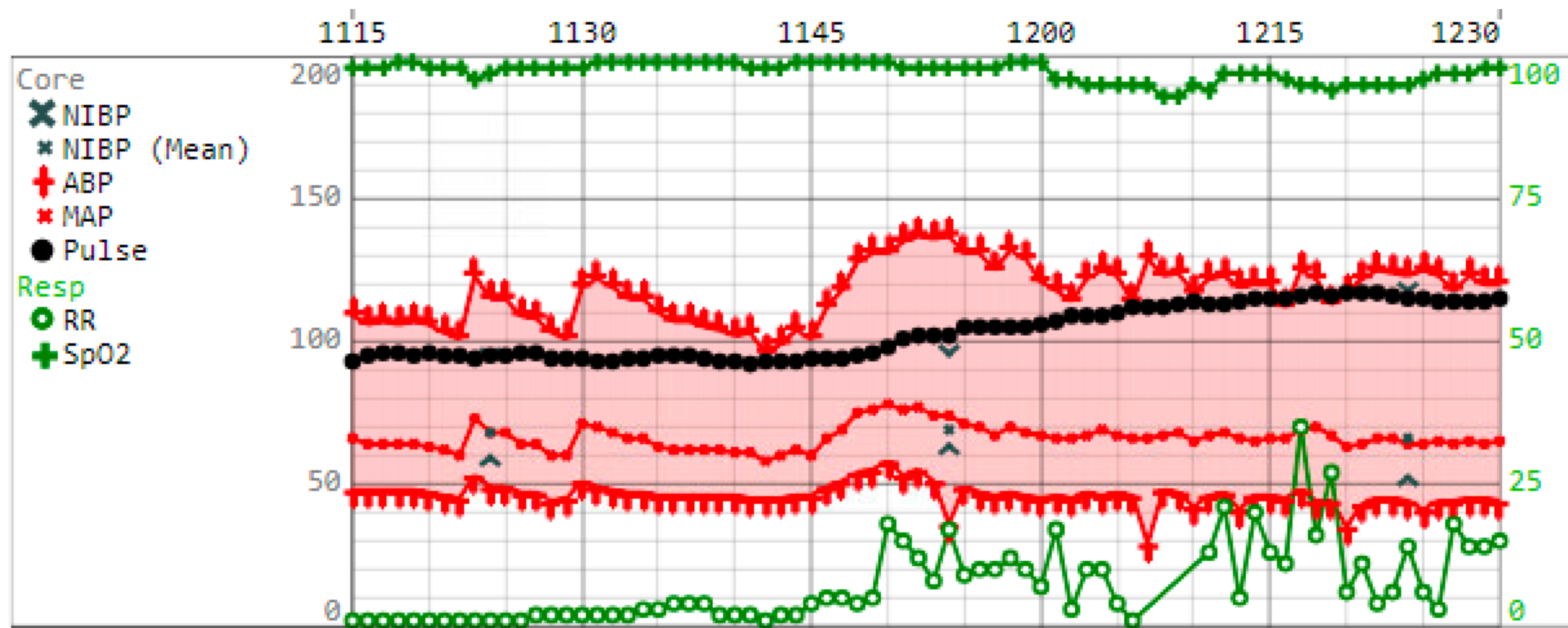


Figure 2: Intraoperative vital signs for the remainder of the case

Discussion

- This case report demonstrates the efficacy of using regional anesthesia to provide rib fracture analgesia during DBS insertion to optimize respiratory status.
- Uncontrolled pain from rib fractures leads to low tidal volumes, atelectasis, hypercarbia induced increased intracranial pressure, and respiratory failure².
- These can be devastating during DBS insertion where there is limited access to the airway.
- Other widely used techniques for managing rib fractures include thoracic epidurals (TEA) and erector spinae plane (ESP) blocks.
- One study demonstrated similar pain control amongst TEA, ESP, and PVB. However, TEA was associated with a higher incidence of hypotension³.
- ESP blocks have become increasingly popular, with multiple studies highlighting their effectiveness and similarity to PVBs in managing 24-hour pain scores following rib fractures⁴.
- In addition, several other cases have shown that serratus anterior blocks offer excellent analgesia for anterolateral, lateral, and posterior rib fractures, making them ideal for patients who can only tolerate supine positioning⁵.
- Evidently, there is a wide range of regional techniques available for rib fracture pain management. Further exploration of their use in awake neurosurgical settings is warranted, particularly in urgent cases where ventilation may be compromised.

References

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