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Erector Spinae Plane Blocks with Dexmedetomidine and Dexamethasone for the Treatment of Pain Associated with Rib Fractures: Case Report

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Background: The erector spinae plane block (ESPB) is an ultrasound-guided approach for acute pain management in patients with single or multiple rib fractures. The addition of a dexmedetomidine and dexamethasone (Dex-Dex) solution to an ESPB injection has been shown to provide longer-lasting pain control in rib-fracture patients. Adding a Dex-Dex adjunct to an ESPB injection diminishes the need for more invasive techniques used in longer-lasting pain management, such as ESPB catheter placements.

Case Report: We present 2 cases of rib fractures, one in a 79-year-old woman and the other in an 82-year-old-man. Both patients received a single ESPB injection with Dex-Dex to provide longer-lasting pain control. After the procedure, both patients reported a significant reduction in pain and no complications to the intervention.

Conclusion: The successful analgesic management of both patients' conditions suggests that a single ESPB injection with Dex-Dex can be used as an alternative to traditional management techniques such as catheter placements.

Key words: Erector spinae plane block, dexmedetomidine and dexamethasone, rib fractures, respiratory distress

BACKGROUND

Chest trauma can induce a fracture in one or more ribs, resulting in pain and respiratory insufficiency (1). Reduced inspiration may provoke respiratory distress or, in serious cases, acute respiratory failure, hypoxemia, or pneumonia (2). Perioperative pain levels are also associated with increased morbidity and mortality (3). Compromised respiratory and pulmonary functions and perioperative pain levels cause increased hospital stays and worsened surgical outcomes and may increase patients' risk of developing chronic pain syndromes if effective interventions are not provided (4). Adequate analgesics are crucial in helping to prevent complications associated with rib fractures.

Traditionally, erector spinae plane blocks (ESPBs) are used to control pain in patients presenting with single or multiple rib fractures. The ESPB can be administered as a single injection for short-term pain relief or through epidural catheters with continuous local anesthetics for longer relief. The ESPB injection is a novel, ultrasound-guided approach for acute pain management in patients with rib fractures. The injection has been shown to improve pain relief in patients, increase inhalation

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and movement, and decrease discomfort (5). However, the 2 anesthetics commonly used in this block, ropivacaine and bupivacaine, do not provide pain relief for very long. While catheter placements can be used to provide longer pain relief, they limit patients' mobility and increase their risk of infection (6). An emerging approach that has received limited documentation in the current literature consists of adding a combination of dexmedetomidine and dexamethasone (Dex-Dex) to local anesthetics to provide a synergistic effect and longer-lasting pain control. Prolonging the analgesic effects of ESPB injections reduces the need for more invasive pain management techniques like catheters as well as the consumption of opioids. Furthermore, the opioid use epidemic is a rising concern, so opioid-sparing methods of pain management are of increasing importance.

In this report, we discuss a modification in which a preservative-free Dex-Dex solution was added to a single ESPB injection to provide longer-lasting pain control for 2 patients presenting with multiple rib fractures. The findings allow us to contribute to the present literature on this emerging technique and provide further insight into its potential efficacy.

CASE PRESENTATION 1

A 79-year-old woman (Patient One) presented at the Bon Secours Mercy Emergency Department with injuries due to a fall from a standing position. During her initial physical examination, the patient was found to have hypertension and right-sided rib fractures from T6 to T12. She experienced pain localized around the region of the rib fracture, along the midaxillary line, and radiating to the front and back during breathing. The patient was admitted to the intensive care unit (ICU) for respiratory distress. Initially, during admission, she received patient-controlled analgesia with morphine. However, due to concerns regarding respiratory depression, the Department of Anesthesiology was consulted for alternative pain management measures.

Subsequently, the proposed treatment consisted of placing an ESPB with 10 mL of Dex-Dex solution at the level of T7 and 10 mL at T9. The patient was placed in a lateral position at the bedside. With sterile technique and ultrasound guidance, a single shot of the ESPB was administered at every 3 transverse processes until all the dermatomes corresponding to the rib fractures were treated (Fig. 1). Using a high-frequency linear ultrasound probe, the block was administered by an in-plane technique using a 4 cm 21-gauge needle that was advanced through the erector spinae muscles just before reaching the transverse process (Fig. 1). The needle placement was confirmed by hydrodissection. One injection of 20 mL of 0.2% ropivacaine mixed with 5 mg of preservative-free dexamethasone and 25 mcg of dexmedetomidine was delivered into the interfacial plane beneath the erector spinae muscles and above the transverse process of the vertebrae.

After the ESPB intervention, the patient reported that her pain score was reduced from an 8/10 to a 4/10. During a subsequent physical examination, once the ESPB was administered, the patient was able to achieve full inspiratory effort and did not show signs of respiratory distress. After 2 to 3 days of pain relief, the patient was transferred to a step-down unit where her pain was managed with oxycodone, acetaminophen, and lidocaine patches until she was discharged.

CASE PRESENTATION 2

Similarly, an 82-year-old Caucasian man (Patient 2) presented at the Bon Secours Emergency Department with injuries caused by a fall from a standing position. The patient's medical history was significant for dementia and hypertension. He had left-sided rib fractures from T4 to T9. He was seen in the emergency department and received patient-controlled analgesia with morphine. However, due to the onset of respiratory distress, he was admitted to the ICU. As an alternative method of pain management, the patient received an ESPB injection with 10 mL of Dex-Dex at the level of T5 and 10 mL at T7. The patient was placed in a lateral position at the bedside. With sterile technique and ultrasound guidance, a single-shot ESPB was administered at every 3 transverse processes until all the dermatomes corresponding to the rib fractures were treated.

Like Patient One, Patient 2 reported positive improvement in his pain relief and a reduced pain score, which in this case went from 10/10 to 5/10. His reduction in pain lasted around 3 days. When the pain at the patient's fracture site resolved, he was examined. The patient was able to achieve full inspiratory effort and did not experience respiratory distress. Afterward, he was transferred to a step-down unit and treated with oxycodone, acetaminophen, and lidocaine patches.

DISCUSSION

The ESPB injection offers a successful intervention

for acute pain management in patients with single or multiple rib fractures while avoiding risks associated with more traditional interventions such as catheters for extended analgesia and opioids. Based on the observed improvements in both patients' pain levels and respiration, administering a single-shot ESPB with a Dex-Dex solution is a valid technique for improving the analgesic outcomes of treating trauma that has resulted in multiple rib fractures.

Previous studies have shown this novel intervention can reduce opioid consumption and the potential length of hospital stays as well as promote a synergistic effect of introducing adjuncts to regional anesthesia (7,8). Regional blocks may benefit elderly patients and those with compromised pulmonary function. In addition, regional blocks have been shown to provide superior analgesia when there is an increase in the severity of rib fractures (9).

However, despite the synergistic effect of Dex-Dex in improving analgesia, certain risks like bradycardia or hypotension can occur with the use of ESPBs (10). Ultrasound-guided blocks like the ESPB have also been characterized as having less feasibility or use in patients with compromised positioning and multisystemic trauma (10).

CONCLUSIONS

In conclusion, the ESPB with Dex-Dex administered via the single-injection technique appears to be a safe and effective way to provide adequate pain control while avoiding the risks associated with opioids and more invasive regional anesthesia techniques. This observation is further supported by the method's ability to reduce pain levels in elderly patients with multiple rib fractures, preserve adequate respiration, and improve inspiratory capacity. Based on its synergistic effects and promotion of reduced hospital stays, the single-shot ESPB with Dex-Dex may be deemed a highly effective treatment.

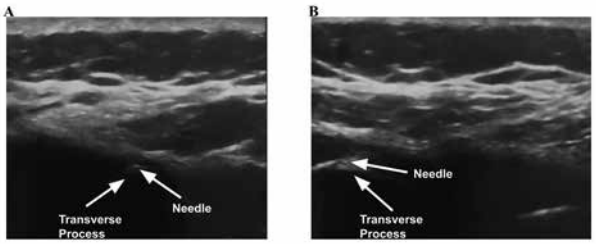

Fig. 1. Ultrasound imaging of the erector spinae plane block on T7 and T11 in 79-year-old woman (Patient 1). Injectant spread can be observed in the fascial plane near the transverse process. (A) Level at T7. (B) Level at T11.

Patient Perspectives

Consent was obtained from both patients, and they were spoken to extensively about the ESPBs with Dex-Dex. Both patients expressed satisfaction and claimed the nerve blocks were very helpful in providing significant comfort for the days the blocks lasted. As the blocks began to wear off, the patients reported that the pain was not nearly as bad as the initial presentation.

Author Contributions

Jonathan Eskander contributed to the conceptualization and writing and editing of the drafts. Sagar Patel contributed to writing the original draft, reviewing and editing, and visualization. Courtney Tran contributed to writing, reviewing, and editing the original draft. Sarah Stevens also contributed to writing, reviewing, and editing the original draft. Carly Liquori contributed to writing, reviewing, and editing the first draft.

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