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Case Report

Continuous erector spinae plane block for acute pain control in chest wall reconstruction of extensive traumatic degloving injury

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Introduction

Acute pain management after polytrauma is challenging due to the complex and dynamic nature of pain from multiple injuries. Pain is often a combination of somatic, neuropathic and post-surgical pain and can fluctuate in severity over time because of the need for staged surgical procedures. Poorly controlled traumatic pain can lead to post-traumatic stress disorder, phantom pain, chronic pain and opioid dependence. In all thoracic injuries, treating pain should be prioritized to improve respiratory mechanics. The Eastern Association for the Surgery of Trauma and the Trauma Anesthesiology Society both recommend thoracic epidural analgesia (TEA) for injuries involving the chest wall [1]. However, the use of TEA in the trauma setting is often limited by a dynamic coagulation status, the potential for ongoing resuscitation, and hypotension from sympathectomy. As a result, anesthesiologists have explored alternative regional anesthetic techniques to TEA. We report a case in which bilateral continuous thoracic Erector Spinae Plane Blocks (ESPB) successfully treated severe acute pain from an extensive chest wall degloving injury with traumatic amputation of the left breast requiring reconstruction with a latissimus dorsi flap.

Case report

A 20-year-old female sustained a degloving injury of the anterior chest wall after a motor vehicle accident in which she was a restrained rear seat passenger. The collision resulted in traumatic amputation of the left breast tissue, complete disruption of the left pectoralis muscle, partial disruption of the left pectoralis minor muscle, a 40 × 20 × 6 cm soft tissue defect, open fractures of both the

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manubrium and left clavicle and minimally displaced bilateral first rib fractures without violation of the thoracic cavity (Image 1). Concomitant injuries included sacral and pelvic rami fractures. Soft tissue reconstruction was performed using a pedicled left latissimus dorsi musculocutaneous flap and split thickness skin graft (Image 2). The acute pain service was consulted to aid in the management of uncontrolled pain despite escalation of opioid and non-opioid analgesics. TEA was relatively contraindicated due to the potential for bacteremia and need for prophylactic anticoagulation. Bilateral ultrasound-guided ESPB catheters were placed at the left second and right fourth thoracic vertebral level. Using a high-frequency linear ultrasound (HFL50xp 15–6 MHz) the left second thoracic transverse process (TP) was visualized in short-axis (Image 3). An 18-gauge blunt tip echogenic needle (B-Braun) was advanced in-plane until it was positioned between the erector spinae muscles and the transverse process. Following a 20 mL bolus of 0.25% bupivacaine, a 20-gauge catheter was inserted. Satisfactory placement of the catheter tip was confirmed by injection of agitated saline through the catheter under ultrasound visualization. The same procedure was performed at the fourth thoracic level on the right side. A continuous infusion of 0.2% ropivacaine was initiated at 10 mL/h per side. For the rest of her hospital stay, she had an 87.9% decrease in mean daily opioid use (186.5 MME vs. 22.5 MME) following ESPB catheter placement. Numeric pain scores were also reduced by half with a daily range of 7–10/10 pre-block to 0–4/10 post block. The patient was able to participate in physical and occupational therapy. Over the course of her hospital stay, she returned to the operating room for 12 chest wall surgeries. The ESPB catheters provided analgesia for a total of 15 days. To minimize risk of infection, the catheters were replaced 7 days after initial placement. She was discharged from the hospital on POD 34 with gabapentin and tramadol as needed for pain. At one-year follow-up, the patient reported no chronic chest wall pain or phantom breast pain.

Discussion

The ESPB was first described by Forero et al. in 2016 for the treatment of chronic post-thoracotomy pain [2]. Analgesia is achieved by depositing local anesthetic into the fascial plane deep to the erector spinae muscle and superficial to the vertebral transverse process. Local anesthetic spreads within this plane in a craniocaudal fashion and is presumed to cause a volume-dependent segmental blockade of dorsal and ventral rami of thoracic spinal nerves in a pattern similar to TEA by diffusing into the corresponding

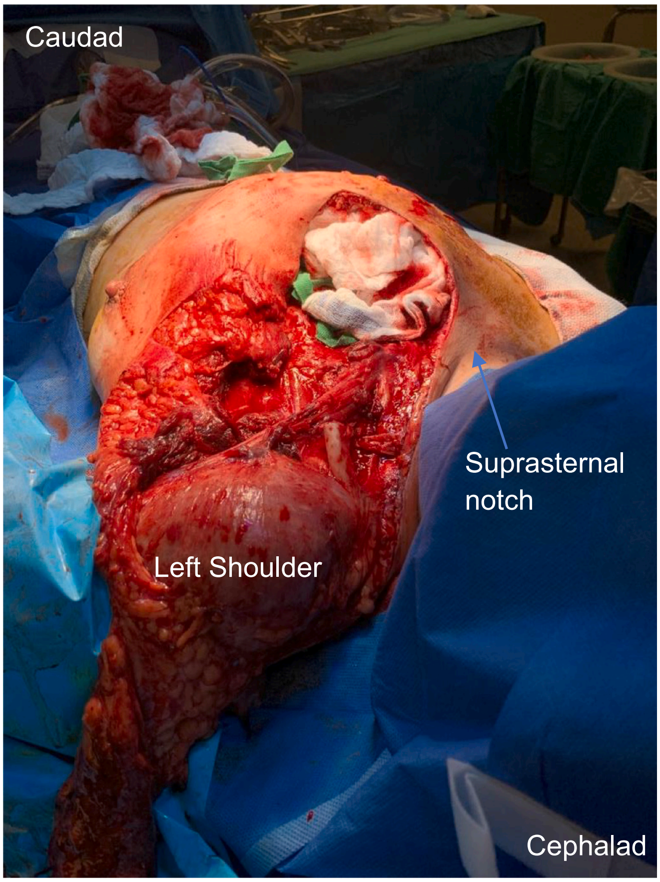

Image 1. Intraoperative image showing the extent of patient's degloving injury upon arrival to the operating room. A 40 × 20 × 6 cm soft tissue defect and a left open clavicular fracture can be appreciated. There is complete disruption of the left breast tissue and left pectoralis major muscle with partial disruption of left pectoralis minor muscle.

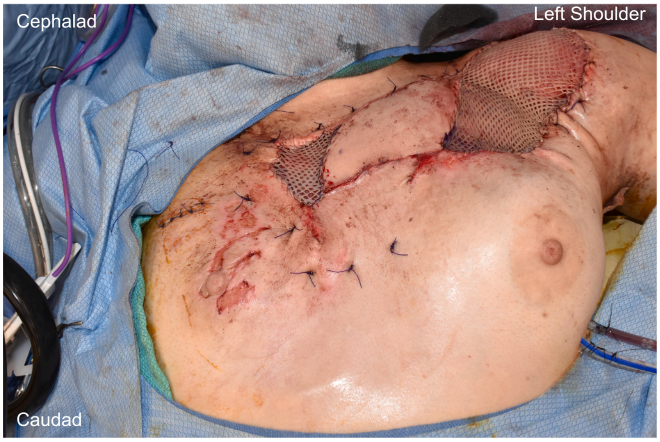

Image 2. Intraoperative image after placement of latissimus dorsi flap.

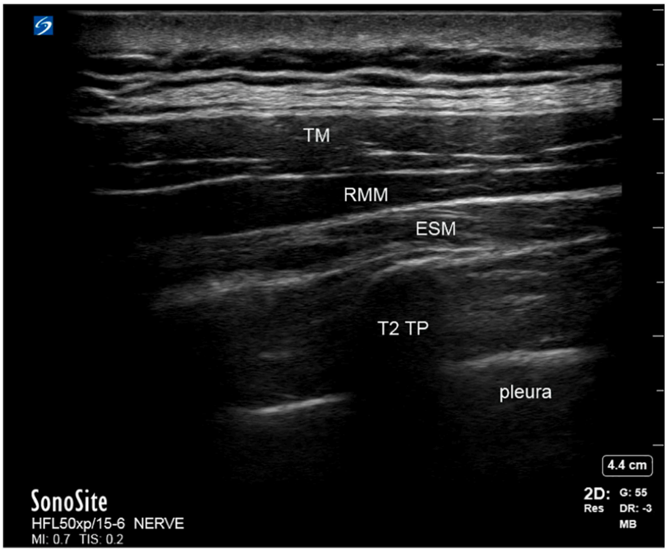

Image 3. Ultrasound image of a T2 Thoracic Erector Spinae Plane Block.
The three muscle layers TM, RMM, and ESM can be seen overlying the T2 TP. LA spread is seen in between the ESM and T2 TP.
Abbreviations: ESM, erector spinae muscle; LA, local anesthetic; RMM, rhomboid major muscle; TM, trapezius muscle; TP, transverse process.

paravertebral spaces [3]. To date, there has only been one randomized controlled trial (RCT) comparing ESPB to TEA for thoracic post-operative pain [4]. A systematic review included this RCT plus 3 others comparing ESPB to opioids, and deemed ESPB a safe alternative which may be as effective as TEA in controlling pain, although more studies are needed [3].

Despite the potential for superior pain control from TEA, there are many obstacles for TEA placement in patients with complex polytrauma. Trauma patients can have a dynamic coagulation profile due to ongoing blood loss, resuscitation, and the need for uninterrupted prophylactic or therapeutic systemic anticoagulation, which complicates TEA management. Anticoagulated patients are at risk of hematoma formation in the neuraxial space. To date, no hematologic complications have been reported after ESPB [3].

Duration of high intensity pain must be taken into consideration when choosing regional anesthesia techniques. In this patient who presented with grossly contaminated wounds requiring multiple surgical interventions, we chose a catheter that could be left in place for an extended period of time while minimizing the risk of a devastating neurologic complication secondary to infection. Abscess formation superficial to the transverse process from an ESPB catheter would be far less life-threatening than an epidural abscess from TEA.

Sympathectomy has been shown to improve tissue oxygenation and wound healing, however results in hypotension and may require vasopressor therapy. In trauma patients, fluctuations in intravascular volume can put them at higher risk of hypotension from TEA. It is controversial whether ESPB generates a sympathectomy. Most cadaveric studies describing the spread of injectate after ESP block do not show spread to the paravertebral space where the sympathetic chain lies, however, Bang et al. successfully used ESPB as an alternative to direct sympathetic blockade in the treatment of complex regional pain syndrome of the upper extremity [3,5]. In addition, side effects following ESPB which would imply that a sympathectomy had occurred, such as Horner's syndrome and Harlequin syndrome, have been reported after high thoracic ESPB [6]. Interestingly, ESPB has never been reported to cause hypotension [3]. Thus, ESPB potentially provides benefits of sympathectomy without concomitant hypotension.

Phantom breast syndrome has been reported in patients following mastectomy with an incidence ranging from 30 to 80% [7]. In general, the incidence of phantom pain is higher in traumatic amputations. Well-established risk factors for developing phantom breast pain are poorly treated severe acute pain and higher doses of opioid use after surgery [7]. We deemed our patient high risk for developing phantom pain after her traumatic mastectomy. Thus, adequate pain control from an opioid sparing analgesic regimen was key to prevent downstream chronic pain syndromes.

Conclusion

This case highlights the complexity of acute pain management in thoracic and chest wall trauma, and the challenges of incorporating what is considered a gold standard analgesic technique. The clinical effectiveness of ESP catheters for severe acute pain following extensive thoracic soft tissue trauma is demonstrated in this case report. Further studies are needed to elucidate the clinical efficacy and safety of ESPB over other regional techniques for analgesia of the chest wall, as well as the optimal volume and concentration of injectate. ESPB is a viable alternative to TEA for treating acute pain due to major soft tissue deformities of the chest wall.

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