

# Ultrasound-guided clavipectoral fascial plane block for clavicle fracture in a 40-year-old male: a case report on pain management

## Abstract

The clavipectoral fascial plane block (CPB) is an excellent alternative to general anesthesia techniques given its efficacy and ease of performance and administration. Our case highlights a 40-year-old male involved in a motor vehicle accident that resulted in polytrauma. The patient underwent an open reduction and internal fixation for a displaced fracture in the mid-portion of the right clavicle. CPB was performed pre-operatively to mitigate post-operative clavicle pain. In this case, we report that CPB is a safe and simple regional anesthesia technique that can replace other approaches, such as the interscalene block and superficial cervical plexus block, due to its lack of adverse events such as ipsilateral phrenic nerve palsy, Horner's syndrome, and motor block of the upper limb.

**Keywords:** regional anesthesia, anesthesiology, nerve block, clavicular surgery, analgesia

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## Introduction

Clavicle fractures represent a significant portion of orthopedic injuries.<sup>1</sup> They are the most common injury of the shoulder girdle, often resulting from indirect or direct trauma to the shoulder.<sup>2</sup> Recent literature advocates for surgical intervention due to its potential for improved postoperative outcomes compared to traditional non-surgical approaches.<sup>2</sup> Traditional clavicle surgeries often rely on general anaesthesia; however, regional anesthesia techniques are gaining traction for their associated benefits, including improved postoperative analgesia, lower instances of postoperative nausea and vomiting, reduced hemodynamic instability, and faster recovery times.<sup>1</sup> Despite these advantages, debates persist regarding the optimal regional anesthesia approach, given the complex and variable innervation of the clavicle.<sup>3</sup>

The clavicle has a complex and variable innervation that has generated controversy regarding the optimal regional anesthetic technique for reducing pain associated with clavicle fractures.<sup>4</sup> Often ascribed to either the cervical or brachial plexus, the innervation of the clavicle remains a subject of ongoing discussion.<sup>5</sup> It is well understood that the supraclavicular nerve originates from the superficial cervical plexus and innervates the skin overlying the clavicle, yet there is limited evidence and consensus regarding the innervation of the bone itself. Some sources suggest that the supraclavicular nerve also supplies the clavicle yet others convey that the sensory innervation is delivered by the brachial plexus, which includes the long thoracic, subclavian, and suprascapular nerves.<sup>5</sup> As a result, various regional anesthesia techniques, such as superficial cervical plexus block and interscalene block (and sometimes a combination of both), have been utilized in clavicular surgery. However, performing separate ultrasound-guided injections can require a significant amount of time, and brachial plexus blocks are associated with adverse events like

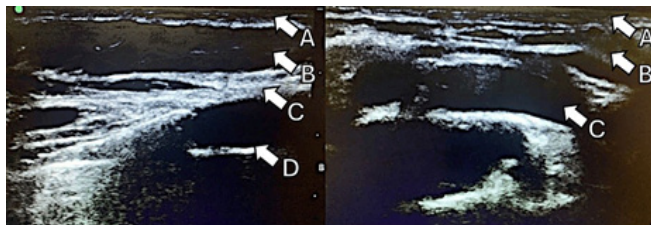
phrenic nerve palsy, recurrent laryngeal nerve block, and Horner's syndrome, among others.<sup>4</sup> Thus, focus has been redirected to the clavipectoral fascial plane block as a simpler option.<sup>6</sup>

The clavipectoral plane block (CPB) has emerged as an attractive alternative to standard regional anesthesia techniques due to its relative ease in performance, reinforced safety, and ability to reduce pain following clavicle repairs.<sup>4</sup> It is thought to provide analgesia by blocking the branches of the lateral pectoral, long thoracic, subclavian and suprascapular nerve. The CPB works by inducing a field block around the clavicle, targeting all of the neural structures involved in its innervation.<sup>6</sup> First introduced by Dr. Luis Valdés in 2017, this technique has seen recurrent implementation in clinical practice.<sup>7</sup> We present a case report of a 40-year-old male involved in a motor vehicle accident who received preoperative CPB for clavicular surgery, adding to the growing amount of evidence endorsing this technique.<sup>8</sup>

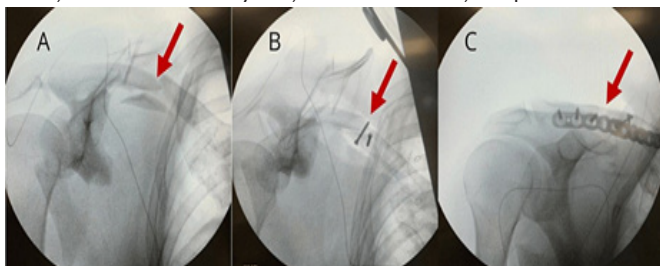
## Case presentation

A 40-year-old male with no significant past medical history was involved in a motor vehicle accident that resulting in polytrauma, predominantly affecting the right side with injuries including clavicle and scapula fractures, multiple rib fractures, pulmonary contusion, and a grade 2 liver laceration. Given the displaced fracture through the mid-portion of the right clavicle, the patient was scheduled for open reduction and internal fixation under anesthesia. The CPB was performed preoperatively under general anesthesia under comprehensive monitoring, including non-invasive blood pressure measurement and continuous electrocardiogram, pulse oximetry, and capnography. We received informed consent from the patient for the procedure and for the submission of this case report, which was subsequently approved through institutional processes. Potential risks and benefits of CPB were thoroughly communicated to the patient.

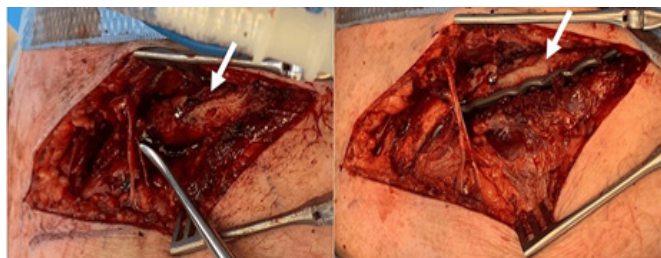
Under aseptic conditions, an ultrasound-guided approach using a 10-15MHz linear transducer (Figure 1) was used. To visualize the clavipectoral fascial plane, an ultrasound probe was situated on the clavicles anterior surface and an in-plane technique enabled visualization of the needle's caudal-to-cephalad advancement (Figure 2). A 4-inch 20-gauge Stimuplex needle was used to inject 15mL of 0.375% bupivacaine between the periosteum and clavipectoral fascia to achieve effective regional anesthesia (Figure 3). Throughout the procedure, monitoring of vital signs and continuous patient assessment ensured safety and efficacy.



**Figure 1** Ultrasound view of the clavipectoral fascial plane highlighting A) The skin, B) The subcutaneous layer, C) The clavicle, and D) The pleura.



**Figure 2** Intra-operative X-Ray images of the right clavicle highlighting A) Displaced fracture of mid-portion of clavicle, B) Fracture reduction, C) Fracture internal fixation.



**Figure 3** Intra-operative images displaying surgical reduction and fixation with supraclavicular nerve spared.

There were no intraoperative complications during the surgery. In the immediate post-anesthesia care unit (PACU), the patient reported no pain. However, at two and four hours postoperatively, the patient reported moderate pain levels (4/10 and 5/10) localized to the right posterior shoulder and thorax, with minimal to no pain reported in the clavicle region targeted by CBP. Remarkably, 24 hours postoperatively, the patient continued to experience similar levels of pain (5/10), predominantly sparing the clavicle region, which was effectively managed. Despite not receiving opioids in the PACU, the patient reported opioid analgesia for pain related to scapula and rib fractures in the postoperative period.

Our observations highlight the safety and efficacy of the clavipectoral fascial plane block in providing prolonged analgesia (24 hours) specifically for the clavicle fracture, contributing to improved pain management and potentially reducing opioid requirements in this case.

## Discussion

Clavicle fractures are traditionally less commonly managed under regional anesthesia compared to general anesthesia; however, due to the uncertainty of the sensory innervation of the clavicle, various regional anesthesia techniques have been carried out for clavicular surgery.<sup>8,9</sup> The CPB presents distinct advantages as a regional anesthesia technique for clavicle surgeries, offering ease of performance and effective postoperative pain management while mitigating potential adverse events, particularly phrenic nerve paralysis in patients with respiratory compromise.<sup>3</sup>

Our case report underscores the positive outcomes associated with CPB, including immediate pain relief post-surgery and prolonged anesthesia, contributing to patient satisfaction and recovery. We presented a case of CPB as the primary mode of anesthesia for the open fixation of a midshaft clavicle fracture, adding to the growing evidence supporting the use of this technique. Our patient reported no pain immediately following surgery and demonstrated prolonged analgesia secondary to the block; however, due to the polytrauma sustained, the patient reported a maximum pain score of 5/10. Our patient was discharged from the PACU within 90 minutes and reported satisfaction with the clavicle block. In this case, given the patient's co-existing thoracic injuries and pulmonary contusion, the safety profile of the CPB was preferred to minimize the risk of phrenic nerve block and respiratory complications, however, the CPB did not provide any analgesia for the scapular fracture or the rib fractures. Overall, we reaffirm the results found in other studies: that this technique is a safe and effective option for managing postoperative pain after clavicle surgery.

The CPB clearly poses several distinct advantages for clavicle surgery, however under certain circumstances, its effectiveness may be limited. Delivery consists of injecting a local anesthetic between the periosteum and clavipectoral fascia, which causes the anesthetic to surround the clavicle. The blocks success relies on the intact fascia and inter-fascial plane. However, the fascia's integrity can be compromised by disruptions due to injury, surgical procedures, or the healing process following trauma or surgery.<sup>6</sup> Therefore, CPB may not be effective when there is a significant delay between trauma and surgery, for revision surgery, for displaced or comminuted fractures, or for implant removal surgery.<sup>6</sup> Due to the uncertainty that may arise regarding the optimal regional anesthesia technique, Kartik et al.<sup>6</sup> propose a valuable resolution: they discuss the 'Identify-Select Combine' method, which aims to assist in identifying the most appropriate procedure-specific regional anesthesia approach.

Another possible advantage to CPB is its potential to reduce opioid usage following clavicle surgery. Opioid medications carry various risks, with potential addiction and medication overuse being of primary concern, thus minimizing opioid use through CPB can promote safer perioperative care.<sup>10</sup> Various studies have reported opioid sparing with effective analgesia following CPB; for example, the case series described by Kukreja et al featured opioid-sparing effects seen in their 3 patients following CPB, enabling early discharge.<sup>4</sup> In our case, a single patient required opioids postoperatively; however, this was due to polytrauma sustained, likely related to the scapula and rib fractures. While the clavipectoral plane block may exhibit opioid-sparing effects, further extensive studies may be necessary to establish its role in opioid consumption due to the current lack of large-scale studies.

## Conclusion

We found that the CPB offers several distinct advantages for clavicle surgery such as ease of performance and effective postoperative pain

management while also mitigating potential adverse events. However, we advocate that prospective studies with large sample sizes may be needed to better understand the distribution of the sensory blockade, the effect of myofascial plane disruption, opioid-sparing effects, and the overall safety of CPB. In addition, we advocate that further research is required to better understand the sensory innervation of the clavicle and to compare existing blocks, including the CPB, ISB, SCP, and combinations of them in a controlled manner, for optimal procedure specific treatment options.

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## Additional information

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. Not applicable issued approval. This case report did not require IRB/ethics committee approval, as it did not involve a prospective clinical study or research that mandates such review. According to our institution's guidelines, case reports are exempt from IRB/ethics committee approval.

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