

Costoclavicular block for distal radius open reduction and internal fixation

ABSTRACT

Interscalene and supraclavicular brachial plexus nerve blocks are routinely used for upper extremity surgeries, although they carry the risk of phrenic nerve involvement, which can lead to diaphragmatic paralysis. The costoclavicular block is a newer block that may mitigate the risk of this complication while providing similar coverage. Our case involves a patient who presented with a displaced distal radius fracture. He received a preoperative single-shot costoclavicular nerve block before undergoing a distal radius open reduction and internal fixation. The patient did not require any opioids or other pain medications intraoperatively or postoperatively in the post-anesthesia care unit. This case supports the utility of using a costoclavicular nerve block for upper extremity surgeries.

Key words: Costoclavicular nerve block, distal radius fracture, pain management, regional anesthesia, upper extremity surgery


Introduction

Regional anesthesia has been growing in recent decades with the development of new nerve blocks and the utilization of ultrasound, improving safety, efficacy, and placement.^[1] Interscalene and supraclavicular nerve blocks are routinely used to provide anesthesia to the upper extremities. They work by blocking sensory and motor signal transmission in the brachial plexus at the root and trunk levels that extend from the shoulder into the hand. The costoclavicular block is a newer block with a similar distribution, but it avoids some of the possible complications of these two blocks and may have a faster onset of action.^[2] Another potential benefit of using a costoclavicular block rather than a supraclavicular block is that the more superficial costoclavicular anatomy

may be better visualized in obese patients.^[3] Our case involves a patient presenting for open reduction and internal fixation (ORIF) of a displaced radius fracture. The patient received a pre-operative costoclavicular block that provided significant pain relief both during and after the surgery.

Case Presentation

The patient is a male in his forties who presented to the emergency department with left wrist pain and deformity after a fall while playing soccer. Sensation, motor control, and perfusion were maintained, and there was no tenderness in the hand, elbow, or shoulder. His past medical history was significant only for hypercholesterolemia. An x-ray was

Access this article online	
Website: https://journals.lww.com/sjan	Quick Response Code 
DOI: 10.4103/sja.sja_354_24	

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Williams C, Ikram J, Swerchowsky N, Ayad S. Costoclavicular block for distal radius open reduction and internal fixation. Saudi J Anaesth 2025;19:105-7.

CASSANDRA WILLIAMS¹, JIBRAN IKRAM¹, NICHOLAS SWERCHOWSKY², SABRY AYAD^{1,2}

¹Anesthesiology Department, Outcomes Research, Cleveland Clinic, Cleveland, OH, ²Anesthesiology Department, Fairview Hospital, Cleveland Clinic, Cleveland, OH, United States

Address for correspondence: Dr. Sabry Ayad, Department of Anesthesiology, Cleveland Clinic Lerner College of Medicine, Case Western Reserve University, Outcomes Research Consortium, Cleveland Clinic - Fairview Hospital, Cleveland, OH, USA.
E-mail: saayad@ccf.org

Submitted: 14-Jun-2024, **Accepted:** 15-Jun-2024, **Published:** 01-Jan-2025

performed and showed fractures in the left distal radius and ulnar styloid. There was a 0.9-cm displacement and angulation of the radial fracture, and the ulnar styloid tip was also noted to be displaced [Figure 1].

On the day of surgery, the patient received 1,000 mg of acetaminophen. He was evaluated by the anesthesiology team, and general anesthesia with an endotracheal tube was planned. The possibility of doing a preoperative costoclavicular nerve block for intraoperative and postoperative pain management was also discussed, which the patient was receptive to. In the pre-operation unit, the patient was given 2 mg of midazolam for anxiolysis. An ultrasound machine was then used to locate the lateral, posterior, and medial cords beneath the subclavius muscle and lateral to the axillary artery and vein [Figure 2a]. A mixture of 10 mL 0.5% bupivacaine and 10 mL liposomal bupivacaine was injected via a 21-gauge 100 mm echogenic needle in the area surrounding the cords [Figure 2b]. The procedure was completed without paresthesia or any complications.

Induction was performed using propofol, lidocaine, and rocuronium. Esmolol was given to blunt the sympathetic response from intubation. The operation was uneventful, with the patient's blood pressure, heart rate, and O₂ saturation remaining in a steady, normal range. No narcotics or any other pain medications were needed during the surgery. The patient emerged from anesthesia appropriately and was extubated.

Outcome and Follow-Up

In the post-anesthesia care unit, the patient rated his pain as a 0/10 on the numeric pain scale on each of his two assessments. He was noted to be hemodynamically stable and was saturating well on room air. He graduated from phase II and was discharged in approximately two hours to his home with postoperative instructions. Follow-up visits with orthopedic surgery, physical therapy, and occupational therapy were scheduled. Imaging of the wrist with hardware in place was performed, confirming the proper alignment of the distal radius [Figure 3]. Sensation and motor control were described as intact at his follow-up visit, and he stated that he had been doing well post-operatively.

Discussion

Trauma patients presenting to the emergency department experience peak pain severity on the trauma care continuum, necessitating expert management of acute pain. Given the challenges posed by the opioid epidemic, there is a pressing



Figure 1: X-ray of left hand and wrist with displaced fracture of the distal radius (red arrow) and a displaced ulnar styloid fracture (blue arrow)

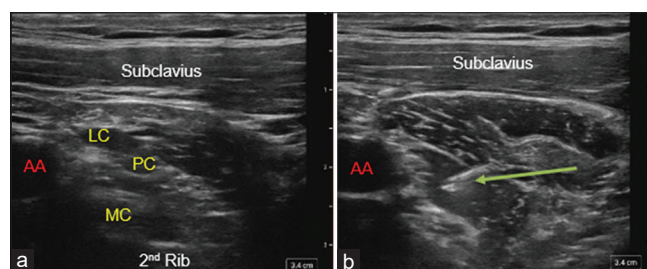


Figure 2: (a) Initial image of the costoclavicular region showing lateral, medial, and posterior cords and axillary artery and vein. (b) Costoclavicular single-shot nerve block using an echogenic needle (green arrow) and the injection of 10 ccs of 0.5% bupivacaine and 10 ccs of liposomal bupivacaine



Figure 3: (a and b) Post-operative imaging showing the new hardware and proper alignment of the distal radius

need for non-addictive pain management techniques that effectively reduce pain without the drawbacks of opioids. By blocking nociceptive signaling, regional anesthetic procedures like costoclavicular nerve blocks provide superior, focused pain relief, making them an ideal analgesic strategy. This method also preserves mental acuity for thorough damage evaluation and could increase tissue viability by improving blood flow through localized sympathectomy.^[4]

The use of costoclavicular nerve blocks, as described in the presented case, reflects an emerging trend in regional anesthesia for upper extremity procedures. The lateral, medial, and posterior cords are the precise areas of the brachial plexus that the costoclavicular blocks target. There are benefits to this targeted approach in terms of lower hazards related to more extensive nerve blocks. For example, costoclavicular blocks typically spare the phrenic nerve, in contrast to interscalene and supraclavicular blocks, which reduce the risk of diaphragmatic paralysis and associated respiratory difficulties.^[5]

The current literature describes the use of various local anesthetics and doses for costoclavicular nerve blocks, including ropivacaine, bupivacaine, liposomal bupivacaine, and even lidocaine for shorter procedures.^[2] A study by Kewlani *et al.*^[6] found that 21 ccs of 0.5% ropivacaine provided effective surgical anesthesia in 95% of patients. For our case, a mixture of 10 mL 0.5% bupivacaine and 10 mL of liposomal bupivacaine was chosen for its potency and the desire for prolonged pain relief following the operation.

The costoclavicular block may be of particular importance for obese patients due to its superficial location and improved ultrasound visibility. Patients who are obese have greater tissue depth and anatomical changes, potentially making other approaches technically difficult.^[3]

The successful outcomes observed in this case with a notable reduction in both intraoperative and postoperative discomfort, highlight the efficacy of costoclavicular blocks for procedures involving the distal upper extremity, such as an ORIF of radial fractures. This aligns with existing literature that points to the costoclavicular block as being a potentially safer alternative to the interscalene and supraclavicular nerve blocks for regional anesthesia during upper limb procedures.

Conclusion

Costoclavicular blocks anesthetize the arm distal to the shoulder and cover the lateral, medial, and posterior cords. Costoclavicular blocks do not involve some of the risks of other upper extremity blocks, specifically diaphragmatic paralysis from phrenic nerve involvement with interscalene and supraclavicular blocks. Due to the more superficial location of the brachial plexus in the costoclavicular region, these blocks may be easier to place in obese patients than more traditional upper extremity nerve blocks.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Albrecht E, Chin KJ. Advances in regional anaesthesia and acute pain management: A narrative review. *Anaesthesia* 2020;75(Suppl 1):e101–10.
2. ASRA Pain Medicine. How I do it: Costoclavicular brachial plexus block. Available from: <https://www.asra.com/news-publications/asra-newsletter/newsletter-item/asra-news/2021/11/01/how-i-do-it-costoclavicular-brachial-plexus-block>. [Last accessed on 2024 May 15].
3. Silva GR, Borges DG, Lopes IF, Ruzi RA, Costa PRR de M, Mandim BL da S. [Ultrasound-guided costoclavicular block as an alternative for upper limb anesthesia in obese patients]. *Braz J Anesthesiol* 2019;69:510–3.
4. Neal JM, Barrington MJ, Fettiplace MR, Gitman M, Memtsoudis SG, Mörwald EE, *et al.* The Third American Society of Regional Anesthesia and Pain Medicine Practice Advisory on local anesthetic systemic toxicity: Executive summary 2017. *Reg Anesth Pain Med* 2018;43:113–23.
5. Reeves MT, O'Neil K, Slesinger TL. Costoclavicular brachial plexus block facilitates painless upper extremity reduction: A case report. *Clin Pract Cases Emerg Med* 2023;7:221–6.
6. Kewlani A, Bhatia N, Makkar JK, Kumar V. Median effective volume of 0.5% ropivacaine for ultrasound-guided costoclavicular block. *Anesthesiology* 2021;134:617–25.