

Unraveling the mysteries of a costoclavicular block: A case report

Kartik Sonawane¹, Hrudini Dixit², Jagannathan Balavenkatasubramanian³

From ¹Junior Consultant, ²Fellow in RA, ³Senior Consultant, Department of Anesthesiology, Ganga Medical Centre and Hospitals Pvt. Ltd., Coimbatore, Tamil Nadu, India

ABSTRACT

The outcome of regional anesthesia with respect to the sensory and motor effects of local anesthetics has been a mystery to anesthesiologists. However, testing these effects is subjective with the currently available scoring/grading systems. We report an unusual case where the author himself is a patient, a 37-year-old male with no comorbidities, who underwent plating of distal radius fracture under costoclavicular block (CCB). He took this opportunity to record changes in the sensory and motor functions that he experienced until he regained them completely. This case report is a narration of his own experiences related to CCB during the perioperative period.

Key words: Costoclavicular block, Nerve fibers, Outcome, Regional anesthesia

Jāve Tyachya Vansha, Tevha Kale – a line from one “Abhang,” a form of devotional poetry sung in praise of the Hindu god “Vitthal,” written by the famous Indian saint Tukaram. It means the joys and sorrows of any human being cannot be understood without experiencing the condition himself.

Every regional anesthetist, irrespective of his years of experience, is probably still curious about the outcome of a given block with respect to the time sequence of loss of sensations, duration of anesthesia, and the time sequence of regaining the sensations. Despite the multiple advances in regional anesthesia, testing of these sensations is still subjective. It relies mainly on patient’s perception of sensory function, which can have great interindividual variability because each person’s brain interprets stimuli differently based on that individual’s learning, memory, emotions, and expectations [1].

Costoclavicular block (CCB) has emerged as an alternative to the infraclavicular approach of brachial plexus block and has been shown in recent years to be safe and effective for anesthesia for elbow, forearm, wrist, and hand surgeries. The advantages are that the plexus in this approach is superficial with the three fascicles clustered on the lateral side of the axillary artery requiring a single injection [2,3]. The technique consists of a single in-plane needle placement guided by ultrasound keeping the whole needle length in vision [4]. In this case report, I’m describing my own experience with this newer costoclavicular approach to brachial plexus block.

CASE REPORT


I am a 37-year-old healthy man with no significant medical history, sustained a fracture to the right distal end radius due to fall on an outstretched hand. Immediately after the fall, there was a severe pain of score 10/10 on the numeric rating scale (NPS) followed by progressive swelling over the right wrist joint leading to a limited range of motion (ROM).

In the emergency department, general examination revealed a pulse rate of 82/min, blood pressure of 110/80 mmHg, and SpO₂ of 100% on room air. Local examination revealed swelling and tenderness over the right wrist with a restricted ROM due to severe pain and visible deformity due to fracture. I was posted for an open reduction and internal fixation (ORIF) with the plating of right distal radius fracture under regional anesthesia.

Preoperatively, an intravenous (IV) line was secured on the dorsum of the left hand. No premedication or sedation was given and standard monitors were attached. Under aseptic precautions, ultrasound-guided right CCB was given with 20 cc of 0.75% Inj. ropivacaine + 4 mg of Inj. dexamethasone using a 23G block needle. During the block, the needle prick into the skin was not painful or uncomfortable. There was no paresthesia or any other abnormal sensations while injecting drug. After the block, the pain sensation over the fracture site reduced from 10/10 to 5/10 on a NPS in the first 5 min. Till 15 min, there was a little difference in power of the right upper limb after which progressive loss of power was noted. There was mild pain on manipulation of fracture site till 20 min. After 20 min, there were no sensations in arm except light touch above the tourniquet level. I was shifted to the operating room after

Correspondence to: Dr. Kartik Sonawane, Department of Anesthesiology, Ganga Medical Centre and Hospitals Pvt. Ltd., Coimbatore, Tamil Nadu, India. E-mail: drkartiksonawane@gmail.com

© 2020 Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC-ND 4.0).

Access this article online	
Received - 01 August 2020 Initial Review - 17 August 2020 Accepted - 27 August 2020	Quick Response code 
DOI: 10.32677/IJCR.2020.v06.i09.010	

30 min after all sensations and movements were lost. The sequence of loss of sensations and movements is detailed in Table 1.

Intraoperatively, before the skin incision, 1 g IV paracetamol and 30 mg IV ketorolac were given as a part of multimodal analgesia. Occasional tingling sensations over fingertips were felt during fracture reduction, but it did not produce any discomfort. There was no tourniquet sensation. ORIF with plating was done in 90 min without any need of sedation or IV fluids.

Postoperatively, I was shifted to post-anesthesia care unit where nil per os status was broken immediately. Multimodal analgesia was continued including Tab. aceclofenac 100 mg PO BD, Tab. pregabalin 75 mg PO H.S., and Tab. pantoprazole 40 mg PO OD for 5 days. I got discharged after 24 h post-block without any pain sensations or complications. The sequence of regaining of sensations and movements is detailed in Table 2.

DISCUSSION

Regional anesthesia has grown by leaps and bounds over the past few decades with regard to the assessment of the effects of

local anesthetic drugs after a nerve block. Testing these effects is subjective with the currently available scoring/grading systems. Many years of experience suggest that the assessment of block depends on the practitioner and the patient, making it highly variable. Even the detailed testing done by various authors may be debatable as it may not be practical to do it in clinical settings. Technological advancement has made it possible to move from subjective to more objective assessment, but the battle is still not completely won. It is rightly said by Isadora Duncan, “*What one has not experienced, one will never understand in print.*” An anesthesiologist as a patient would probably be able to more accurately assess the anesthesia effects of a nerve block since they are more aware of what to look for.

Many studies have explored the different nerve fibers, their functions, and their sensitivity to local anesthetic agents. Depending on the fiber type and size, the sequence of block onset is B fibers > C fibers = Aδ fibers > Aγ fibers > Aβ fibers > Aα fibers [5]. Hence, sympathetic block appears before sensory block, which appears before motor block. In a peripheral nerve, the nerve fibers are arranged as outer mantle fibers innervating the proximal structures and inner core fibers innervating the distal structures. Mantle fibers from outside to inside include C-fibers (unmyelinated) and Aδ (noxious) and Aβ fibers (sensory), whereas core fibers mainly include Aα fibers (motor) [6]. Local anesthetic agent diffuses from the mantle to the core along a concentration gradient, with anesthesia progressing in a proximal-to-distal direction. Since the core fibers are highly vascular, the recovery occurs in a distal-to-proximal direction [7,8]. The block reversal occurs in the reverse manner (i.e., Aα > Aβ > Aγ > Aδ = C > B). Therefore, the motor block lasts for the shortest time while the autonomic block lasts the longest.

In my case as well, I experienced a similar sequence of events consistent with the previously mentioned findings. After the

Table 1: Time sequence of loss of sensations after block

Time since block	Sensory component changes	Motor component changes
0 h	• All sensations intact	All movements intact
5 min	• Reduced pain over fracture site	
15 min	• Pain on fracture site manipulation • Reduced touch sensation below elbow • Pressure sensation intact	Reduced muscle power 2/5
20 min	• No pain/touch/pressure sensation • Light touch + above tourniquet level	No movements muscle power 0/5

Table 2: Time sequence of regaining the sensations after block

Time after block	Sensory regaining	Motor regaining	Movement not possible	Regained nerves distribution
0 h	Absent	Absent		
6 h	No pain. No touch	Flickering movement of lateral three fingers mainly flexion	Shoulder, elbow, wrist	Median nerve
8 h		Flexion of wrist and forearm	Shoulder, elbow	
10 h		Increased power of hand, wrist, and forearm flexion	No sensations over ulnar, radial, and musculocutaneous nerve distribution	
11 h	No pain. Touch + on deep pressure	Improvement in motor movements of hand wrist and forearm flexion. Slight flexion of elbow.	Shoulder	Median nerve. Mild sensation over ulnar, radial, and musculocutaneous nerve
19 h	Mild pain over incision (VAS <3)	Full movements of hand, wrist, elbow, and shoulder		Median nerve, ulnar nerve, musculocutaneous nerve, radial nerve
22 h	Very mild pain over incision during finger movement			
24 h	Mild pain			
34 h	No pain			

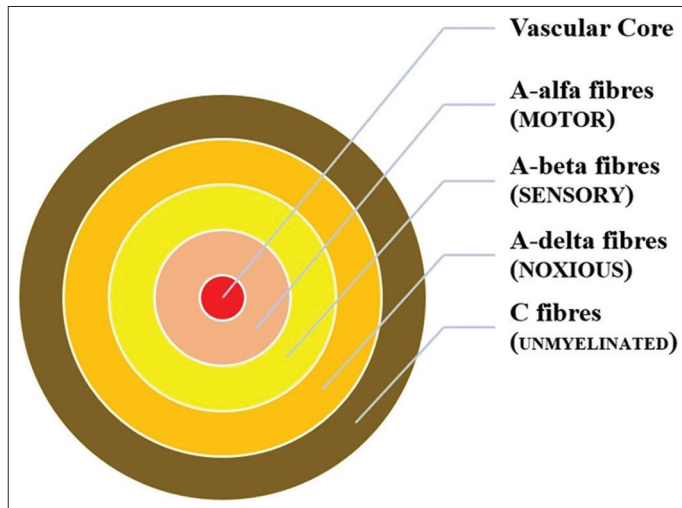


Figure 1: Arrangement of nerve fibers

block, there was an initial change in temperature of the extremity (B fibers) followed by a reduction in pain (C and A δ fibers) within 5 min and descending paralysis of all muscles (A α core fibers) over 20 min. The regaining of all sensations and movements was in a reverse manner (ascending type) (Fig. 1).

The onset time of sensory and motor blockade for all four nerves (median nerve, ulnar nerve, radial nerve, and musculocutaneous nerve) was 5–10 min. Complete sensory and motor blockade was observed in 20–30 min. Extension movement caused by radial nerve was lost before flexion movement caused by the ulnar and median nerve. While regaining sensations, the flexion movement regained before extension. All these observations were consistent with the finding of Li *et al.* [3]

The duration of analgesia in my case was more than 24 h without the use of any opioids. It was due to the combination of long-acting LA agent ropivacaine with dexamethasone, known to increase the mean duration of analgesia by 8 h and mean motor blockade by 4 h. Dexamethasone as an additive is also known to decrease pain scores at rest and on movements and also known to reduce opioid consumption in 24 h, as described by Desai *et al.* in 2019 [9].

CONCLUSION

Based on my personal experience, I feel the CCB is not very painful and provides excellent surgical anesthesia as well as

analgesia postoperatively. My observations are as follows: Effect of CCB occurred in the sequence we are already familiar with, the sensory loss occurred before the loss of motor function, muscle paralysis occurred in descending order (proximal followed by distal), a reversal of paralysis occurred in reverse order, that is, ascending order (distal to proximal), flexion movements were regained before the extension, median nerve sensations were regained first, followed by the ulnar nerve, musculocutaneous nerve, and then at the last radial nerve, and with a good block, perioperative sedation can be avoided. It can also facilitate early post-operative oral feeding, thus avoiding post-operative IV analgesics.

REFERENCES

1. Available from: <https://www.courses.lumenlearning.com/wmopen-psychology/chapter/outcome-sensation-and-perception>. [Last accessed on 2020 Aug 02].
2. Sala-Blanch X, Reina MA, Pangthipumpai P, Karmakar MK. Anatomic basis for brachial plexus block at the costoclavicular space: A cadaver anatomic study. *Reg Anesth Pain Med* 2016;41:387-91.
3. Li JW, Songthamwat B, Samy W, Sala-Blanch X, Karmakar MK. Ultrasound-guided costoclavicular brachial plexus block: Sonoanatomy, technique, and block dynamics. *Reg Anesth Pain Med* 2017;42:233-40.
4. Karmakar MK, Sala-Blanch X, Songthamwat B, Tsui BC. Benefits of the costoclavicular space for ultrasound-guided infraclavicular brachial plexus block: Description of a costoclavicular approach. *Reg Anesth Pain Med* 2015;40:287-8.
5. Hadzic A. *Textbook of Regional Anesthesia and Acute Pain Management*. 1st ed. New York: McGraw-Hill Medical; 2006. p. 159.
6. Helgeson L, Sinatra R. Overview of local anesthetics. In: Sinatra R, Jahr J, Watkins-Pitchford J, editors. *The Essence of Analgesia and Analgesics*. Cambridge: Cambridge University Press; 2010. p. 267-73.
7. Cousins MJ, Bridenbaugh PO, Carr DB, Horlocker TT. *Cousins and Bridenbaugh's Neural Blockade in Clinical Anesthesia and Pain Medicine*. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008. p. 35-40.
8. Brunton LL, Lazo JS, Parker K. *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. 11th ed. New York: McGraw-Hill Medical; 2005. p. 381.
9. Desai N, Albrecht E, El-Boghdadly K. Perineural adjuncts for peripheral nerve block. *BJA Educ* 2019;19:277.

Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Sonawane K, Dixit H, Balavenkatasubramanian J. Unraveling the mysteries of a costoclavicular block: A case report. *Indian J Case Reports*. 2020;6(9):511-513.