International Journal of
Regional Anaesthesia

Case Report

Redefining Limits: Shoulder Disarticulation Under Regional Anaesthesia Alone

Vandana Mangal[1], Momoson Maring Tontanga[1], Chitra Singh[1], Tuhin Mistry[2]

[1]Department of Anaesthesiology and Critical Care, SMS Medical College, Jaipur, Rajasthan, India.

[2]Department of Anaesthesiology and Perioperative Care, Ganga Medical Centre and Hospitals Pvt Ltd, Coimbatore, India

Abstract

Shoulder disarticulation following of animal bites is not uncommon and is often performed for various indications, including vascular insufficiency. General anaesthesia is usually the preferred choice in optimized patients, with or without regional anaesthesia. Phantom limb pain is a distressing and frequently encountered condition following limb amputation. In addition to their well-established benefits, nerve blocks not only provide effective perioperative analgesia but may also reduce the incidence of phantom limb pain. In this case, we undertook shoulder disarticulation exclusively under regional anaesthesia, as the patient's respiratory condition was not optimal for general anaesthesia.

Keywords: Shoulder disarticulation, Regional anaesthesia, Subclavian perivascular block, Superficial cervical plexus block, Pectoserratus plane block.

Introduction

Camel bite injuries in India are relatively uncommon but can occur, particularly in desert regions like Rajasthan, where camels are used for work or kept as pets. Camel-related injuries — including bites, kicks, penetrating wounds, and crush injuries — are commonly encountered, with bites typically targeting thinner areas such as the head, neck, and upper limbs, often resulting in severe trauma, including fractures, vascular injury or delayed thrombosis [1]. Although the exact incidence is unknown, studies suggest camel-related injuries are more frequent during the rutting season (November to March), when male camels become increasingly aggressive, irritable, and difficult to handle [2].

Shoulder disarticulation is a rare amputation procedure involving the surgical removal of the entire arm at the shoulder joint, typically performed in cases of severe trauma, malignant tumors, or infections when limb-preserving options are not feasible [3]. It is a debilitating surgical procedure that involves the removal of the entire upper limb and shoulder joint from the scapula and thoracic wall. Beyond the profound psychological and emotional impact of limb amputation, phantom limb pain is a distressing and commonly encountered postoperative complication [4].

Shoulder disarticulation is usually performed under general anaesthesia in optimized patients with or without regional anaesthesia. Stand-alone locoregional anaesthesia techniques involved tumescent anaesthesia or wide-awake local anesthesia with no tourniquet (WALANT) or various combinations of nerve blocks [5, 6]. However, in patients with poor respiratory conditions, general anaesthesia poses a significant challenge, like an increased risk of bronchospasm, hypoxemia, and other postoperative pulmonary complications [7]. In such cases, exclusive regional anaesthesia offers a safer and more effective alternative method of anaesthesia. We report a case of shoulder disarticulation under a combination of three regional anaesthesia techniques in a patient with compromised respiratory function.

Address of Correspondence
Dr. Tontanga Momoson Maring
Department of Anaesthesiology and Critical Care, SMS Medical College, Jaipur, Rajasthan, India.
Email id: drmomoson@gmail.com

Submitted: February 18-11-2024; Reviewed: 25-11-2024; Accepted: 02-12-2024; Published: 10-12-2024

DOI: https://doi.org/10.13107/ijra.2024.v05.i02.98 | www.ijrajournal.com | Online ISSN 3048-9520

Figure 1a: CT Angiogram

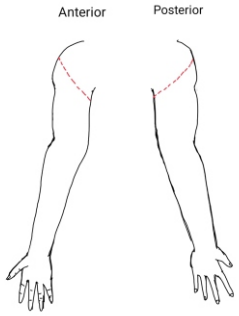

Figure 1b: Proposed Line of Incision

Case Report

A 42-year-old male, 172 cm tall and weighing 70 kg, presented eight weeks after sustaining a camel bite on the right upper arm. Initial wound debridement and suturing had been performed at a primary health care centre. The patient had received four doses of rabies vaccine (Rabipur) as post-exposure prophylaxis treatment following the bite, with the final dose administered approximately three weeks prior to presentation. He had a history of chronic obstructive pulmonary disease secondary to prolonged tobacco use (smoking and chewing), with no other notable medical or surgical illness. About three weeks post-injury, the patient developed progressive sensory loss in the affected limb along with skin changes. On examination, the right upper limb displayed signs of gas gangrene, with a sensory deficit extending proximally up to the elbow. Arterial pulsations were absent in the ipsilateral radial, ulnar, and brachial arteries. Chest auscultation revealed wheezes and crepitations bilaterally, with oxygen saturation of 95% on room air. Cardiovascular and other neurological examinations were unremarkable. Computed tomography angiography revealed absent blood flow in the affected limb (Fig. 1a), while X-ray showed no evidence of fracture. Hematological investigation was otherwise unremarkable, except for elevated total leucocyte counts. The patient was diagnosed with gangrene of the right upper limb and was scheduled for shoulder disarticulation. Informed written consent was obtained for the procedure, anaesthesia, and publication of this report.

Standard monitors in the operation room were attached, including 5-lead electrocardiogram, finger-tip pulseoximeter, and non-invasive blood pressure. A wide-bore intravenous cannula was placed in the left upper limb, and Ringer's lactate infusion was initiated. The surgeon outlined the proposed incision site for right shoulder disarticulation around the arm, as shown in the image (Fig. 1b). All blocks were performed under aseptic precautions using ultrasound guidance. A high-frequency linear probe (Sonosite HFL 38xp/13–6 MHz; Fujifilm SonoSite Inc., Bothell, WA, USA) probe and an 80-mm, 22G echogenic, insulated, stimulating single-shot nerve block needle (Stimuplex® Ultra 360®; B Braun, Melsungen, Germany) were used to perform three blocks. Subclavian perivascular brachial plexus block (SPBPB, 10 mL of 0.5% ropivacaine), superficial cervical plexus block (SCPB, 5 mL of 0.5% ropivacaine), and pectoserratus plane block (PSPB, 10 mL of 0.5% ropivacaine) were administered (Fig. 2a, b, c). The efficacy of the blocks was assessed using pinprick and cold sensation testing using alcohol swabs in all relevant dermatomes, and the surgery commenced. The entire upper extremity was disarticulated en masse. The second part of the axillary artery was ligated following the division of surrounding muscles and ligaments. The head of the humerus was dislocated from the glenoid cavity by severing the associated ligaments, with care taken to preserve the clavicle, coracoid process, and acromion. Intravenous paracetamol 1 gm, diclofenac 75 mg, and dexamethasone 8 mg were administered as a part of perioperative multimodal analgesia. The patient was hemodynamically stable throughout the surgery, and the blood loss of 300 mL was managed with crystalloids and transfusion of one unit of packed red blood cells. Postoperatively, the patient received oral paracetamol 1 gm every 6 hr, diclofenac 75 mg 12 hourly, and pregabalin 75 mg once daily. The remainder of his

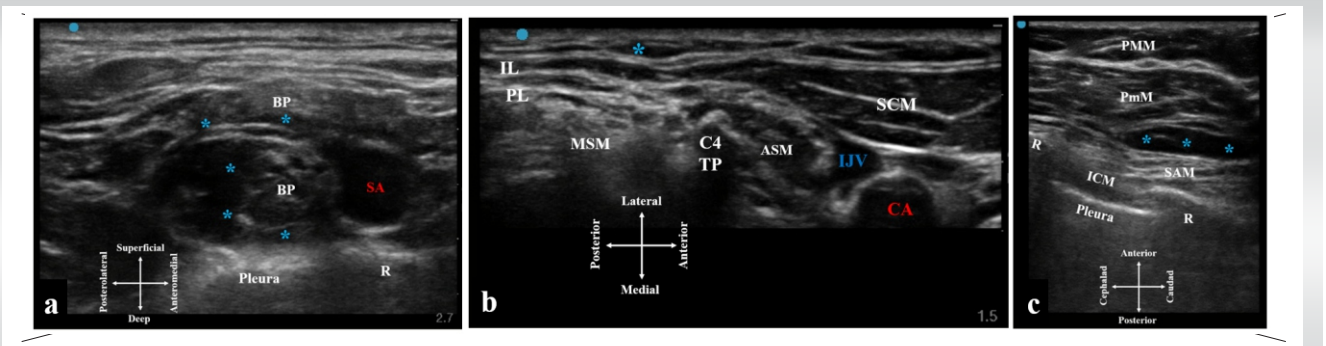

Figure 2: Post block ultrasound scanning images; a: Subclavian Perivascular Brachial Plexus Block, b: Superficial Cervical Plexus Block, c: Pectoserratus Plane Block; BP = brachial plexus neural elements, SA = subclavian artery, R = Rib, SCM = sternocleidomastoid muscle, ASM = anterior scalene muscle, MSM = middle scalene muscle, TP = transverse process, CA = carotid artery, IJV = internal jugular vein, IL & PL = investing layer and prevertebral layer of deep cervical fascia, PMM = pectoralis major muscle, PmM= pectoralis minor muscle, SAM = serratus anterior muscle, ICM = intercostal muscles, Blue asterisk = local anaesthetic spread.

hospital course was smooth, and he was discharged on the fifth day.

Discussion

The shoulder is the most mobile ball-and-socket synovial joint in the human body, primarily innervated by the brachial plexus for both sensory and motor function. The dermatomes of the shoulder joint are primarily supplied by the C4, C5, and C6 nerve roots, with C4 innervating the superior portion of the shoulder, while C5 and C6 supply the lateral shoulder and lateral aspect of the arm, respectively. However, the skin over the shoulder's "cape" region receives cutaneous innervation from the cervical plexus (C2, C3, C4). The myotomes are comprised of the rotator cuff muscles — supraspinatus, infraspinatus, subscapularis, and teres minor — which receive innervation from branches of the brachial plexus. The supraspinatus and infraspinatus muscles are innervated by the suprascapular nerve (C5, C6), while the axillary nerve (C5, C6) supplies the teres minor, and the subscapular nerve (C5, C6) innervates the subscapularis. The C5, C6 and C7 nerve roots supply the sclerotomes of the shoulder joint which is formed by the head of humerus, scapula and the distal end of clavicle [8]. Accordingly, a combination of SPBPB, SCPB, and PSPB was planned to provide comprehensive anaesthesia for shoulder disarticulation, taking into account the nerve supply and surgical requirements of our patient. PSPB was administered to involve intercostobrachial and T3-T6 intercostal nerves as a precautionary measure, anticipating the potential extension of the incision or the need to ligate the first part of the subclavian artery.

Kilicaslan et al. performed a combination of interscalene brachial plexus block, SCPB, and bilevel thoracic intertransverse process blocks (at the T1 and T3 transverse processes) for shoulder disarticulation amputation in a patient with compromised respiratory function [5]. Hamadnalla et al. performed a C7 transverse process level continuous erector spinae plane block to provide analgesia for shoulder disarticulation in a patient with stage IV lung carcinoma [9]. Although the authors achieved sensory block from the C4 to T4 dermatomal areas in both cases, the interscalene block or cervical erector spinae plane block may further compromise lung function due to the potential for phrenic nerve involvement and subsequent hemidiaphragmatic palsy. Hence, we selected SPBPB and SCPB to decrease the incidence. During the COVID-19 pandemic, Mbabazi et al. employed the WALANT technique to perform a shoulder disarticulation in a patient diagnosed with arm liposarcoma and third-degree heart block [10]. Although the authors proceeded without a pacemaker in this high-risk patient, we avoided this approach due to the potential risk of local anaesthetic systemic toxicity.

This combination of SPBPB, SCPB, and PSPB offers a simple recipe of commonly performed blocks for major upper limb amputation in high-risk patients. These blocks can also be performed using anatomical landmarks or neurostimulation-guided techniques, particularly in resource-limited settings.

Conclusion

Regional anaesthesia provides a safe and effective alternative to general anaesthesia for shoulder disarticulation, especially in patients with compromised respiratory function. Larger prospective studies are warranted to establish its role as the primary anaesthetic modality in similar clinical scenarios.

References

1. Mahajan, A., Luther, A., & Chhabra, A. (2015). Brachial artery injury caused by camel bite. Indian Journal of Vascular and Endovascular Surgery, 2(1), 33. https://doi.org/10.4103/0972-0820.152834

2. Abu-Zidan FM, Hefny AF, Eid HO, Bashir MO, Branicki FJ. Camel-related injuries: Prospective study of 212 patients World J Surg. 2012;36:2384–9

3. Maduri P, Akhondi H. Upper Limb Amputation. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from:

https://www.ncbi.nlm.nih.gov/books/NBK540962/

4. Donnelly, M. R., & Hacquebord, J. H. (2023). Shoulder level amputation: Forequarter and brachial plexus-level amputation. Operative Techniques in Orthopaedics, 33(3), 101056.

https://doi.org/10.1016/j.oto.2023.101056

5. Kilicaslan A, Gok F, Colak TS, Keklicek O, Kucuksen MF. Combined interscalene, superficial cervical plexus and thoracic intertransverse process blocks for surgical anaesthesia of the shoulder disarticulation. Anaesth Rep. 2024;12(1):e12306. Published 2024 May 29. doi:10.1002/anr3.12306

6. Mbabazi P, Mwaniki M, Wambua G, Kagua S, Kamau RW, Daggett J, Nthumba PM. Successful Shoulder Disarticulation under Local Anesthesia in the COVID-19 Era. Plast Reconstr Surg Glob Open. 2023 Sep 13;11(9):e5266. doi: 10.1097/GOX.0000000000005266. PMID: 37711723; PMCID: PMC10499080.

7. Duggappa DR, Rao GV, Kannan S. Anaesthesia for patient with chronic obstructive pulmonary disease. Indian J Anaesth. 2015 Sep;59(9):574-83. doi: 10.4103/0019-5049.165859. PMID: 26556916; PMCID: PMC4613404.

8. Miniato MA, Anand P, Varacallo MA. Anatomy, Shoulder and Upper Limb, Shoulder. [Updated 2023 Jul 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK536933/

9. Hamadnalla, H., Elsharkawy, H., Shimada, T. et al. Cervical erector spinae plane block catheter for shoulder disarticulation surgery. Can J

Anesth/J Can Anesth 66, 1129–1131 (2019).

https://doi.org/10.1007/s12630-019-01421-9

10. Mbabazi P, Mwaniki M, Wambua G, Kagua S, Kamau RW, Daggett J, Nthumba PM. Successful Shoulder Disarticulation under Local Anesthesia in the COVID-19 Era. Plast Reconstr Surg Glob Open. 2023 Sep 13;11(9):e5266.

doi: 10.1097/GOX.0000000000005266. PMID: 37711723; PMCID: PMC10499080.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

How to cite this article: Mangal V, Tontanga MM, Singh C, Mistry T | Redefining Limits: Shoulder Disarticulation Under Regional Anaesthesia Alone | International Journal of Regional Anaesthesia | July-December 2024; 5(2): 16-19 | DOI: https://doi.org/10.13107/ijra.2024.v05.i02.98