BJHS
Birat Journal of Health Sciences

ISSN:
2542-2758 (Print) 2542-2804 (Online)

ARTICLE INFO:
Received Date: 21/01/ 2024
Acceptance Date: 7/03/2024
Published Date:16/04/2024

KEYWORDS:
Brachial plexus block, Continuous catheter, Capsulectomy, Range of motion , Upper extremity injury

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Access the article online

DOI: https://doi.org/10.62065/bjhs550

CITATION:
Khatiwada SR, Sharma A, Bhattarai PR, Adhikari H, Khadka B.Enhancing pain control in elbow rehabilitation; A case report of variable ropivacaine dosages through Brachial Plexus Catheter. Birat J. Health Sci. 2024;9(1):109-112.

Enhancing pain control in elbow rehabilitation; A case report of variable ropivacaine dosages through Brachial Plexus Catheter

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ABSTRACT

Managing postoperative pain and discomfort during physiotherapy for upper arm injuries, including complex fractures or traumatic amputations, is crucial. Challenges include severe pain, stiffness, and limited range of motion. Physiotherapy is vital for preventing muscle atrophy, promoting joint mobility, and facilitating functional recovery.

The successful management of postoperative pain and pain during physiotherapy in a 27-year-old female, who sustained multiple injuries including a displaced distal humerus fracture and a traumatic right-hand amputation, was achieved through the utilization of a continuous brachial plexus block with variable doses of ropivacaine. The patient's history revealed a complex array of injuries, including a displaced distal humerus fracture and traumatic right-hand amputation, necessitating open reduction and internal fixation for the fracture and subsequent hand debridement. Despite addressing stiffness through capsulectomy, persistent concerns arose regarding postoperative pain and discomfort during physiotherapy sessions. To address these concerns, a continuous supraclavicular catheter was placed under ultrasound guidance, providing effective pain relief and facilitating physiotherapy interventions for optimal recovery. The patient underwent open reduction and internal fixation for the humerus fracture which was subsequently managed with amputation of several fingers and a hand debridement procedure. Following the surgeries, the patient complained of a stiff elbow, which was addressed through capsulectomy. However, concerns persisted regarding postoperative pain and pain during physiotherapy sessions, leading to the decision to place a continuous supraclavicular catheter. The catheter was accurately positioned under ultrasound guidance and tunneled under the skin, providing effective pain relief for seven days. Ropivacaine was administered as per the patient's requirements, with a background infusion of 0.2% ropivacaine at 8-hour intervals, a 10 ml bolus of 0.2% ropivacaine administered half an hour before physiotherapy, and 10 ml of 0.5% ropivacaine during physiotherapy sessions if pain levels exceeded 4 on the numerical rating scale. This case highlights the utility of continuous brachial plexus blockade for prolonged postoperative analgesia and pain management during physiotherapy in patients with upper extremity injuries.

INTRODUCTION

The continuous brachial plexus block not only prolongs block duration during long upper limb surgery but also serves as a means to maintain postoperative analgesia[1,2]. The technique of inserting catheters in the vicinity of the plexus, using approaches such as inter scalene, supraclavicular, or axillary, has been commonly practiced[3]. We

reported a case where a continuous brachial plexus catheter was used to manage postoperative physiotherapy using variable doses of ropivacaine.

CASE PRESENTATION

Twenty-seven-years old lady presented in the emergency department with an alleged history of road traffic accident with polytrauma. She had a right displaced distal humerus fracture, soft tissue injury over the right anterior thorax below the clavicle, Right-hand traumatic amputation, left transverse process fracture of L5 vertebra and right transverse process L1 and L2 vertebra, minimal right pleural effusion with right pneumothorax and right radial styloid process fracture. She was managed accordingly in the ICU. Open reduction and internal fixation with plating were done for the right distal humerus fracture, near complete amputation of the second to fifth fingers which were attached by tendons only. She was managed with amputation of the second to fourth fingers at the metacarpophalangeal joint. Debridement and groin flap for the right upper extremity was done by plastic surgery. After the procedure, the Range of Motion brace application was done.

She presented in OPD with complaints of a stiff elbow following Open reduction and internal fixation for distal humerus fracture. A capsulectomy was done for pain and management of a stiff elbow.

Fig 1: During Physiotherapy

However, the concerns regarding post-operative pain and pain during the physiotherapy sessions were the concerns for the placement of the continuous supraclavicular catheter.

Before the procedure, we thoroughly discussed with the patient the possibility of scarring caused by tunneling the catheter. Ultrasound-guided technique was used and under local anesthesia, we tunneled the catheter under the skin via Tuohy epidural needle following hydro dissection while accurately locating the subclavian artery and brachial plexus and securing the catheter at 8.5 cm, which proved to be effective throughout 7 days.

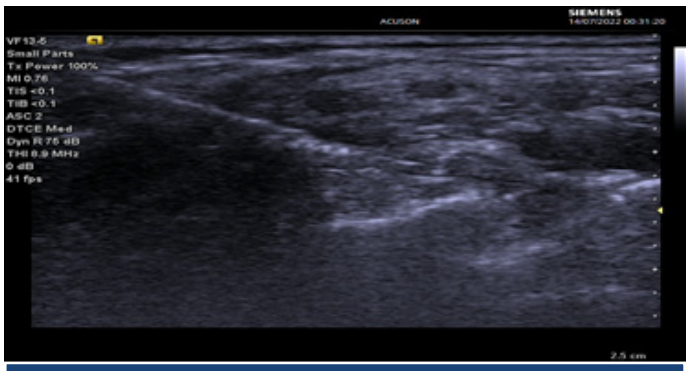

Fig 2: Catheter tunneled through Tuohy needle

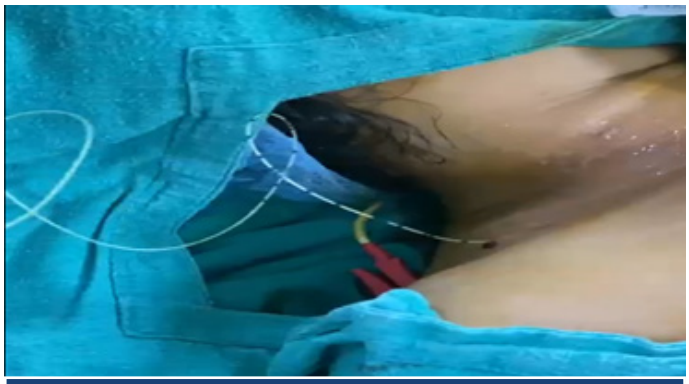

Fig 3: Catheter fixed at 8.5 cm with appropriate suturing and bio-occlusive dressing

Ropivacaine was given according to requirements. Background 0.2% Ropicavacaine 10ml via the catheter 8 hourly, Bolus 10 ml 0.2% ropivacaine half an hour prior to physiotherapy, and 0.5 % ropivacaine 10 ml during physiotherapy if pain (NRS>4). Follow-up was done every day and in the physiotherapy sessions as well. The catheter was removed on day 7 and the patient was discharged on Day 8. The telephonic follow-up after 1 month was where the patient expressed gratitude for adequate pain control during the surgery, during physiotherapy sessions, and postoperatively.

DISCUSSION

In this case, We utilized a brachial plexus catheter to manage postoperative physiotherapy using variable doses of ropivacaine. The postoperative outcome is largely contingent on the effectiveness of physiotherapy during the recovery period. The presence of the continuous catheter in the brachial plexus effectively controlled the pain, mitigating any potential hindrance to her physiotherapy sessions.

Tamosiunas first described the catheter insertion technique in brachial plexus[4]. An interscalene, infraclavicular, or axillary approaches are commonly preferred techniques for continuous catheter insertion in the brachial plexus[2]. The supraclavicular approach for continuous catheter insertion into the brachial plexus is not a widely adopted technique. One of the primary concerns with continuous brachial plexus catheterization is the

increased risk of catheter dislodgement, mainly due to challenges in effectively securing the catheter in a region with high neck mobility[5]. We tend to avoid tunneling the catheter in this area, as it can lead to a visible scar on the neck, which may not be desirable for patients. The analgesic effect of the interscalene approach of the continuous catheter targets the brachial plexus, which innervates the shoulder and upper arm, providing pain relief in those areas and it may not extend as effectively into the elbow region. The reason for opting for the supraclavicular approach was to ensure continuous analgesia over the elbow and regions below it, as these were the anticipated areas where the patient would experience the most intense pain during her physiotherapy sessions[6]. We were unable to perform the catheter insertion via infraclavicular approach as the area below the clavicle exhibited a wound, making the sonoanatomy challenging and there was an increased probability of infection.

The anticipated complications were pneumothorax, hemothorax, subclavian artery puncture, phrenic nerve palsy, LAST, and Injuries to the transverse cervical artery and dorsal scapular artery[7,8]. These complications were not encountered in our case.

The presence of transverse cervical and dorsal scapular arteries at three ultrasound probe positions is commonly used in supraclavicular brachial plexus blocks[9]. These should be taken into consideration during the procedure.

To enhance pain relief during physiotherapy, we administered a bolus dose of ropivacaine instead of raising the continuous infusion's basal rate, which takes longer to take effect. We used ropivacaine as a local anesthetic agent as it is less cardiotoxic[10].

We proposed the continuous catheter in the brachial plexus via supraclavicular approach is a safe and effective modality to control postoperative pain in various settings but further practice and research are deemed necessary to measure its efficacy.

CONCLUSION

The utilization of a continuous brachial plexus catheter via the supraclavicular approach proved to be an effective method for managing postoperative pain and discomfort during physiotherapy sessions in a patient with complex upper extremity injuries. Variable doses of ropivacaine administered through the catheter provided targeted analgesia, facilitating optimal recovery and functional rehabilitation. Despite concerns regarding catheter placement, meticulous technique, and ultrasound guidance ensured successful implementation without encountering anticipated complications. This case underscores the significance of individualized pain management strategies tailored to the patient's needs, highlighting the potential of continuous brachial plexus blockade as a valuable adjunct in postoperative care. Further research and clinical experience are warranted to fully elucidate its efficacy and safety profile across diverse clinical scenarios.

CONFLICT OF INTEREST The informed consent letter from the patient has been attached to the manuscript submission.

ACKNOWLEDGEMENTS We would like to acknowledge our Department of Anaesthesiology, Critical Care and Pain Management, who directly or indirectly helped us to complete the study.

CONFLICT OF INTEREST None

FINANCIAL DISCLOSURE None

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