

Shearing and Migration of Interscalene Catheter After an Uncomplicated Ultrasound Guided Placement

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Abstract

We report on the case of shearing and migration of an interscalene nerve catheter in 68-year-old female who underwent a left shoulder surgery. The catheter was placed under ultrasound guidance without any apparent complications. Continuous interscalene nerve block was successfully used to complement General Anaesthesia and provide postoperative pain relief. On the second day, at the time of catheter removal, the catheter inadvertently sheared at the point of insertion with the distal 7 centimetres migrating under the skin. The axial and coronal CT scan sections confirmed the migration of the catheter posterolateral to subclavian artery in the vicinity of the Brachial plexus. Patient did not have any pain or neurological deficit. Surgery was performed to extract the catheter, which was found in brachial plexus sheath between lower end of Scalenus Anterior and Scalenus Medius.

Keywords: Interscalene catheter, Shearing, Migration

Introduction:

Continuous Interscalene catheter blocks give superior intra & post op analgesia in shoulder surgeries in comparison to the single shot Interscalene technique, thereby encouraging early start of physiotherapy. [1] Interscalene catheter complications are not common. We report on a rare complication viz. the shearing off of the catheter at removal after being used successfully intraoperatively and postoperatively for pain management for a shoulder surgery. The patient was counselled about the merits of conservative choice versus corrective intervention. In keeping with the patient's wishes, a successful surgical extraction of the broken and migrated catheter piece was conducted. The authors have taken written consent from patient to report this case.

Case Report:

A 68-year-old female patient, American Society of Anesthesiology grade 2, presented with a two week old left humerus greater tubercle fracture for open reduction and internal fixation. She was not having any comorbid condition. General anesthesia with continuous interscalene block was planned for anesthesia and postoperative analgesia.

After informed consent was obtained, standard monitors were applied and intravenous line established. The patient was positioned in the supine position and an anterolateral approach was used for catheter placement. Using both ultrasound guidance in the short axis and the nerve stimulation technique, an 18-gauge, 50 mm contiplex D (B Braun, Bethlehem, PA) was advanced in plane between C5 and C6 nerve roots. During the procedure no paraesthesia or pain was experienced by patient. There was no response to nerve stimulation below 0.5 mA. Ten millilitres of 0.25% bupivacaine were injected without resistance with good spread noted around C5-C6 roots. A 20-gauge single orifice, non-stimulating, polyamide terminal opening catheter was advanced 3 cm past the tip of the needle and secured with tunnelling and a suture. The catheter mark was noted at 7cm at the skin. Six ml of 0.25% bupivacaine given through catheter resulted in a good spread. General anesthesia was provided as per institutional protocol. Patient underwent

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Submitted: 19 May 2021; Reviewed: 30 May 2021; Accepted: 15 June 2021; Published: 10 July 2021

DOI: 10.13107/ijra.2021.v02i02.042 | www.ijrajournal.com |

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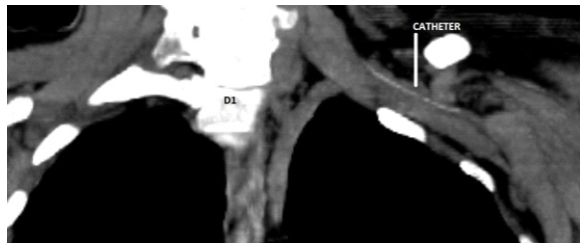


Figure 1: Coronal MIP image shows the retained catheter which has migrated along the brachial plexus beyond the outer border

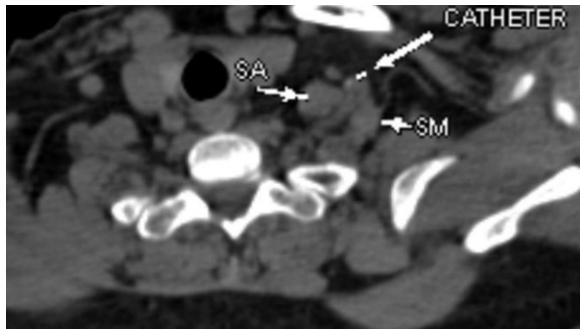


Figure 2: Axial image shows the cross section of catheter located along brachial plexus, between scalenus anterior and medius



Figure 3: The catheter was identified as it coursed between the anterior and middle scalene muscles, penetrating the sheath

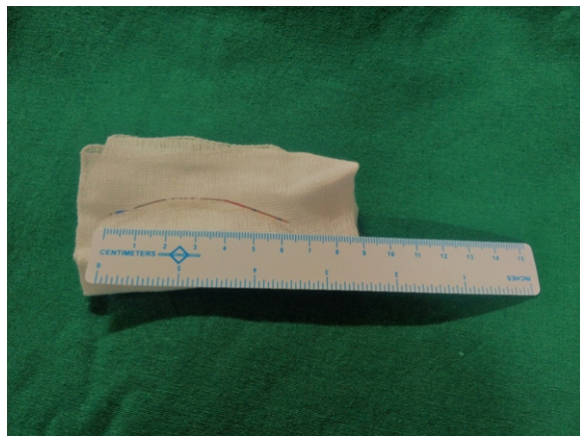


Figure 4: The intact broken catheter was extracted with careful dissection avoiding injury to the nerve and vascular structure

an uneventful operation and had a smooth course in the post anesthesia care unit. Post operatively Interscalene catheter infused with 0.1% bupivacaine infusion at the rate of 5ml per hour through syringe pump till the time of the removal. Patient pain score was 2-3/10 on NRS scale till morning of second postop day without any sensory or motor block.

On the 2nd post-operative day, the pain nurse attempted catheter removal after providing a 5 ml bolus of the same solution. The catheter was not removed from the tunnel prior to the attempted removal. The suture was removed first and as per institutional protocol, catheter removal was initiated with gentle pull at the insertion point. A mild resistance was then felt at the initial pull on the catheter. A subsequent tug resulted in the catheter being sheared off at the skin and disappearing under the skin. The Anaesthetist with the Acute Pain Services was immediately alerted. The Anaesthetist discovered that interscalene catheter had sheared at skin and the 7-centimetre distal part of catheter was now lodged inside the patient. There was no apparent lengthening of the distal end of that part of the catheter that was lying outside the patient. There was no pain or neurological deficit at rest and movement. The complication was informed to the patient and relative and they were reassured about the further care.

The C-Arm and a subsequent Ultrasound failed to locate the whereabouts of the catheter. A neck exploration under local anaesthesia to trace the missing piece proved unsuccessful. Therefore, a CT scan of neck and thorax were conducted. Coronal image showed that the retained catheter had migrated along the brachial plexus beyond the outer border of the D1 vertebral level. (Figure 1) Axial image showed the cross section of catheter located along brachial plexus, between Scalenus anterior and Scalenus Medius. (Figure 2)

The patient was counselled on the conservative approach of letting the catheter remain as there was no pain or discomfort given the inert and non-toxic nature of the catheter. Also the challenges of a surgical extraction including surgery at the base of neck with many vital structures in the vicinity and the possible difficulty in locating and extracting the catheter were discussed. After understanding the pros and cons, the patient decided to opt for the surgical extraction of the catheter.

The following day, after securing an informed consent the patient underwent neck exploration under general anesthesia by a plastic surgeon experienced in brachial plexus surgeries. A transverse incision was made at the base of the neck. The catheter was identified as it coursed between the anterior and middle scalene muscles, penetrating the sheath of the brachial plexus. (Figure 3) The intact broken catheter was extracted with careful dissection avoiding injury to the nerve and vascular structures, there was no kinking or knotting of catheter. (Figure 4) The subsequent recovery of the patient

was uneventful and patient demonstrated excellent rehabilitation in the serial OPD follow-ups.

Discussion:

Continuous nerve catheters are superior in providing postoperative analgesia and have a very rare incidence of serious complications. [1] It is used frequently at our institution and the anaesthetists and pain nurse are quite adept at its safe insertion and post-operative management respectively. In our case the catheter was not defective at the time of insertion and at post extraction and it gave no evidence of knotting or kinking. The interscalene catheter used for this case was made up of polyamide which is a tough material yet inert enough to allow its long term use. [2] But in the present case, it sheared with minimal outward force. The final resting position of the catheter could have a result of the recoil forces upon the sudden shearing of the catheter subjected to an outward force. It could not be determined if the catheter was injured at the initial step of cutting the suture. In our case, the attempts to locate the broken catheter using sonography and C-ARM failed, as the catheter was only partially radiopaque and non-echogenic as revealed to us by our communications with the company. We therefore recommend that the peripheral nerve catheters should be radiopaque for C-ARM and extremely echogenic for localizing using the Ultrasound.

In our case, catheter was inserted 3-centimetres distal to needle tip as recommended by Hadzic et al to avoid kinking or knotting. [3] To avoid catheter entrapment, excessive force during insertion should be avoided and indwelling catheter distance should be minimal.

In one case report, it was recommended to consider leaving the inert cut catheter piece inside the patient in the absence of any pain or neurological deficit. In the case report of Despond O et al, the patient underwent an unsuccessful attempt at surgical extraction after a three-month period of conservative approach. [4] The search was abandoned and the patient was quite well at one year. In our case, the initial lack of pain and paraesthesia could be explained by the fact that the local anaesthetic infusion was continued right till the attempt at catheter removal. The patient, however continued to be symptom free till the eventual surgical catheter removal twenty four hours after the shearing of the catheter.

Mitra R. et al provided some recommendations to avoiding shearing of catheter during removal:

- (1) Use slow continuous force at all times and discontinue if the catheter begins to stretch and reapply traction several hours later
- (2) Place the patient in the same position as insertion

- (3) Attempt removal after injection of preservative-free normal saline through the catheter
- (4) Consider computed tomographic scan to identify the aetiology of entrapment

- (5) Consider leaving a retained catheter in place in adult patients and provide patient education regarding “red flags” to watch out for. [5]

In addition, it would be prudent to deliver the catheter out from the tunnel prior to cutting the sutures placed at the entry point. It is possible that the catheter be injured by the needle used to create the tunnel. In our case, the outward force was correctly given at the insertion point and not at the far end of the tunnel. There are only a few case reports where surgical removal of an interscalene catheter was required. Clifford B. et al, reported a case where the interscalene catheter tip was hooked around and entrapped the C5 root resulting in significant pain. [6]

In the case described by Ilfeld et al, the metallic tip of a stimulating infraclavicular catheter caught on the median nerve. The severe pain necessitated a surgical exploration. [7]

Brenier et al reported the need for surgical extraction of a stimulating interscalene catheter that caused radicular pain on attempted removal, but surprisingly was not looped or knotted. [8]

In an attempt to improve the safety of these catheters, we have shifted totally to the Contiplex S Ultra 360 which has better radio opacity and echogenicity.

Conclusion:

We present a rare case of breakage of an indwelling Interscalene catheter and its successful surgical retrieval. As the peripheral nerve blocks are becoming more popular, the incidences of complications need to be compiled to allow consensus to be built and recommendations provided for managing even rare challenges. Further developments including better fixation techniques and devices including surgical glue may help address these situations in the future.

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

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

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How to cite this article: Rane S, Shetty V, Prasad S, Bhargava R | Shearing and Migration of Interscalene Catheter After an Uncomplicated Ultrasound Guided Placement | International Journal of Regional Anaesthesia | July-December 2021; 2(2): 137-140.