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CASE REPORT

Spread of anesthetics in peripheral blocks at the neck-shoulder junction according to the localization of clavicle (case series)

Boyun-omuz bileşkesinde periferik bloklarda klavikula lokalizasyonuna göre anestetiklerin yayılması (olgu serisi)

Ergün MENDEŞ,[1] Aziz YARBİL,[1] Hüseyin GÖÇERGİL,[1] Yusuf EMELİ[2]

Summary

After the brachial plexus blocks, local anesthetics do not diffuse under the clavicle and can spread to the epidural space with a cephalic tendency. We aimed to show how the local anesthetic spread will be according to the integrity of the clavicle by adding contrast agent to the peripheral blocks. We observed that the barrier created by the clavicle at the neck-shoulder junction disappeared in fracture >2 cm and the drug distribution showed a caudal transition. We think that the type and degree of clavicle fracture changes the drug diffusion and affects the success of the block.

Keywords: Clavicle fracture; peripheral block; X-ray imaging.

Özet

Brakiyal pleksus bloklarından sonra lokal anestetikler klavikula altına yayılmaz ve sefalik bir eğilimle epidural boşluğa yayılabilir. Periferik bloklara kontrast madde ekleyerek lokal anestezik yayılmanın klavikula bütünlüğüne göre nasıl olacağının gösterilmesi amaçlandı. Boyun-omuz bileşkesinde klavikulanın oluşturduğu bariyerin >2 cm kırıkta kaybolduğu ve ilaç dağılımının kaudal geçiş gösterdiği gözlemlendi. Klavikula kırığının tipi ve derecesinin ilaç difüzyonunu değiştirdiği ve blokun başarısını etkilediği düşünüldü.

Anahtar sözcükler: Klavikula fraktürü; periferik blok; X-ray görüntüleme.

Introduction

Clavicle fractures are mostly seen in young and physically active patients after blunt trauma. Although non-surgical (conservative) treatments are the primary approach, the current recommendation in the cases with an instability of the fracture or shortening of more than 2 cm in the bone length is the surgical approach.[1]

Contrast-guided fluoroscopy has been used for many years to determine the injection point in peripheral nerve blocks and follow the spread. Compared to advanced imaging methods, serial radiographic imaging can provide real-time information about drug diffusion.[2]

Local anesthetic spread does not pass under the clavicle, and it can spread to the contralateral side of epidural space.[3] In our study, we aimed to present four cases in which we investigated whether there was a difference in drug diffusion according to the degree of clavicle instability.

Case Reports

The patients were given 0.05 mg/kg midazolam premedication as standard through a 22-gauge intravenous route. The patients were monitored for oxygen saturation (SpO_2) in the supine position, non-invasive blood pressure, and electrocardiogram. All patients underwent nerve block with a 5-cm 21-gauge block needle under ultrasound guidance with a linear probe

[1]Department of Anesthesiology and Reanimation, Kilis State Hospital, Kilis, Türkiye
[2]Department of Anesthesiology and Reanimation, Seyhan State Hospital, Adana, Türkiye

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Correspondence: Dr. Ergün Mendeş. Kilis Devlet Hastanesi, Anesteziyoloji ve Reanimasyon Bölümü, Kilis, Türkiye.
Phone: +90 - 551 - 426 50 12 **e-mail:** erg.mendes@gmail.com

under aseptic conditions. A 20-mL mixture of 10 mL bupivacaine, 5 mL lidocaine, and 5 mL contrast agent (iohexol 3mg/mL, Omnipaque, GE Healthcare, USA) were prepared. In clavicle surgeries, the brachial plexus block (BPB, 15 mL) and the deep cervical plane block (dCPB, 5 mL) were applied in-plane over the fascia at C4 transverse protrusion level while observing the craniocaudal diffusion. The diffusion of the mixture was followed using serial radiographic images during the injection of the local anesthetic. The patients' pain levels were monitored with the visual analog scale (VAS) at the post-operative 1st, 2nd, 6th, 12th, and 24th h, and their analgesic needs were determined.

Case 1

A 34-year-old male with ASA I physical status underwent interscalene block (ISB) and dCPB due to a non-displaced midclavicular fracture that did not heal after conservative treatment. After ISB, the anesthetic mixture went along the brachial plexus down to the clavicular line and then directed to the head (Fig. 1).

Case 2

A 21-year-old male with ASA I physical status underwent BPB and dCPB due to a partially displaced (<2 cm) midclavicular fracture. BPB was applied with two different approaches: ISB and supraclavicular block. Although the mixture applied from both sites was concentrated on the fracture area, it did not diffuse downward but spread upward along the brachial plexus, with a similar diffusion (Fig. 2).

Case 3

A 29-year-old male with ASA I physical status underwent ISB and dCPB due to a displaced (>2 cm) midclavicular fracture. After the ISB, moving partially upward along the brachial plexus and passing below the clavicular line to a greater extent, the mixture diffused to the axillary region (Fig. 3).

Case 4

A 33-year-old male with ASA I physical status underwent infraclavicular block (ICB) for forearm surgery. The mixture did not spread from the clavicle to the head but was directed distally along the axillary line (Fig. 4).

Only the patient with a displaced fracture of >2 cm had pain during the skin incision and the retraction of the skin toward the nipple. The patient was given 100 mcg fentanyl and 10 mg ketamine and was

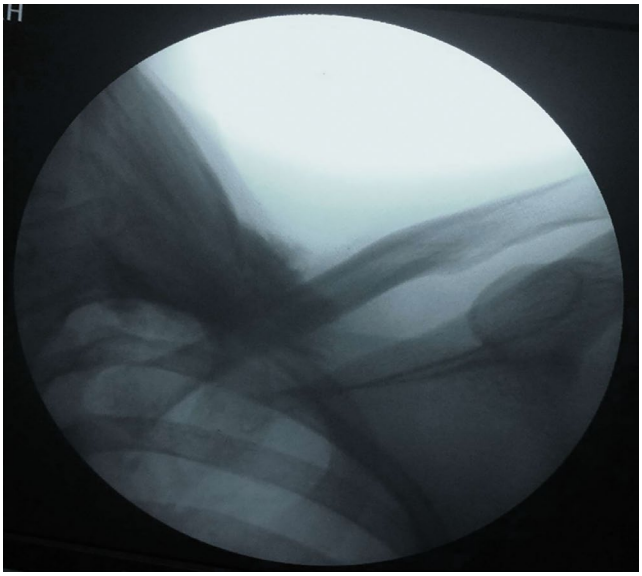

Figure 1. The mixture did not diffuse below the clavicular line.

Figure 2. The mixture is restricted at the fracture line.

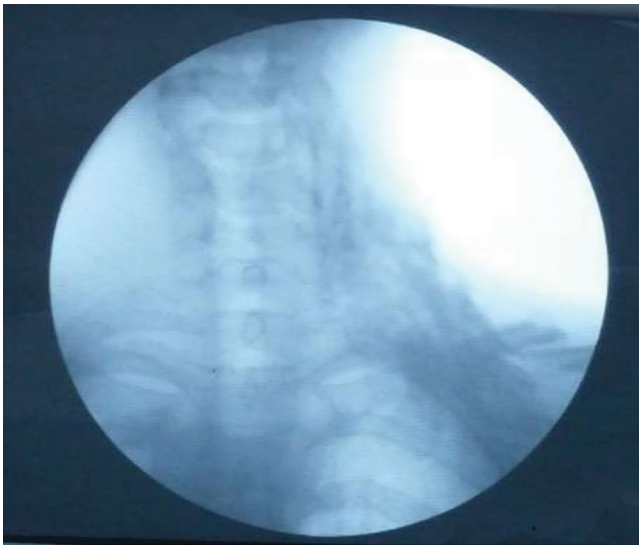

Figure 3. The mixture diffused below the clavicular line after the interscalene block.

Figure 4. The mixture did not diffuse above the clavicular line and directed distally after the infraclavicular block.

found to have no pain after the skin incision. It was observed that the isolation of the supraclavicular nerve in the 15th min of the surgery and the addition of a local anesthetic relieved the patient of pain, and there was no requirement for additional medication. It was found that none of the patients had VAS scores higher than 1–2 in the first 24 h and none required additional analgesics.

Discussion

Today, there is still no consensus about the innervation of the clavicle, even in textbooks. Various approaches are used for the anesthesia and analgesia of the area, including those involving the brachial and cervical plexus together.[4]

Since it is a rarely performed surgery, there are a limited number of case reports rather than controlled studies involving this area's anesthesia. There are several different approaches, from isolated root blocks to peripheral plane blocks, and different clinical results that require sedation can occur in these cases.[5,6]

In studies where the diffusion of local anesthetic was observed with contrast agents, several factors, including injection point or volume, were found to affect the success of the nerve block. It has been demonstrated that local anesthetic diffusion was not descended under clavicle and was cephalad after the ISB; epidural diffusion and even contralateral diffusion were mentioned, depending on the volume.[3]

In our cases where the contrast agent was added to and followed up with the local anesthetic agent, it was observed that the clavicle acted as a barrier and the spread of local anesthetic were directed cephalad in neck blockades. In ICB, the anesthetic agent was limited to the clavicular line and directed to peripheral by spreading from the axillary region to the arm. In one case where the clavicular integrity was impaired, it was observed that the cephalad spread of the local anesthetic was limited, and it descended below the clavicular line.

In conclusion, we think that the clavicle creates a barrier for the transition from the neck region to the thoracic space and may affect the standard block's success when its integrity is impaired. This barrier created by the clavicle should be considered in the selection of block approach and volume. Further studies are needed on this subject.

Informed Consent: Written informed consent was obtained from the all patients for the publication of the case report and the accompanying images.

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