Rev Bras Anestesiol. 2019;69(5):510–513

Sociedade Brasileira de Anestesiologia

REVISTA BRASILEIRA DE ANESTESIOLOGIA

Publicação Oficial da Sociedade Brasileira de Anestesiologia
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CLINICAL INFORMATION

Ultrasound-guided costoclavicular block as an alternative for upper limb anesthesia in obese patients

Grazielle Rodrigues Silva *, Danielle Gonçalves Borges, Iuri Ferreira Lopes, Roberto Araújo Ruzi, Paulo Ricardo Rabello de Macedo Costa, Beatriz Lemos da Silva Mandim

Universidade Federal de Uberlândia (UFU), Hospital de Clínicas da Faculdade de Medicina, Serviço de Anestesiologia, Uberlândia, MG, Brazil

Received 29 September 2018; accepted 14 January 2019
Available online 20 October 2019

KEYWORDS
Regional anesthesia;
Brachial plexus block;
Costoclavicular;
Ultrasound;
Obesity

Abstract
Background and objectives: Costoclavicular brachial plexus block is an anesthesia performed through the infraclavicular route described in the literature as a safe and effective route for upper limb anesthesia distal to the elbow. The following report describes the case of a patient whose traditional plexus blocking techniques presented ultrasound visualization difficulty, but the costoclavicular approach was easy to visualize for anesthetic blockade.
Case report: A grade 3 obese patient scheduled for repair of left elbow fracture and dislocation. Ultrasound examination revealed a distorted anatomy of the supraclavicular region and the axillary region with skin lesions, which made it impossible to perform the blockade in these regions. It was decided to perform an infraclavicular plexus block at the costoclavicular space, where the brachial plexus structures are more superficial and closer together, supported by a muscular structure, lateral to all adjacent vascular structures and with full view of the pleura. The anesthetic block was effective to perform the procedure with a single injection and uneventfully.
Conclusion: Costoclavicular brachial plexus block is a good alternative for upper limb anesthesia distal to the elbow, being a safe and effective option for patients who are obese or have other limitations to the use of other upper limb blocking techniques.

* Corresponding author.
E-mail: grazielle.rs@gmail.com (G.R. Silva).

https://doi.org/10.1016/j.bjane.2019.09.003

PALAVRAS-CHAVE
Anestesia regional;
Bloqueio do plexo braquial;
Costoclavicular;
Ultrassonografia;
Obesidade

Bloqueio costoclavicular guiado por ultrassonografia como alternativa para anestesia de membro superior em paciente obeso

Resumo
Justificativa e objetivos: O bloqueio de plexo braquial via costoclavicular é uma anestesia feita por via infraclavicular, já descrita na literatura como uma via segura e efetiva para anestesia de membro superior distal ao cotovelo. O relato a seguir trata de um paciente em que as técnicas tradicionais para bloqueio de plexo apresentavam dificuldade de visibilização à ultrassonografia, já a via costoclavicular foi de fácil visibilização para execução do bloqueio anestésico.
Relato de caso: Paciente com obesidade grau 3 a ser submetido a correção de fratura e luxação de cotovelo esquerdo apresentava anatomia da região supraclavicular distorcida à avaliação ultrassonográfica e região axilar com lesões de pele, que impossibilitavam o bloqueio nessas regiões. Optou-se por fazer o bloqueio de plexo via infraclavicular no espaço costoclavicular, região onde as estruturas do plexo braquial estão mais superficiais e unidas, amparadas por uma estrutura muscular, laterais a todas as estruturas vasculares adjacentes e com a visibilização plena da pleura. O bloqueio anestésico foi efetivo para a realização do procedimento sob punção única em pele e sem intercorrências.
Conclusão: O bloqueio de plexo braquial via costoclavicular é uma boa alternativa para anestesia de membro superior distal ao cotovelo, é uma opção segura e efetiva para pacientes obesos ou que tenham outras limitações à aplicação de outras técnicas de bloqueio de membro superior.

Introduction

Regional anesthesia in obese patients is a daily and increasingly frequent challenge in the routine of anesthesiologists.[1] Ultrasound (US) has emerged as a facilitating tool in this process and, even so, the difficulty in identifying structures, positioning limitations, and decreased blockade effectiveness in obese patients are more frequent than in normal patients.[2] The US-guided Brachial Plexus Block (BPB) is a safe, well-established technique that has benefits for this group of patients, as it avoids airway management and provides good postoperative analgesia without the need for opioids.[1]

The costoclavicular (CC) approach for BPB has emerged as an alternative to the infraclavicular approach for upper limb analgesia distal to the elbow. It is established as an effective and easily performed technique, since the brachial plexus structures in this space are more superficial, with the three plexus fascicles interconnected and lateral to the vascular structures.[3,4] The technique consists of a single in-plane needle placement guided by US; it is possible to see the entire needle path with a single skin puncture and considered to be easy and safe to perform.[5] The following report describes the case of an obese patient who benefited from this new BPB approach.

Case report

Male patient, 28 years old, weigh 120 kg, height 1.72 m (BMI 40.6; Grade 3 obesity $kg.m^{-2}$), former smoker and former alcoholic for six months, without other comorbidities, diagnosed with fracture and left elbow dislocation after a car accident. In preoperative fasting, the patient was admitted to the operating room with functioning venous access in the right upper limb. After monitoring with cardioscopy, oximetry and noninvasive pressure, sedation with midazolam (5 mg) and fentanyl (100 μg) was performed to obtain a Ramsay sedation level 2.

The initial anesthetic proposal was the supraclavicular US-guided brachial plexus block with axillary complementation, but during the US inspection it was not possible to safely identify the vascular and brachial plexus structures in the supraclavicular region, possibly because of anatomical variation or technical difficulty due to elevated BMI (Fig. 1). Additionally, in the axillary region, erythematous nodules with signs of secondary infection at the blockade site to be performed. Thus, the axillary region was contraindicated.

However, upon US-guided inspection of the brachial plexus in the infraclavicular region via costoclavicular approach, we obtained a good visualization of the structures (axillary artery and vein and the three brachial plexus fascicles lateral to them) and opted for the Costoclavicular Brachial Plexus Block (CCBPB) for the procedure (Fig. 2).

To perform the CCBPB, the patient was placed in supine position and contralateral rotation of the head, with the upper limb to be anesthetized positioned on a mayo table at 90° abduction. Antisepsis with alcohol solution and 0.5% chlorhexidine was performed, and the high frequency linear transducer (10–18 MHz) of the ultrasound device (MyLab25™Gold) was positioned just below the middle third of the clavicle. The axillary artery and vein were located and, laterally to them, the three components of the brachial plexus (lateral, posterior, and medial fascicles). Keeping these components constantly visible, a neurostimulator needle (Locoplex A100 brand) was introduced in-plane (the entire needle path was visible) until it penetrated the fascia covering the three fascicles. The needle was positioned

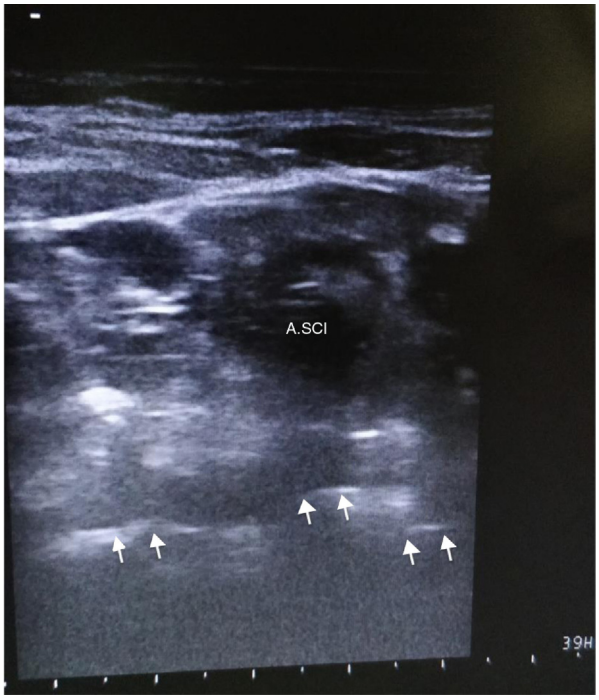

Figure 1 Image of the supraclavicular region of the case reported. Note that it is not possible to safely identify the brachial plexus components. ASCl, subclavian artery; arrows, pleura.

between the lateral and posterior fascicles and, at this location, 20 mL of 0.75% ropivacaine and 20 mL of lidocaine with 1.5% vasoconstrictor were injected to reduce latency, besides providing lasting analgesia as surgery could be prolonged.[6]

With a single-injection technique, the blockade was performed uneventfully. Ten minutes after the anesthetic injection, the dermatome sensitivity test of the radial, musculocutaneous, median, and ulnar nerves was performed, and effective blockade was detected in all dermatomes tested.

Surgical procedure was uneventful and lasted 135 minutes. Six hours after surgery, the patient was reevaluated in bed, showing no pain in the operated limb and persistence of mild residual block, with paresthesia in left hand fingers, but already showing movement. The patient was discharged 21 h after the procedure with complete reversal of the blockade.

Discussion and conclusion

In recent decades, obesity has become one of the most important public health problems worldwide and its prevalence has increased significantly in recent years. This epidemic situation has important implications for anesthesiologists, considering that these patients commonly present with other predictors of difficult anesthetic management, such as obstructive sleep apnea, coronary disease, and pulmonary changes, among others.[1]

Regional anesthesia offers advantages for obese surgical patients, such as minimal airway intervention, improved postoperative analgesia, and decreased opioid consumption.[2] The advent of the US-guided BPB technique allowed the anesthesiologist to perform upper limb blockade at various sites along the brachial plexus, aiming at improving anesthetic effectiveness, greater safety and patient comfort, in addition to good postoperative analgesic efficacy. However, anthropometric changes associated with obesity may technically hinder peripheral nerve blocks, and the traditional blockade approaches are not always the best option for this type of patient.[7]

CCBPB has been described as an innovative approach in which it is possible to visualize in the infraclavicular space the three brachial plexus fascicles, from which the forearm main nerves (radial, median, musculocutaneous, and ulnar) responsible for motor and sensory function originate. These structures are more superficially arranged in the costoclavicular region, which allows full visibility of the vascular structures and chest wall.[3,4] This new approach has been evaluated in recent years as safe and effective for anesthesia in elbow, forearm, wrist and hand surgeries with the advantages of a single injection, good effectiveness,

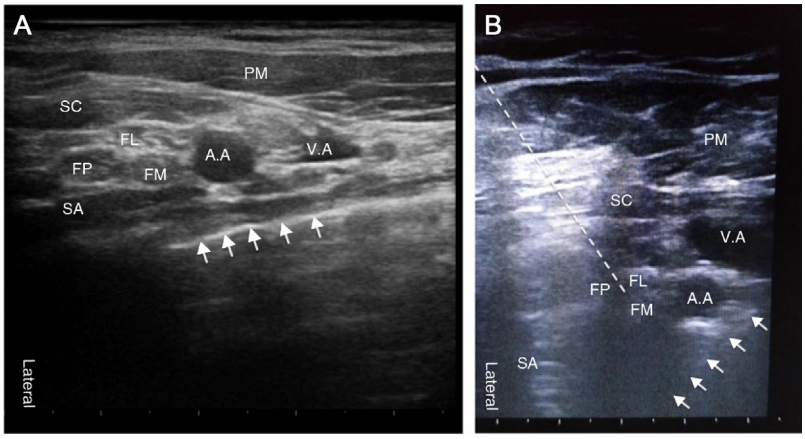

Figure 2 Costoclavicular space. (A) Image of costoclavicular space in eutrophic patient. (B) Image of costoclavicular space in the case described. PM, pectoralis major; SC, subclavian; AS, serratus anterior; FL, lateral fascicle; FP, posterior fascicle; FM, medial fascicle; AA, axillary artery; VA, axillary vein; arrows, pleura; dashed line, needle positioning site.

technically ease to perform, in addition to the possibility of continuous postoperative analgesia using a continuous anesthetic infusion catheter, which improves patient recovery comfort.[5]

This case report describes the CCBPB technique as an option to upper limb anesthesia distal to the elbow for patients in whom other BPB approaches are not possible or safe to perform. In our report we show a case in which a US-guided anesthetic block was effective and uneventful with a single skin puncture and single in-plane needle placement, which allowed the entire needle path to be seen and also provided good visibility of structures, such as the axillary artery and vein and the three brachial plexus fascicles.

Eventually, a mixture of local anesthetics is recommended in cases requiring a shorter onset latency of blockade to confirm analgesia efficiency, while its prolongation is required, as in complex surgery in obese patients.[6] Another option for analgesia maintenance would be the introduction of a catheter in the costoclavicular region, considering that in this region the brachial plexus is surrounded by the anterior subclavian and serratus muscles, which allow the catheter to be safely inserted and fixed.[5]

The choice of anesthetic volume was based on a study that described the minimum effective volume for 90% of patients (MEV90) as 34 mL of anesthetic in CCBPB.[8] Based on this study, we chose to use a similar volume in the reported case, but further studies are likely to demonstrate the use of even lower doses through this route, as described by another study that found good blockade effectiveness with a local anesthetic volume of only 20 mL.[4]

The evolution of regional anesthesia techniques with the development of ultrasound enabled the anesthesiologist to improve both the effectiveness and safety of the anesthetic technique. Knowing the peculiarities of each patient, their limitations and demands, enables the anesthetic technique to be individualized, making the experience of the patient and the support team more comfortable. In this context, costoclavicular block appears as another possibility for a safe, effective brachial plexus anesthetic approach, with the promising possibility of providing continuous analgesia for patients with upper limb injuries distal to the elbow.

Conflicts of interest

The authors declare no conflicts of interest.

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