Case report

Bilateral ultrasound-guided supraclavicular block

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\textbf{Abstract}

Analgesic management in patients with bilateral trauma to the shoulder or the proximal third of the arm is difficult. The multimodal strategy based on the administration of local analgesics to the brachial plexus appears to be the most effective; however, there are risks associated with bilateral blocks, including phrenic nerve palsy, toxicity due to local anesthetics, and bilateral pneumothorax. These risks may be diminished using an ultrasound-guided supraclavicular approach to the brachial plexus.

This paper describes the management of a patient with bilateral injury to the shoulder and the proximal third of the humerus. The patient is taken to bilateral humeral fixation surgery and develops severe post-operative pain which does not respond to high-dose opioids and anti-inflammatory agents. He is managed initially with bilateral ultrasound-guided supraclavicular block using a low volume of a local anesthetic followed by continuous administration of bupivacaine. Pain assessment was 2/10 at 24 h and 3/10 at 48 h.

We concluded that bilateral supraclavicular blockade is an option in the acute management of pain after surgery to the shoulder and the proximal third of the humerus. Continuous administration of local anesthetics to the brachial plexus helps maintain the analgesic response.

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\textbf{Palabras clave:}
Bloqueo nervioso
Analgesia
 Plexo braquial
 Ultrasonido

\textbf{Resumen}

El manejo analgésico de los pacientes con trauma bilateral de hombro o tercio proximal del brazo es difícil. La estrategia multimodal basada en administración de anestésicos locales en el plexo braquial parece ser la más efectiva, pero hacer bloques bilaterales tiene riesgos asociados, como son: la parálisis del nervio frénico, la toxicidad por anestésicos locales y el neumotórax bilateral. Estos pueden ser disminuidos con una aproximación supraclavicular al plexo braquial y el uso de ultrasonografía.


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Describimos el manejo de un paciente con trauma bilateral de hombro y tercio proximal de húmero, quien es llevado a cirugía de osteosíntesis bilateral de húmero y presenta dolor postoperatorio severo que no responde a dosis altas de opiáceos y antinflamatorios. Es manejado inicialmente con bloqueo supraclavicular bilateral guiado por ecografía con volumen bajo de anestésico local y posteriormente administración continua de bupivacaína, con una valoración del dolor de 2/10 a las 24 h y 3/10 a las 48 h.

Concluimos que el bloqueo supraclavicular bilateral es una opción para el manejo del dolor agudo en cirugía de hombro y tercio proximal de húmero. La administración continua de anestésicos locales al plexo braquial contribuye a mantener la respuesta analgésica.

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**Case description**

Trece y medio láminas varón que denuncia dolor en ambos hombros y pérdida funcional de 1 día de duración. Las radiografías muestran una luxación fracturada del hombro izquierdo y luxación del hombro derecho. El paciente es llevado a cirugía para reducción cerrada de ambos hombros. Se realiza una inversión del cuello para el control del dolor postoperatorio, utilizando 15 ml de levobupivacaína 0.375%.

Dos días después, el paciente es llevado a cirugía para fijación bilateral de húmero y reparación del cuello rotador (ver Fig. 1).

Durante el periodo postoperatorio, el paciente desarrolló dolor severo, que no mejoró a pesar de dosis altas de opioides y NSAIDs. Se decidió realizar un bloqueo supraclavicular bilateral (ver Fig. 2) utilizando 10 cc de levobupivacaína 0.375% en cada lado, logrando control del dolor durante un período de 12 h.

Después de los dos bloqueos, el paciente no muestra evidencia de disminución de la respiración o desaturación en cualquier momento. No se encuentra ninguna anomalía en la radiografía de tórax.

Después de 12 h, el dolor volvió y fue valorado como 10/10 en la escala numérica verbal, particularmente en el hombro izquierdo. Consecuentemente, se decidió colocar un catéter supraclavicular para infusión continua de bupivacaína 0.1% a un ritmo de 5 cc por hora (ver Fig. 3), logrando buen control del dolor valorado como 2/10 a las 24 h y 3/10 a las 48 h (ver Fig. 4).

**Discussion**

La cirugía de hombro está asociada con dolor postoperatorio significativo que requiere el uso de opioides a alta dosis, lo que favorece la aparición de efectos secundarios como vómito, náuseas, prurito, disnea y retención urinaria.1

La mejor estrategia para el control del dolor postoperatorio en cirugía de hombro es un enfoque multimodal que consiste en el uso simultáneo de NSAIDs, opioides y anestésicos locales, ya sea a través de una bloqueo o infiltración en la herida.2

Los bloqueos periféricos con anestésicos locales utilizados en este tipo de cirugía incluyen: interscalene, subacromial, intra-articular, suprascapular y axilar.1,3 La infiltración subacromial es realizada por el cirujano antes de cerrar la herida, llenando el espacio subacromial con 20–50 cc de anestésico local. Esta técnica sencilla es una buena alternativa al

**Fig. 2 – Supraclavicular block. PB: brachial plexus; A: artery; P: pleura.**

**Fig. 1 – Shoulder X-ray. D: right; I: left.**
Are there any recommendations for bilateral upper-limb blocks?

It has always been believed that performing bilateral surgery in injured limbs simultaneously is not a good option, either from the surgical or anesthetic point of view. However, surgeons have recently chosen to take patients with bilateral trauma to a single-stage surgical solution. This poses a significant challenge for the anesthetist, in particular when the injury is to the upper limb, because the option of neuroaxial anesthesia, available for lower limb surgery, is not available for the upper limbs.

At the present time, ultrasonography has become widely used as a tool for direct visualization of the anatomical structures and of the needle, leading to a lower rate of adverse effects caused by blind identification of the nerves and the administration of large volumes of local anesthetic with their potential toxicity. This means that ultrasonography is a good alternative for performing simultaneous peripheral blocks.

Considering that there is not just one approach for bilateral anesthesia in the upper limb, the only option open to the anesthetist for providing regional anesthesia or analgesia in a patient with bilateral upper limb injury is a bilateral brachial plexus block.

If bilateral brachial plexus block is considered, it is of vital importance to bear in mind the main risks of this technique, including toxicity due to local anesthetics, phrenic nerve palsy, and pneumothorax. The development of toxicity due to local anesthetics is a multifactorial reaction influenced not only by individual characteristics beyond the control of the practitioner, but also by other factors that may be controlled, including the rate of administration and the mass (concentration) of the local anesthetic. When a nerve block is used as the single anesthetic strategy in bilateral procedures, the amount of local anesthetic required usually exceeds the toxicity limits, although this is something that happens often with no significant clinical effect. The option of supplementing regional anesthesia with profound intra-operative sedation in order not to surpass those limits ensures adequate post-operative analgesia, which is usually difficult to achieve in these surgical procedures. However, there are groups of anesthetists who prefer regional anesthesia and have managed, through the use of ultrasound, to reduce the effective amount of the drugs in order to achieve surgical blockade with a minimum amount of local anesthetic.

Phrenic nerve palsy is a very important consideration when administering bilateral brachial plexus blockade. When it happens, it may create a serious condition requiring mechanical ventilation because of bilateral diaphragmatic paralysis. In this regard, it is critical to consider the level of plexus block, because for the axillary and infraclavicular approaches, the presence of this adverse reaction is hardly inexistente, whereas with the interscalene block is it very high. However, axillary and infraclavicular blocks for shoulder and proximal humerus surgery are practically useless; and even though they are possible if low concentrations of the local anesthetic are used, they entail a huge risk. Bearing these considerations in mind, the only option left is to perform a supraclavicular block which, although not free of the risk of phrenic nerve palsy, may
provide adequate post-operative analgesia in patients undergoing shoulder or proximal humerus surgery, as long as the local anesthetic is administered under ultrasound guidance to help identify the suprascapular nerve, which traverses at this level, lateral to the brachial plexus (see Fig. 5).15

In 1979, Knoblanche published a paper showing that the incidence of phrenic nerve palsy with the use of the supraclavicular block was 67%.16 However, it has been determined recently that this incidence is closer to 17%17 and that, with the use of ultrasound guidance, it may be reduced almost completely,18 which could be very useful should a bilateral supraclavicular block be needed.

The risk of pneumothorax when brachial plexus blockade is used varies depending on the site of approach, and is estimated to range between 0.3 and 6% for paresthesias in the case of the landmark-guided supraclavicular approach.19 The incidence of this complication in ultrasound-guided supraclavicular approaches is unknown and, to date, there are only case reports that are insufficient to arrive at a clear determination of this risk, although it is considered to be extremely low.8

Bilateral proximal brachial plexus blockade at the supraclavicular level may be an option for the analgesic management of patients with bilateral injuries of the shoulder and the proximal third of the humerus, considering that there are associated risks that could be diminished with the use of ultrasonography and the administration of lower amounts of local anesthetics.

And what about continuous blocks for bilateral upper limb surgery?

Continuous administration of low-dose local anesthetics is very useful for controlling post-operative pain in upper limb surgery, but recommendations for bilateral administration are scarce. Although bilateral use of continuous 0.2% ropivacaine has been reported using the interscalene approach,14 the risk of phrenic nerve palsy and the catheter migration are important considerations, and the need for monitoring potential complications using special devices such as a spirometer or an ultrasound machine may limit its use during the perioperative period. The supraclavicular approach to the brachial plexus for the continuous administration of local anesthetics is an analgesic option for patients with shoulder and proximal arm injuries, but there are no references in the literature regarding its bilateral use.

Conclusions

Ultrasound-guided bilateral supraclavicular brachial plexus blockade is an analgesic option in cases of surgery of the shoulder and proximal third of the arm, because it allows the use of low-dose local anesthetics, and entails a lower risk of phrenic nerve palsy compared to the interscalene approach. However, clinical monitoring has to be optimized to ensure early detection of signs of respiratory distress or breathing complications. A useful tool to diminish the risk of toxicity due to local anesthetics is to administer the anesthetic at different times on each side, thus reducing the plasma peak usually associated with adverse effects. Continuous brachial plexus block with local anesthetics at low concentrations may be used for post-operative analgesia in the most painful limb or the limb undergoing the bloodiest procedure, always supplemented with a multimodal strategy.

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Conflict of interest

None declared.

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Fig. 5 – Brachial plexus at the supraclavicular level. Supr: supraclavicular nerve. Photograph courtesy of Dr. Carlo Franco. Reprinted with permission.