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Review

Ultrasound and nerve stimulation-guided axillary block[☆]



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ABSTRACT

Introduction: The axillary block of the brachial plexus is widely used as an anaesthesia and analgesia technique in upper limb surgery, specifically for hand, wrist and forearm procedures. The use of nerve stimulation and ultrasound guidance has increased the rate of success with this block.

Objective: This article presents a non-systematic review of the most recent literature on axillary block of the brachial plexus using ultrasound and peripheral nerve stimulation.

Materials and methods: A search for a non-systematic review was conducted in the Cochrane, Pubmed/Medline, Embase and OVID databases.

Conclusion: The axillary block of the brachial plexus is an anaesthetic and analgesic technique for upper limb surgery that has a high percentage of success, with a low degree of difficulty for the procedure.

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Bloqueo axilar guiado por ultrasonido y neuroestimulador

RESUMEN

Introducción: El bloqueo axilar del plexo braquial es un bloqueo anestésico ampliamente utilizado como técnica anestésica y analgésica en cirugía de miembro superior, específicamente para mano, muñeca y antebrazo. El uso de neuroestimulador y ultrasonido ha aumentado la tasa de éxito de éste bloqueo.

Objetivo: El presente artículo hace una revisión no sistemática de la literatura más reciente relacionada con el bloqueo axilar del plexo braquial utilizando ultrasonido y estimulación de nervio periférico.

Palabras clave:

Ultrasonografía

Ultrasonido

Anestesia de conducción

Bloqueo nervioso

Analgesia

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Métodos y Materiales: Se hizo una búsqueda en las bases de datos de Cochrane, Pubmed/Medline, Embase y OVID para la realización de una revisión no sistemática.

Conclusión: El bloqueo del plexo braquial a nivel axilar es una técnica anestésica y analgésica para cirugía de miembro superior con alto porcentaje de éxito y bajo grado de dificultad en cuanto a realización del procedimiento.

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Introduction

The axillary block is a regional anaesthesia technique, involving blockade of the brachial plexus at the axillary level. It is widely used as an anaesthetic and analgesic technique in upper limb surgery, specifically for hand, wrist and forearm procedures. In the axillary block, the terminal branches of the brachial plexus are blocked. The use of nerve stimulation and ultrasound has increased the rate of success with this block¹ and has reduced the incidence of complications. Unlike the inter-scalene and supra and infraclavicular blocks, the risk of injury to the stellate ganglion, pneumothorax or phrenic nerve palsy is practically non-existent with this block because of the site where the puncture is performed.^{2,3}

Methods

A search was conducted in the Cochrane, Medline/Pubmed, OVID and EMBASE databases using the words axillary block, ultrasound, nerve stimulator, regional anaesthesia. Included in the search were meta-analyses, systematic reviews, clinical trials and non-systematic reviews, and articles in English, Spanish and French.

Results

History

The first percutaneous axillary block was described by Hirschel in 1911.⁴ In 1958, Burnham described how the axillary neurovascular bundle was enveloped by a fascia that could be "filled" with local anaesthetic.⁵ In 1961, De Jong referred to the axillary space as a pyramid of 42 ml in volume, and described that the nerves and blood vessels were surrounded individually by septae.⁶ In 1979, Eriksson and Skarby used a tourniquet distal to the axillary injection site and, in 1984, Thompson and Rorie identified the brachial plexus septae in the axillary space as preventing the homogenous spread of the anaesthetic.⁷ More recently, cadaver studies using nuclear magnetic resonance have concluded that the terminal branches are lined by connective tissue and fascial sheaths that prevent the anaesthetic from flowing homogeneously after a single injection and covering the entire plexus.^{8,9} The nerve stimulator was introduced in the 1990s, and ultrasound has been introduced in recent years¹⁰; their use has increased the rate of success with the axillary block. The use of nerve stimulation and ultrasound has also reduced the number of complications because

of the smaller volume of local anaesthetic required to achieve blockade,¹¹⁻¹³ although there are reports in which the use of ultrasound does not reduce the occurrence of complications when compared to the nerve stimulator.¹⁴ Complications associated with the axillary block include toxicity from the local anaesthetics¹⁵ and neurological and vascular injury,^{16,17} although there is a paucity of reports in the literature on these occurrences, supporting the theory that this block provides a high safety margin. Obesity increases the risk of vascular puncture and failure rates with this type of block.¹⁸

Anatomy

The brachial plexus arises from the ventral branches of C5 to C8. At the level of the scalene muscles, these branches regroup to form the superior, middle and inferior trunks, and when they leave the inter-scalene space, they form anterior and posterior divisions at the supraclavicular level. The divisions regroup again at an infraclavicular level to form the three lateral, posterior and medial cords which finally give rise to the five terminal branches at the axillary level: radial, axillary, musculocutaneous, median and ulnar nerves (Fig. 1).¹⁹

The radial nerve arises from the posterior cord. It runs together with the radial artery along its posterior aspect and breaks away from the neurovascular bundle at the axillary level in order to continue along the spiral humeral groove. It provides sensation to the posterior and lateral aspects of the arm and forearm down to the wrist, the lateral aspect of the dorsum down to the hand, the dorsal surface of the first three digits and half of the fourth digit. It provides motor innervation

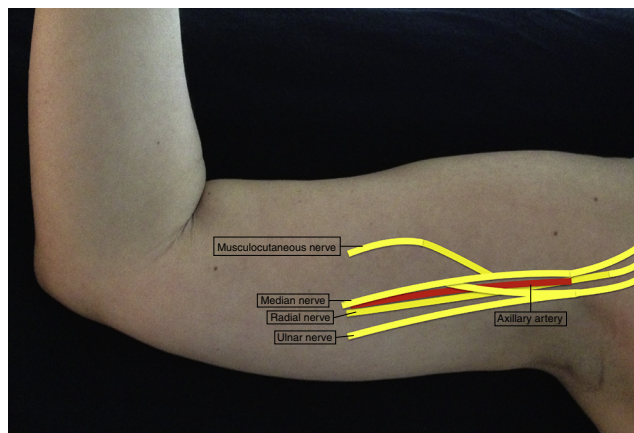


Fig. 1 – Illustration of the terminal branches of the brachial plexus at the axillary level.

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