Comparison between Supraclavicular and Interscalene Brachial Plexus Blocks in Patients Undergoing Shoulder Joint Arthroscopy

Thesis

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُواْ فَسَيَرَى اللّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

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INTRODUCTION

Peripheral nerve blocks play an important role in modern regional anaesthesia and pain medicine. The concept of direct visualization of nerve structures via ultrasonography is convincing and supported by recent publications ***(Marhofer et al., 2005).***

Advocates of use of ultrasound believe that the use of ultrasound technology provides a superior technique by allowing visualization of the target structure (i.e. the nerve) and other structures of interest (i.e. blood vessels, lung, pleura,…), a real time examination of the spread of local anesthetic as it is injected, and the ability of reposition of the needle to both avoid injury and increase success rates ***(Hopkins, 2007).***

Ultra-sonographic guidance for peripheral nerve blocks offers significant advantages compared with conventional methods such as peripheral nerve stimulation and nerve mapping. It shortens sensory onset times, improves the quality and the duration of blocks, may avoid complications such as intraneuronal punctures, inadvertent vessel punctures and pneumothorax during periclavicular brachial plexus blocks, and enables a reduction of the volume of local anaesthetic due to precise administration of the local anaesthetic solution ***(Marhofer et al., 2010).***

Ultrasound guidance may eliminate the need for electrical stimulation and therefore reduce pain of the block. This was confirmed by a study of an infraclavicular block comparing ultrasound guidance and nerve stimulator guidance in children ***(Frederiksen et al., 2010).***

Claimed benefits of ultrasound guided regional anaesthesia include that it is easier to learn and perform, quicker to perform, has a faster onset, results in higher success rates, results in more complete block, requires lower volumes of local anesthetic, and increases safety ***(Denny et al., 2005).***

Brachial plexus nerve block has analgesic and opioid sparing benefits for upper extremity surgery. Single-injection techniques are limited by the pharmacological duration and the therapeutic index. Continuous catheter techniques while effective can present management challenges ***(Choi et al., 2014).***

AIM OF THE WORK

The aim of this work is to compare between Supraclavicular brachial plexus block and interscalene block in patients undergoing shoulder arthroscopy regarding motor, sensory block and the incidence of side effects.

Chapter One

ANATOMICAL AND PHARMACOLOGICAL BACKGROUND

Anatomy of Brachial Plexus:

The anterior horn cells that are cell bodies for motor neurons resides in the ventral horn of the spinal cord and send their motor outflow through the ventral root. The ventral roots exit the spinal cord and combine with the dorsal roots to form spinal nerves. The spinal nerves divide into anterior and posterior rami, and there are the anterior rami that contribute to the formation of the brachial plexus ***(Hentz and Hong, 2003).***

The brachial plexus receives contributions from cervical roots C5, C6, C7, C8 and T1 **.**The sympathetic supply to the head and neck arises from the first thoracic segment and reaches the spinal nerves through the grey ramus from the inferior cervical ganglion **.**Damage to the T1 root may result in an ipsilateral Horner's syndrome **[Fig. 1]** ***(Hentz and Hong, 2003).***

In the neck, the brachial plexus lies between the scalenus anterior and scalenus medius and then deep to the sternocleidomastoid muscle. It emerges from below the sternocleidomastoid muscle and three trunks are formed above the clavicle **[**(upper) C5**-**C6, (middle) C7, (lower) C8**-**T1 ***(Hentz and Hong, 2003).***

Behind the clavicle, the anterior and posterior divisions of the trunks reconfigure to form three cords. The upper two anterior divisions unite together to form the lateral cord, the anterior division of the lower trunk runs on as the medial cord, while all three posterior divisions unite together to form the posterior cord ***(Hentz and Hong, 2003).***

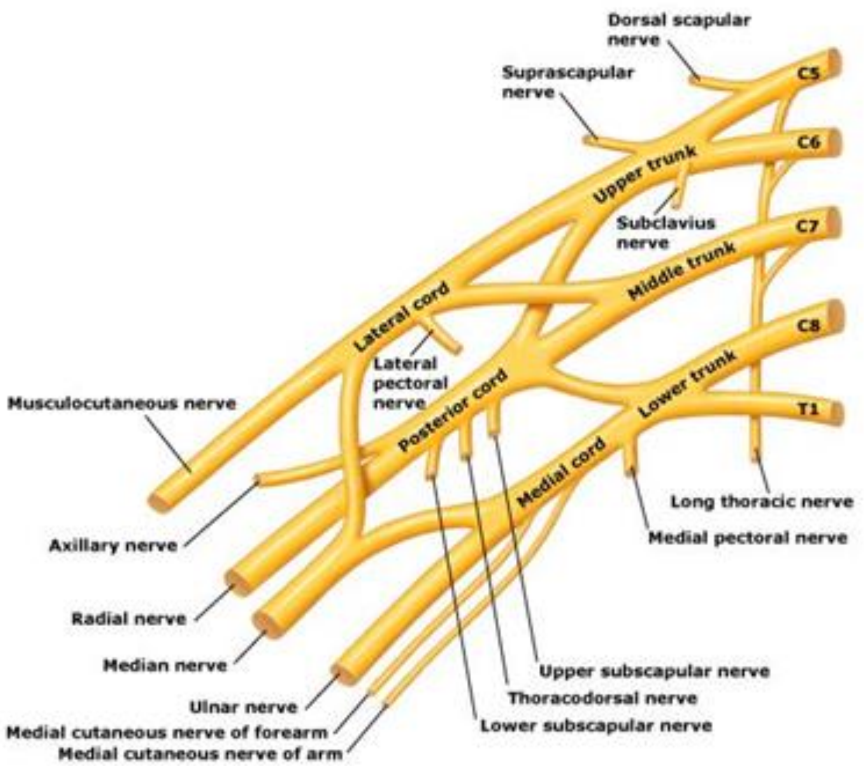

Figure 1: Brachial plexus from roots to terminal divisions ***(Hentz and Hong, 2003).***

Roots:

The anterior rami of the spinal nerves of C5, 6, 7, 8 and T1 form the roots of the brachial plexus; the roots emerge from the transverse processes of the cervical vertebrae immediately posterior to the vertebral artery, which travels in a cephalocaudal direction through the transverse foramina. Each transverse process consists of a posterior and anterior tubercle, which meets laterally to form a costotransverse bar ***(Hentz and Hong, 2003).***

The transverse foramen lies medial to the cost transverse bar and between the posterior and anterior tubercles. The spinal nerves which form the brachial plexus run in an inferior and anterior direction within the sulci formed by these structures ***(Hentz and Hong, 2003).***

The dorsal scapular nerve arises from the C5 root and passes through the middle scalene muscle to supply the rhomboidus and levator scapulae muscles. The long thoracic nerve to the serratus anterior arises from the C5,6 and 7 roots and also pierces the middle scalenus as it passes posterior to the plexus ***(Hentz and Hong, 2003).***

Trunks and divisions:

The trunks of the brachial plexus pass between the anterior and middle scalene muscles**.**The superior trunk lies closest to the surface and is formed by the C5 and C6 roots**.**The suprascapular nerve and the nerve to the subclavius arise from the superior trunk. The suprascapular nerve contributes sensory fibers to the shoulder joint and provides motor innervation to the supraspinatus and infraspinatus muscles. The C7 root continues as the middle trunk and the C8 and T1 roots join to form inferior trunk. The trunks divide into anterior and posterior divisions, which separate the innervations of the ventral and dorsal halves of the upper limb ***(Hentz and Hong, 2003).***

The phrenic nerve (C3, 4, 5) passes between the anterior and middle scalenes and continues over the surface of the anterior scalene muscle, thus a diaphragmatic twitch during interscalene brachial plexus performed with a nerve stimulator may indicate placement of the needle anterior to the plexus ***(Hentz and Hong, 2003).***

The spinal accessory nerve (CN XI) runs posterior to the brachial plexus over the surface of the middle and posterior scalenes. Contact with spinal accessory nerve with a nerve stimulator (stimulating twitch in the trapezius) indicates placement of the needle posterior to the plexus ***(Hentz and Hong, 2003).***

Cords and Branches:

The cords are named the lateral, posterior, and medial cord according to their relationship to the axillary artery. The cords pass over the first rib close to the dome of the lung and continue under the clavicle immediately posterior to the subclavian artery. The lateral cord receives fibers from the anterior divisions of the superior and middle trunks, and is the origin of the lateral pectoral nerve (C5,6,7). The posterior divisions of the superior, middle and inferior trunks combine to form the posterior cord ***(Hentz and Hong, 2003).***