Perineural versus Systemic Dexamethasone to Prolong Analgesia after ultrasound guided Inter-Scalene Brachial Plexsus Block in Arthroscopic Shoulder Surgeries

Thesis

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List of Abbreviations

Abb.	Full term
CNS	Central nervous system
COPD	chronic obstructive pulmonary disease
COX	Cyclooxygenase
DST	Dexamethasone suppression test
HPA axis	Hypothalamus pituitary adrenal axis
HR	Heart rate
ISB	Interscalene brachial plexus block
IV	Intravenous
K+	Potassium
LAs	Local anesthetics
MAP	Mean arterial blood pressure
Na+	Sodium
OR	Operating rooms

INTRODUCTION

Arthroscopic shoulder surgery is a minimally invasive technique which is used as a technique to treat certain diseases and injuries of the shoulder joint ***(Benitez and Torres, 2011)***.

Anesthetic options for shoulder arthroscopic surgery are general anesthesia, a combination of both general and regional anesthesia, and regional anesthesia with or without sedation. Regional anesthesia offers many advantages over general anesthesia for arthroscopic shoulder surgery ***(Seltzer et al., 1993)***. Since arthroscopic surgery is associated with significant postoperative pain, interscalene brachial plexus block (ISB) is well established as a preferred analgesic modality for it. In blocking the brachial plexus in the interscalene space, the anesthesia is applied to the roots or nerve trunk ***(Hughes et al., 2013)***.

Multiple adjuncts to local anesthetics such as epinephrine, clonidine or sodium bicarbonate have been examined for their potential to prolong analgesia after regional anesthesia, but with disappointing side effects ***(Axelsson and Gupta, 2009)***.

Dexamethasone is a glucocorticosteroid with anti-inflammatory properties that is used by anesthesiologists as a systemic, epidural, or perineural analgesic adjunct ***(Gordon et al., 2016)***. An alternative choice of intravenous dexamethasone has likewise been explored, which offers an effective adjunct to reduce postoperative pain and opioid consumption after surgery ***(Mccarthy et al., 2018).***

AIM OF THE STUDY

The objective of this study was to compare the analgesic duration of intravenous and perineural administration of Dexamethasone in interscalene block during arthroscopic shoulder surgery.

INTERSCALENE BLOCK

Anatomy of the Brachial Plexus

Brachial plexus is a complex network of nerves supplying the whole upper limb, including its motor and sensory supply, arising from the neck and passing through the axilla to the upper limb. It is composed of 5 roots, 3 trunks, 6 divisions, 3 cords, and terminal branches **(Figure 1)** (***Andres and Sala, 2001).***

1. Roots:

The ventral rami of spinal nerves from C5 to T1 are referred to as the roots of the brachial plexus. The typical spinal nerve root results from the union of the ventral nerve rootlets originating in the anterior horn cells of the spinal cord and the dorsal nerve rootlets ***(Andres and Sala, 2001).***

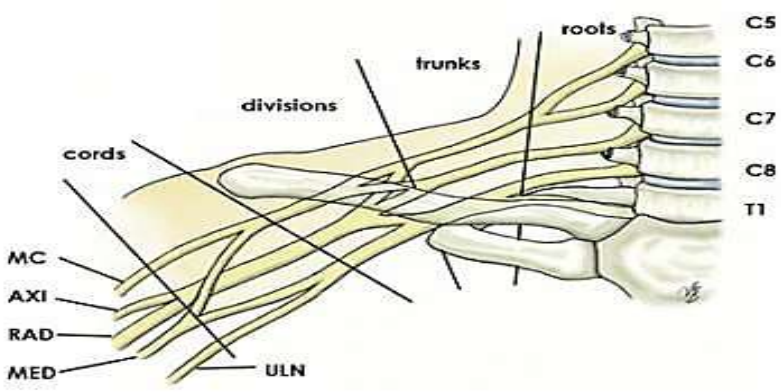

Figure (1): Brachial plexus with terminal branches labeled: MC is musculocutaneous nerve, AXI is axillary nerve, RAD is radial nerve, MED is median nerve, and ULN is ulnar nerve ***(Andres and Sala, 2001).***

The roots then get exit through the transverse processes of the cervical vertebrae just posterior to the vertebral artery, which runs in a cephalic direction through the transverse foraminae. Each transverse process consists of a posterior and anterior tubercle, which meet laterally to form the costotransverse bar (**Figure 2).** The transverse foramenlies medial to the costotransverse bar and between the posterior and anterior tubercles. The spinal nerves that form the brachial plexus run in an inferior and anterior direction with in the sulci which is formed by these structures. (***Gloss et al., 2006)***

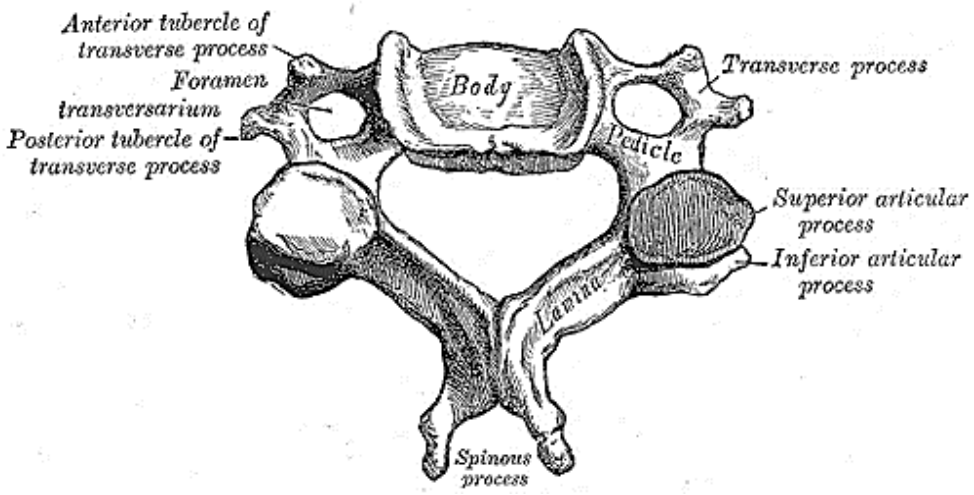

Figure (2): Typical cervical vertebra (***Gloss et al., 2006).***

2. Trunks:

Shortly after emerging from the intervertebral foraminae, the 5 roots (C5-T1) unite to form 3 trunks. One on top of the other, as they traverse the triangular interscalene space formed between the anterior and the middle scalene muscles. This

space becomes wider in the anteroposterior plane as the muscles approach their insertion on the first rib. Although the roots of the plexus are long, the trunks are as short (approximately 1cm) as they are wide, which shortly give rise to a total of six divisions (three anterior and three posterior), as they reach the clavicle ***(Franco and Vieira, 2000).***

The trunks are the point where the brachial plexus is confined to its smallest surface area, 3 nerve structures, closely related to each other, carrying the entire sensory, motor and sympathetic innervation of the upper extremity, with exception of a small area in the axilla and upper middle arm, which is innervated by the intercosto-brachial nerve, a branch of the2ndintercostal nerve ***(Singhal et al., 2007).***

The ventral rami of C5 and C6 unite to form the upper (superior) trunk, from which the suprascapular nerve and the nerve to the subclavius arise. The suprascapular nerve carries sensory fibers to the shoulder joint and provides motor innervation to the supraspinatus and infraspinatus muscles. The ventral ramus of C7 continues as the middle trunk. The ventral rami of C8 and T1 unite to form the lower (inferior) trunk (**Figure 3)** ***(Fazan et al., 2001)***.

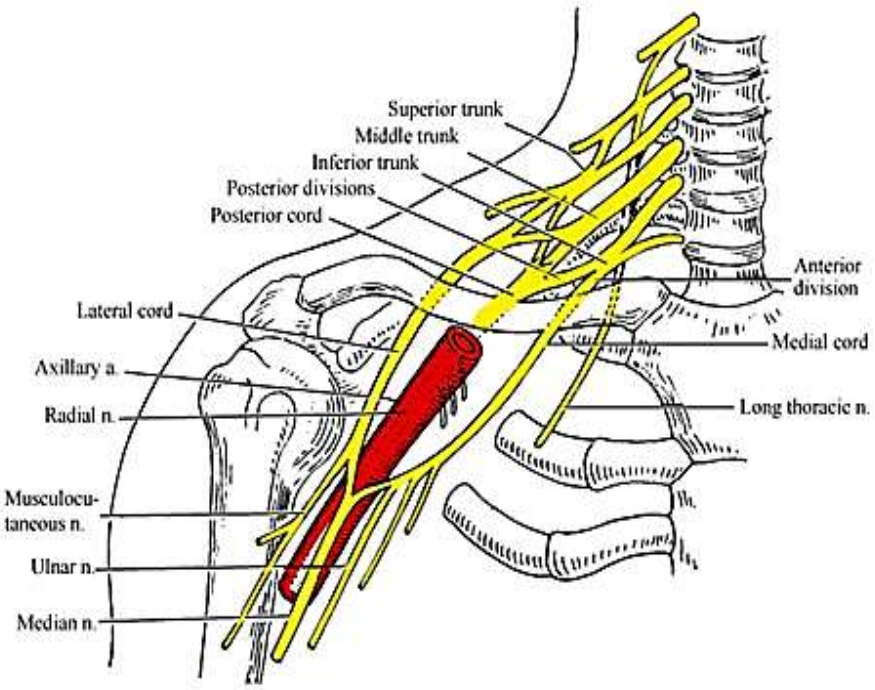

Figure (3): Basic relationships of the brachial plexus to the axillary artery, which is a continuation of the subclavian artery ***(Gloss et al., 2006).***

3. *Divisions:*

Each trunk divides into an anterior division and a posterior division, just above or little behind the clavicle. These separate the innervation of the ventral and dorsal aspect of the upper limb. The anterior divisions usually supply the flexor muscles while the posterior divisions usually supply the extensor muscles ***(Franco and Vieira, 2000).***

4. *Cords:*

The cords are referred to as the lateral, posterior, and medial cord, according to their relationship with 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 anterior divisions of the upper and middle trunks unite to form the lateral cord, that is the origin of the lateral pectoral nerve (C5, C6, C7).The anterior division of the lower trunk forms the medial cord, which gives off the medial pectoral nerve (C8, T1), the medial brachial cutaneous nerve (T1), and the medial antebrachial cutaneous nerve (C8, T1). The posterior divisions from each of the 3 trunks unite to form the posterior cord. The upper and lower subscapular nerves (C5, C6 and C7, C8, respectively) leave the posterior cord and descend behind the axillary artery to supply the subscapularis and teres major muscles. The thoracodorsal nerve to the latissimus dorsi muscles (known also as the middle subscapular nerve, C6, C7, C8) arises also from the posterior cord ***(Fazan et al., 2001).***

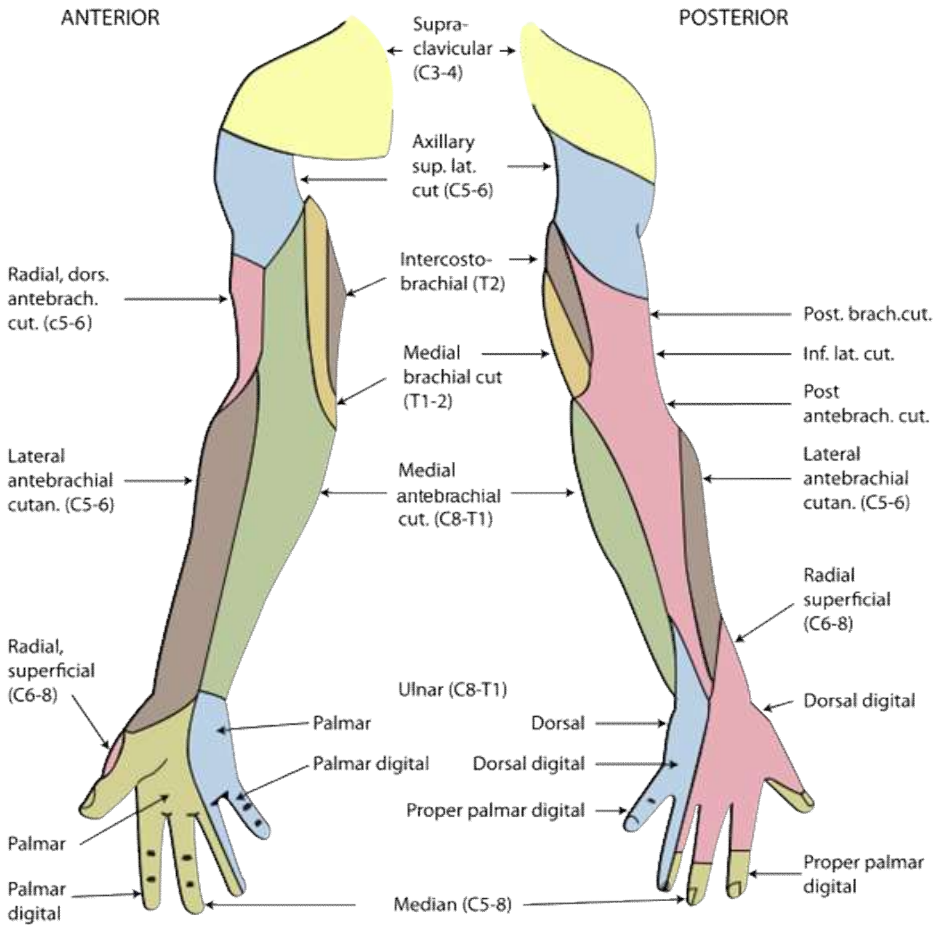

Figure (4): The dermatomes covered by the brachial plexus and their nerve supply ***(Fazan et al., 2001)***

Anatomical relations of the brachial plexus:

Formation of the brachial plexus begins just beyond the scalene muscles. In the neck, the brachial plexus lies in the posterior triangle, in the angle between the clavicle and lower part of the posterior border of the sternocleidomastoid. In this site, it is covered by skin, platysma and deep fascia. Various structures cross over it at this point, such as the supraclavicular