Fentanyl or Dexmedetomidine as an Adjuvant to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block: A Comparative Study

Thesis

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List of Abbreviations

Abb.	Full term
3DCRT:	Three-dimensional conformal radiotherapy
ACLS	Advanced Cardiac Life Support
ASA	American Society of Anaesthesiology
b/min	Beats/minute
BPB	Brachial Plexus Block
Cm	centimeters
CNS	Central Nervous System
CPR	Cardiopulmonary Resuscitation
CVS	Cardiovascular System
DOA	Duration of analgesia
ECG	Electrocardiogram
G	Gauge
HR	Heart Rate
Hrs	Hours
ICB	Infraclavicular Block
IP	in plane
IV	Intravenous
Kg	Kilogram

List of Abbreviations (Cont.)

Abb.	Full term
LA	Local Anaesthetic
mA	MilliAmpere
MAP	Mean arterial pressure
Mcg	Microgram
Mg	Milligram
MHz	Megahertz
Min	Minutes
NMDA	N-methyl-D-aspartate
OOP	out-of-plane
UG	Ultrasound guided
VAS	visual analog scale

Abstract

The present study showed that addition of dexmedetomidine to bupivacaine in ultrasound-guided supraclavicular nerve block shortened the onset times of both sensory and motor blocks and significantly prolonged their duration compared to fentanyl. Also dexmedetomidine prolonged the analgesia of brachial plexus block as well as postoperative analgesia with subsequent consumption of fewer amounts of analgesics.

The use of ultrasonography in performing the supraclavicular nerve block abolished nearly the incidence of complication such as pneumothorax or intravascular injection.

To conclude, we would like to state that dexmedetomidine prolongs the duration of sensory and motor block as compared with fentanyl when used as an adjuvant to bupivacaine in peripheral nerve block. Dexmedetomidine also increase time to first analgesic use, and decreases total analgesic use with no side-effects.

Keywords: Three-dimensional conformal radiotherapy - Brachial Plexus Block - Central Nervous System

INTRODUCTION

Upper extremity surgeries are commonly performed under regional anesthesia. Regional anesthesia of the upper extremity has several advantages over general anesthesia such as improved postoperative pain management, decreased postoperative narcotic consumption, and reduced recovery time ***(Bruce et al., 2012)***.

The supraclavicular block provides an excellent anesthesia of all branches of the brachial plexus as they pass through a relatively confined area ***(Bruce et al., 2012)***.

Ultrasound guided (UG) supraclavicular block has been shown to be a safe alternative to the blind supraclavicular brachial plexus block as it overcomes its complications like pneumothorax or hematoma ***(McCartney et al., 2007).***

Different adjuvants are used with local anesthetics to prolong the duration of anesthesia with less adverse effects, for example; opioids, α2 agonists, and dexamethasone. Addition of fentanyl to local anesthetic is known to significantly improve the duration of sensory and motor blockade as well as visual analog scale (VAS) Scores ***(Madhusudan et al., 2011 & Nishikawa et al., 2009).***

Dexmedetomidine, a potent centrally acting α2 agonist, is widely used for anesthesia, analgesia, monitored anesthesia

care, and as an adjuvant to local anesthetic for peripheral nerve block ***(Ammaeret al., 2012 & Swami et al., 2012).***

The purpose of the study will be to examine if dexmedetomidine added to bupivacaine enhances the duration of the motor block, sensory block, and duration of analgesia when compared to fentanyl added to bupivacaine for brachial plexus block.

AIM OF THE WORK

The aim of this study was to compare between Dexmedetomidine and Fentanyl as an adjuvant to bupivacaine in supraclavicular brachial plexus block as regards the onset and duration of the sensory and motor block as well as side effects.

Chapter 1
ANATOMY OF THE BRACHIAL PLEXUS

Brachial plexus is a complex of nerves supplying upper limb. It arises from the neck and passes 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).***

The brachial plexus is formed by the ventral rami of the fifth to eighth cervical nerves and the greater part of the ramus of the first thoracic nerve. In addition, small contributions may be made by the fourth cervical and the second thoracic nerves ***(Ajar et al., 2007).***

The important part of this anatomy is what happens from the time these ventral rami emerge from between the middle and anterior scalene muscles until they end in the four terminal branches to the upper extremity: the musculocutaneous, median, ulnar, and radial nerves ***(Ajar et al., 2007).***

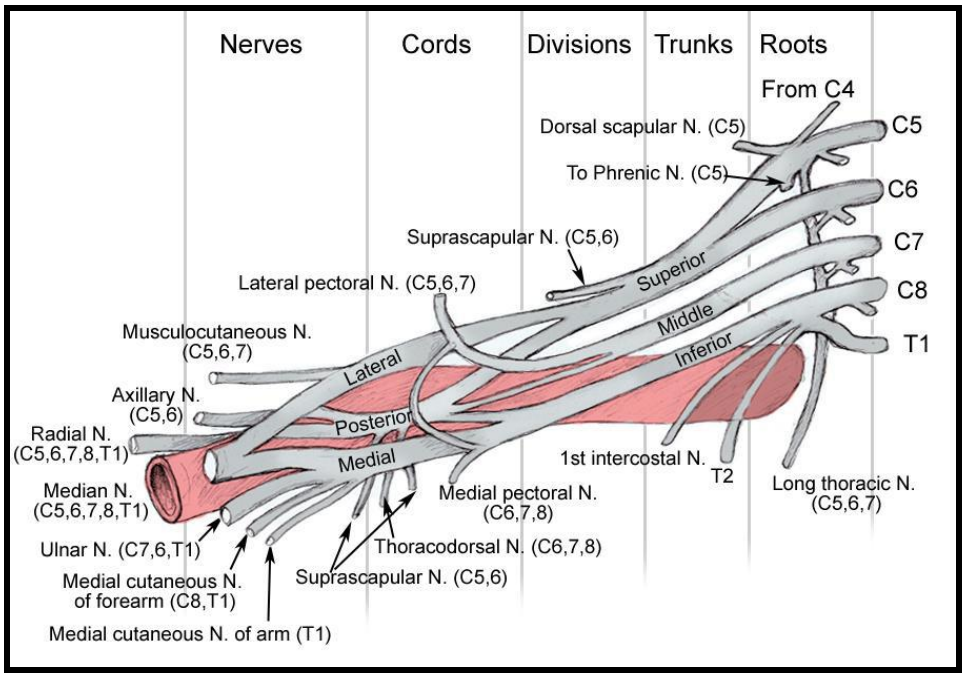

Figure (1): Gross anatomy of brachial plexus ***(Andres and Sala, 2001).***

1- Roots:

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

The root exits through transverse processes of the cervical vertebrae posterior to the vertebral artery.

2-Trunks:

After exiting from intervertebral foraminae, the five roots unite together to form three trunks. They emerge from

interscalene space between scalenus anterior and scalenus medius muscles. This space becomes wider in the anteroposterior plane near their insertion on the first rib. The trunks give rise to six divisions (three anterior and three posterior), as they reach the clavicle ***(Franco and Vierira, 2008).***

The area of the trunks corresponds to the point where the brachial plexus is confined to its smallest surface area, three nerves carrying sensory, motor and sympathetic innervation of the upper limb except small area in the axilla and upper middle arm which is innervated by the intercostobrachial nerve-a branch of the 2nd intercostal nerve ***(Singhal et al., 2007).***

The ventral rami of C5 and C6 unite together to form upper trunk, from which the suprascapular nerve and nerve to the subclavius arise. The suprascapular nerve supply sensation to shoulder joint and provides motor supply to supraspinatus and infraspinatus muscles. The ventral ramus of C7 continues as the middle trunk. The ventral rami of C8 and T1 unite forming the lower trunk ***(Fazan et al., 2001).***

3- Divisions:

Each trunk splits into an anterior division and a posterior division. These separate the innervation of the ventral and dorsal aspect of the upper limb. The anterior divisions usually supply flexor muscles. The posterior divisions usually supply extensor muscles ***(Franco and Vieira, 2000).***