EFFECT OF DEXAMETHASONE AS A LOCAL ANESTHETIC ADJUVANT IN ULTRASOUND GUIDED BRACHIAL PLEXUS BLOCK

An Essay

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By

Karim Ahmed Ramadan Bassiouny

MB. B.CH

Supervised by

Prof.Dr.Omar Mohamed Taha Abd-Allah El-Safty

Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University

Dr. Wael Reda Hussain Thabet

Assistant Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University

Dr. John Nader Naseef Bastaros

Lecturer in Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

﴿وَعَلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا﴾

صدق الله العظيم

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List of Abbreviations

Abb.	Full term
µg	Microgram
AA	Axillary Artery
ASM	Anterior scalene muscle
AV	Axillary Vein
BPBs	Brachial plexus nerve blocks
c	Speed of time
CA	Carotid artery
CN XI	Cranial Nerve XI
D	Depth
dB	Decibel
DIC	Disseminated Intravascular Coagulopathy
DNA	Deoxyribonucleic acid
EU	European Union
f	Frequency
FDA	Food and Drug Administration
FR	First Rib
GR	Glucocorticoids receptors
HC	Health Canada
HZ	Hertz
I.V.	Intra venous
IJV	Internal Jugular Vein
IP	In Plane
ISB	Inter scalene block
IV	Intravenous
K	Potassium
LA	Local anesthetic
LAST	Local anesthetic systemic toxicity
mA	milliAmpere
MAC	Minimum alveolar concentration
Mg	Milligram
MHz	Mega Hertz
msec	Milli second
MSM	Middle Scalene Muscle

List of Abbreviations cont...

Abb.	Full term
MSM	Middle scalene
mV	Milli volt
N	Nerve trunks
Na	Sodium
NSAIDs	Non-steroidal anti-inflammatory drugs
OOP	Out Of Plane
OR	Operating Room
PABA	P-amino benzoic acid
PACU	Post Anaesthesia Care Unit
PMiM	Pectoralis Minor Muscle
PMM	Pectroralis major muscle
PNBs	Peripheral nerve blocks
PONV	Postoperative nausea and vomiting
SA	Subclavian Artery
SCBP block	Supra scapular brachial plexus block
SCM	Sternocleidomastoid Muscle
T	Time
TP	Transverse Process
US	Ultrasound guided
λ	Wavelength

Abstract

There has been found a substantial clinical and statistical effect of adding perineural dexamethasone to LA used for brachial plexus blocks in terms of a prolongation of duration of analgesia as well as on the reduction of pain scores and opioid consumption postoperatively.

Low-dose dexamethasone is sufficient to enhance analgesia associated with brachial plexus blocks when applied perineurally.

Keywords: Middle scalene - Nerve trunks- Post Anaesthesia Care Unit - Peripheral nerve blocks - Sternocleidomastoid Muscle- Transverse Process- Ultrasound guided

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 have 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).***

Use of perineural dexamethasone as an adjuvant to the local anaesthetic has been utilized to prolong single-injection techniques ***(Nebojsa et al., 2015).***

Aim of the Work

The aim of this essay is to assess the contemporary literature and highlight the effects of dexamethasone on ultrasound guided BPB.

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).***

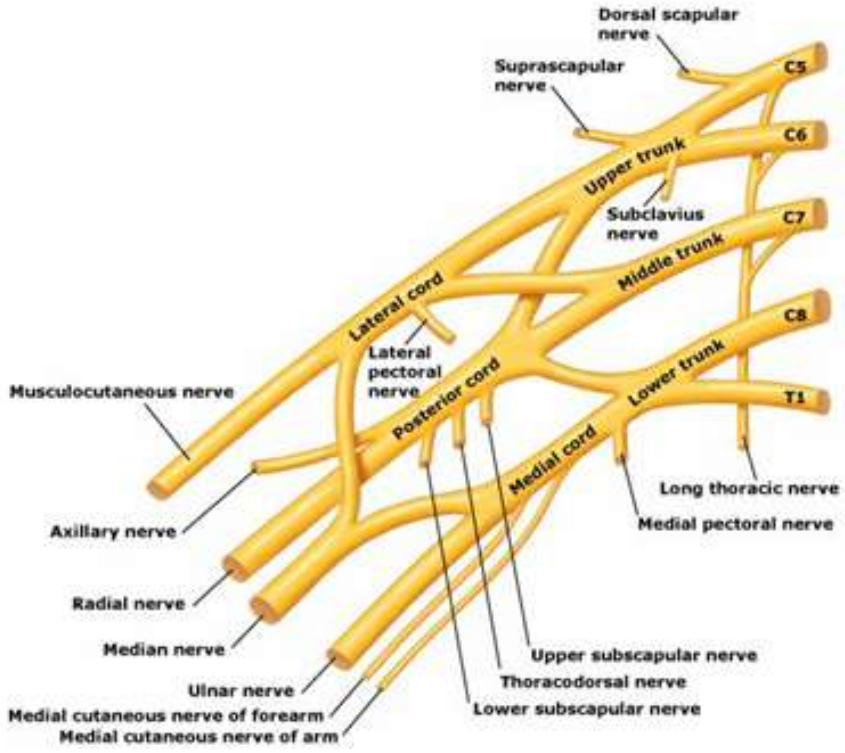

Fig. (1): Brachial plexus from roots to terminal divisions ***(Hentz and Hong, 2003).***

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