Ain Shams University
Faculty of Medicine
Anesthesia and Intensive Care Unit

Infraclavicular Brachial Plexus Block For Upper Limb Reconstructive Surgery And It's Postoperative Pain Relief

An Essay

Submitted for Partial Fulfillment of Master Degree
In Anesthesia

By

Emad Faik Zaky Shafeek
M. B. B.Ch., Faculty of Medicine, Assiut University

Under Supervision of

Prof. Dr. Azza Mohammed Shafik Abdel Mageed
Professor of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Dr. Sanaa Farag Mahmoud
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Dr. Raham Hasan Mostafa
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine - Ain Shams University

Ain Shams University
2013

First of all, I would like to thank "Allah" who provide me with his unlimited generosity, the medical knowledge, which I hope to be beneficial to people.

I would like to express my great and deep appreciation to Prof. Dr. Azza Mohammed Shafik Abdel Mageed, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, who give me honor of working under her supervision. She was kind to offer me much valuable time and advice.

I would like also to give my cardinal thanks to Dr. Sanaa Farag Mahmoud, Lecturer of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for her continuous support and direction that make realization of this work much more easy.

I owe a particular depth gratitude to Dr. Raham Hasan Mostafa, Lecturer of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for her extra ordinary help remarkable advice, close supervision and continuous encouragement.

Emad Faik Zaky

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List of abbreviations

Abbreviaton	Full name
5-HT3	5- hydroxy tryptamine 3
AA	Axillary artery
ACLS	Advanced Cardiac Life Support
AMHs	A mechano heat receptors
ARNI	Anesthesia related nerve injury
AS	Anterior scalene muscle
ASRA	American Society of Regional Anesthesia
AV	Axillary vein
CGRP	Calcitonin gene related peptide
Clv	Clavicle
CNS	Central Nervous System
CP	Coracoid process
C-PMN	C -Polymodal nociceptor
CPNBs	Continuous peripheral nerve blocks
CVS	Cardovascular system
DH	Dorsal Horn
DRG	The dorsal root ganglion
ECG	Electrocardiography
EMR	Evoked motor response

ES	Electrical stimulation
ESRA	European Society of Regional Anesthesia
GABA	Gamma aminobutyric acid
HTM	High threshold mechanoreceptors
I.V	Intravenous
IASP	The International Association for the Study of Pain
ICPB	Infraclavicular brachial plexus block
IP	The In plane Needle Approach
ISB	Interscalene block
LA	Local anesthetic
LAX	Long axis
LC	Locus coeruleus
LC	Lateral cord
MAOI	Monoamine oxidase inhibitors
MC	Medial cord
Mpa	Megapascal
MS	Middle scalene muscle
NE	Norepinephrine
NRM	The nucleus raphe magnus
NS	Nociceptive specific
NS	Nerve stimulation
OOP	The Out of plane Needle Approach

PAG	Periaqueductal gray matter
PB	The parabrachial area
PC	Posterior cord
PCA	Patient controlled analgesia
PMJ	Pectoralis major muscle
PMN	Pectoralis minor muscle
PN	The phrenic nerve
PNS	Peripheral nerve stimulator
RVM	Rostral ventromedial medulla
SA	Subclavian artery
SAX	Short axis
SpO2	Oxygen saturation
SSN	Suprascapular nerve
STT	The spinothalamic tract
TCA	Tricyclic antidepressant
UGRA	Ultrasounded guided regional anesthesia
US	Ultrasound
VA	Vertebral artery
VC	Vasoconstrictors
VPL	Venteral posterolateral nucleus
VPM	Ventral posteromedial nucleus
WDR	Wide dynamic range

Introduction

The procedure of applying local anesthetic agents around the nerves that form the brachial plexus has been of interest to both surgeons and anesthetists alike since it's first description by William Halsted in 1884 **(Baxter and Coventry, 1999).**

When compared with general anesthesia for surgery of the upper extremity, brachial plexus blockade has many potential benefits, including superior pain control, reduced requirement for systemic opioids, improved range of motion after various procedures, and facilitation of early discharge after ambulatory procedures **(Orebaugh and Williams, 2009).** It is a good alternative for severely ill patients, who benefit from the blockade instead of general anesthesia **(Gupta et al., 2009).**

The infraclavicular block is a useful but underused technique for regional anesthesia of the upper limb. An advantage of the approach is the needle direction, because it moves away from the lung, avoiding respiratory complication (pneumothorax). The block provides an effective, safe, and complete anesthesia of the upper limb and allows surgery of the hand, wrist, forearm, elbow, and third distal region of the arm **(Monkowski and Vitale, 2006).**

Continuous infraclavicular block provide site specific analgesia with least systemic effects. It could be effectively used for intraoperative anesthesia and as well as for very effective postoperative analgesia **(Bramanian, 2008).**

Anatomy of the Brachial Plexus

Performing upper extremity regional anesthesia requires a thorough knowledge of brachial plexus anatomy to facilitate the technical aspects of block placement and to optimize patient specific block selection **(Neal et al., 2009).**

The most proximal portion of the brachial plexus is located within the posterior triangle of the neck. The anatomic borders of this triangle include the clavicle inferiorly, the trapezius muscle posteriorly and the sternocleidomastoid muscle anteriorly. The platysma muscle, the deep fascia, and the skin complete the subcutaneous and surface anatomy of the triangle **(Bollini and Wikinski, 2006).**

Origin and Location of its Components :

The brachial plexus is a network of nerves which supply the upper limb with the root value C5-T1. These roots join with each other to form three trunks, each of which bifurcates into anterior and posterior divisions. These divisions reorient themselves to form lateral, medial and posterior cords, which give rise to different nerves for the upper limb **(Chaudhary et al., 2011) Figure (1).**

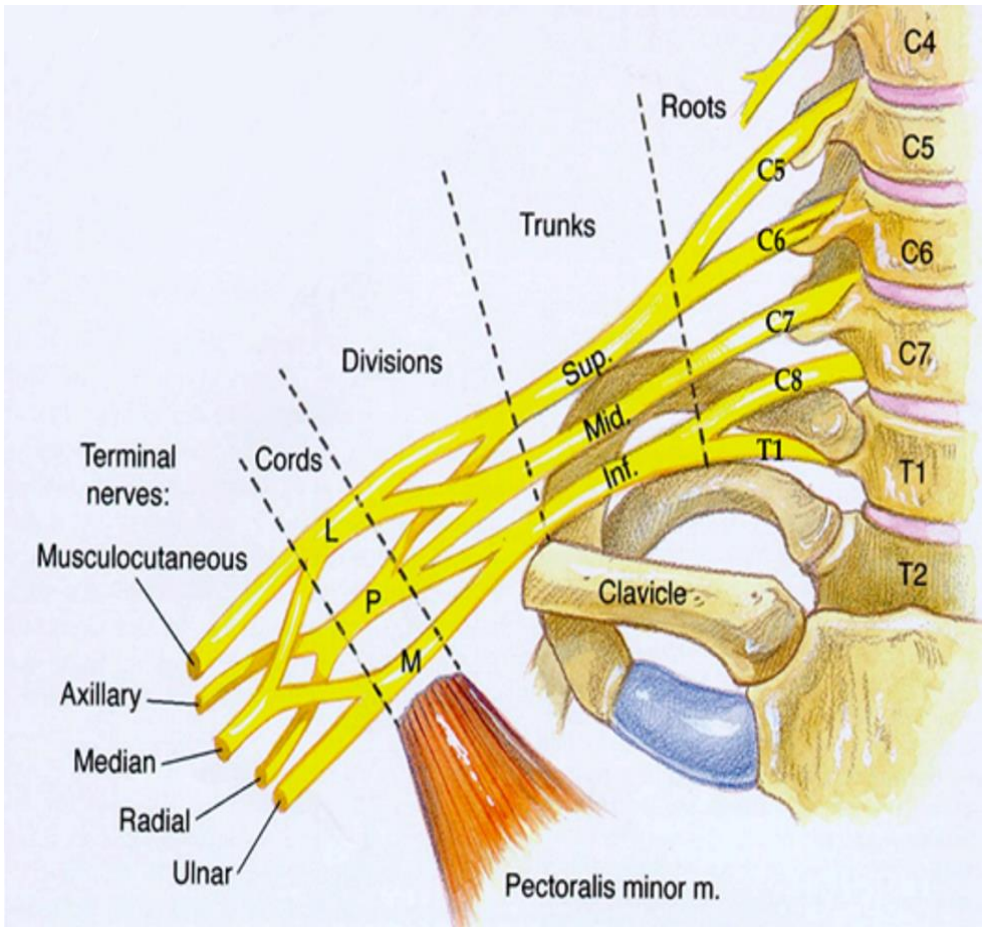

Figure (1). Brachial plexus anatomy. L, lateral. P, posterior. M, medial **(Neal et al., 2002).**

Brachial Plexus Structures and their Relative Surface Area:

The brachial plexus starts as the union of the ventral primary rami of cervical nerves 5 through 8 (C5–C8), including a greater part of the first thoracic nerve (T1). Variable contributions may also come from the fourth cervical (C4) and the second

thoracic (T2) nerves. The ventral rami are the roots of the brachial plexus. The C5 and C6 rami typically unite near the medial border of the middle scalene muscle to form the superior trunk of the plexus; the C7 ramus becomes the middle trunk; and the C8 and T1 rami unite to form the inferior trunk **(Neal et al., 2009) Figure (2).**

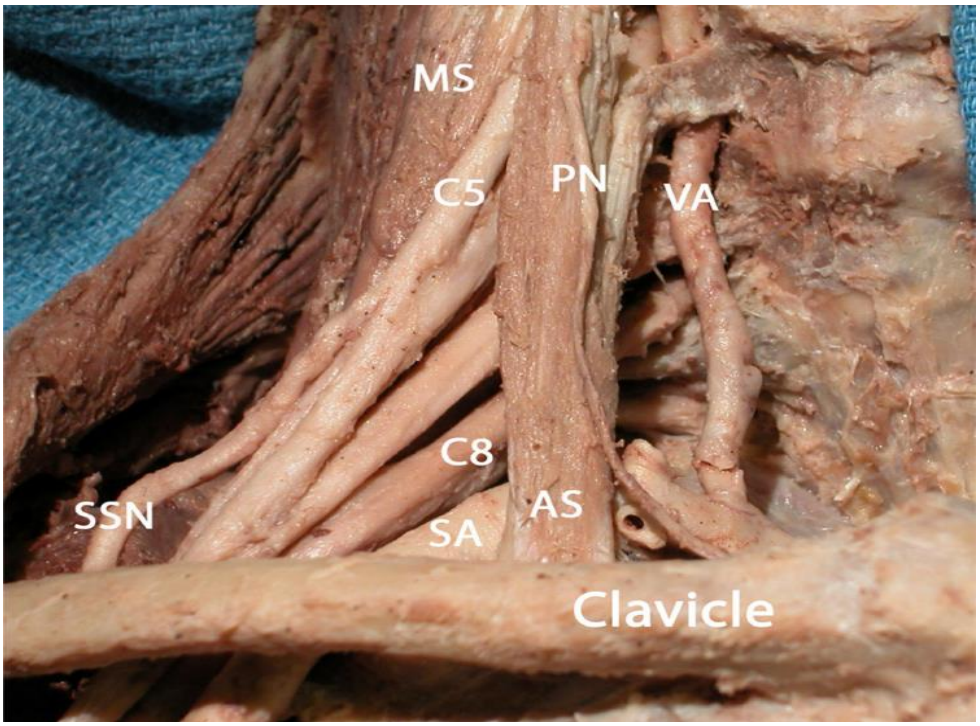

Figure (2). Dissection of the right brachial plexus. The vertebral artery (VA), the anterior scalene muscle (AS), The phrenic nerve (PN), MS indicates middle scalene muscle; SA, subclavian artery; SSN, suprascapular nerve **(Neal et al., 2009).**

The C7 transverse process lacks an anterior tubercle, which facilitates the ultrasonographic identification of the C7 nerve root. The roots and trunks pass through the interscalene groove, a palpable surface anatomic landmark between the anterior and middle scalene muscles **(Martinoli et al., 2002) Figure (3).**

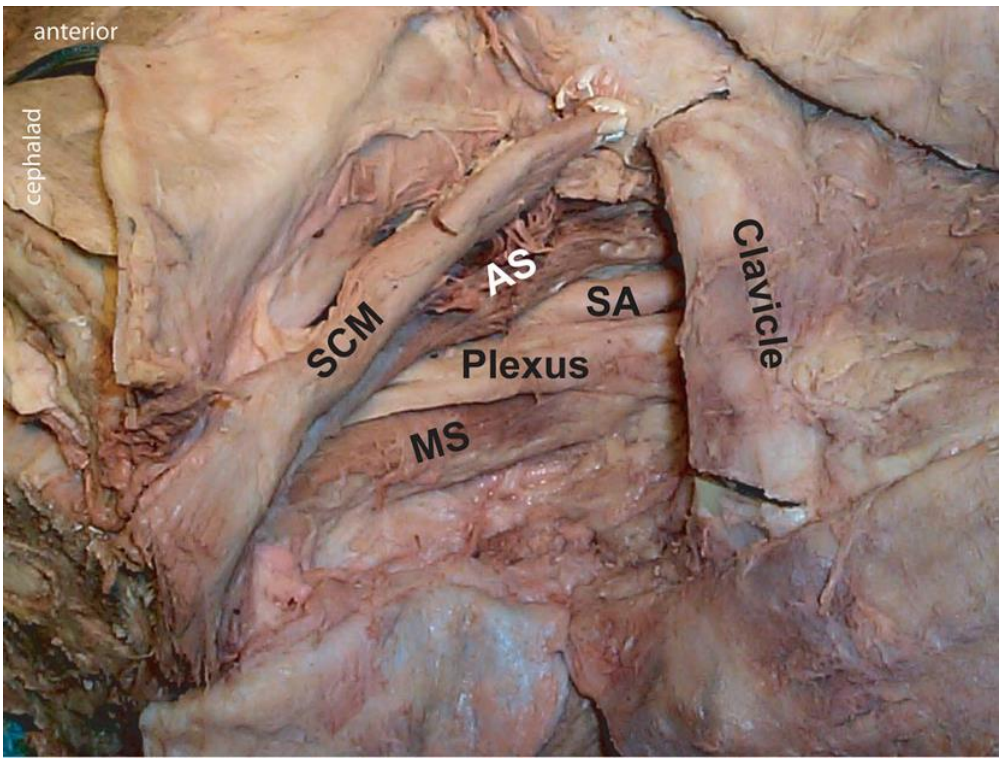

Figure (3). Dissection of the right interscalene area. Anterior scalene (AS) and middle scalene (MS) muscles. The plexus is lateral to the subclavian artery (SA). SCM indicates sternocleidomastoid muscle **(Neal et al., 2009).**