بسم الله الرحمن الرحيم

∞∞∞

تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

A Comparative Study Between the Efficacy of Bupivacaine Plus Nalbuphine Versus Bupivacaine Alone in Pectoral Nerve Block for Management of Postoperative Pain in Patients Undergoing Breast Fibroadenoma Excision

Thesis

Submitted for Partial Fulfillment of Doctorate Degree in Anaethseia

By

Mostafa Mohamed Salaheldeen Faheem Mohamed

MSc in Anesthesia
Faculty of Medicine, Ain-Shams University (2015)

Under Supervision of

Prof. Dr. Samia Abdelmohsen Abdel Latif

Professor of Anesthesia, Intensive Care and Pain Medicine
Faculty of Medicine, Ain-Shams University

Prof. Dr. Dalia Abdelhamid Nasr

Professor of Anesthesia, Intensive Care and Pain Medicine
Faculty of Medicine, Ain-Shams University

Dr. Mostafa Mohamed Serry

Lecturer of Anesthesia, Intensive Care and Pain Medicine
Faculty of Medicine, Ain-Shams University

Ain-Shams University
Faculty of Medicine
2022

Acknowledgement

First and foremost, I feel always indebted to ALLAH, the Most Beneficent and Merciful for every success and achievement I did throughout my life.

It is a great honour to express my deep gratitude to **Prof. Samia Abdelmohsen Abdel Latif**, Professor of Anesthesiology, Intensive Care and Pain Medicine, Faculty of Medicine, Ain-Shams University, for her remarkable supervision and continuous encouragement and for her continuous advice and care during this work.

I am very grateful and truly indebted for **Prof. Dalia Abdelhamid Nasr**, Professor of Anesthesia, Intensive Care and Pain Medicine, Faculty of Medicine, Ain-Shams University, for her meticulous supervision, continuous encouragement, valuable instructions, kind guidance and for her great and indispensable help and support.

I am thankful to **Dr. Mostafa Mohamed Serry**, Lecturer of Anesthesia, Intensive Care and Pain Medicine, Faculty of Medicine, Ain-Shams University for his great help, support, and guidance.

I would like to express my deepest gratitude to the patients without their cooperation this study would never be completed.

Finally, I express my cordial thanks to my family for their great and much appreciated support and patience.

List of Contents

List of Abbreviations

ASA	American Society of Anesthesiologists
$ETCO_2$	End-tidal carbon dioxide
IQR	Interquartile range
PACU	Post-anaesthesia care unit
PECS I	Pectoral block type 1
PECS II	Pectoral block type 2
SAPB	Serratus anterior plane block
SpO_2	Oxygen saturation
VAS	Visual analogue scale

List of Tables

List of Figures

List of Figures *(Cont...)*

Introduction

Breast surgery is one of the most common forms of surgery conducted in hospitals; even relatively minor breast surgery can be associated with significant postoperative pain. Poorly controlled postoperative pain has negative physiological and psychological consequences. Furthermore, effective acute pain control preserves immune function, both by suppressing the surgical stress response and by decreasing the need for general anesthetics and opioids. Acute postoperative pain is an integral risk factor in the development of chronic post mastectomy pain. Regional anesthesia techniques have provided better quality of acute pain control and subsequently less chronic pain (Sittl et al., 2013).

Regional anesthesia techniques, such as thoracic epidural block, thoracic paravertebral block, and intercostal nerve block, have been used in anesthesia and/or analgesia in breast surgery. However, these invasive regional techniques lead to some complications during the perioperative period (Blanco et al., 2012).

The pectoral nerve block (PECS block) is less invasive and has less complications, as compared to the other procedures. It is a superficial nerve block, alternative to neuraxial and para vertebral blocks, which provides good analgesia during and after ambulatory breast surgery. The pectoral nerve block aims to place local anesthetic into the interfascial plane between pectoralis major and minor muscles by blocking the pectoral nerves, the intercostobrachial, intercostals (III, IV, V, and VI), and the long thoracic nerve. These nerves need to be blocked to provide analgesia during breast surgery (Blanco et al., 2012).

It is always the interest of an anesthetist to increase the quality of local anesthetics, by increasing the duration of the block and decrease the incidence of local anesthetic toxicity. So many adjuvants are added to local anesthetics to prolong the block duration and reduce the toxicity, like opioids, dexamethasone, and clonidine (Saryazdi et al., 2015).

Nalbuphine has been used as an adjuvant to local anesthetics in spinal, epidural and local, intravenous block, as it has been proven to be effective when used as an adjuvant to local anesthetics in spinal, epidural, and local intravenous block, as it significantly prolongs the block duration. Nalbuphine is a derivative of 14-hydroxymorphine which is a strong analgesic with mixed agonist and μ antagonist. The analgesic effect of nalbuphine has been found to be equal to the analgesic effect of morphine but with a ceiling effect on respiration. Nalbuphine has the potential to maintain or even enhance μ-opioid based analgesic effect while simultaneously mitigating the μ-opioid side effects (Zeng et al., 2015).

Aim of the Study

The aim of this study was to compare the efficacy of PECS I block with/without nalbuphine as an adjuvant to bupivacaine in pain management in patients undergoing fibroadenoma excision.

The primary outcome was VAS postoperatively. Secondary outcomes were postoperative total morphine consumption, time to first analgesic, heart rate, non-invasive blood pressure, respiratory rate, peripheral oxygen saturation (SpO2), adverse effects such as nausea, vomiting and sedation as well as sedation score.

Anatomy of the Pectoral and Axillary Regions

Pectoralis nerve blocks (PECS blocks) are administered in the pectoral and axillary regions, with the muscles in both regions innervated by the brachial plexus. The axillary, mammary, and inframammary regions limit the pectoral region, which lies over the pectoralis major muscle (Blanco and Barrington, 2022). ***(Figure 1)***.

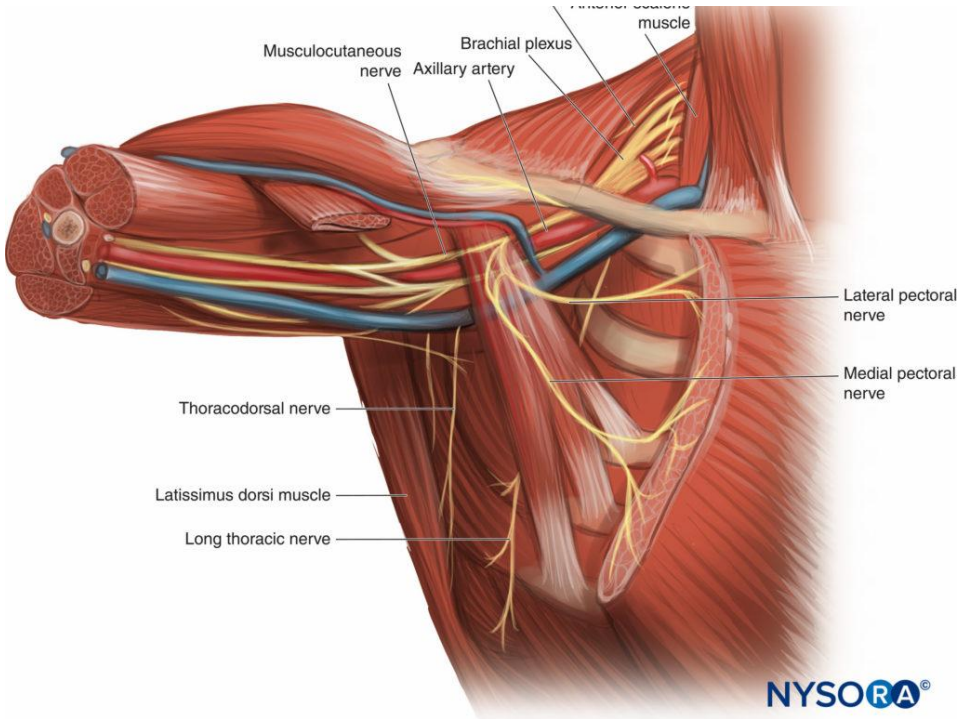

Figure (1): Pectoral Region

The axillary region is the area of the upper chest that bounds the axilla and is lateral to the pectoral region. Muscles, nerves, and vessels are found within the fascial layers in both regions. ***(Figure 2)***.

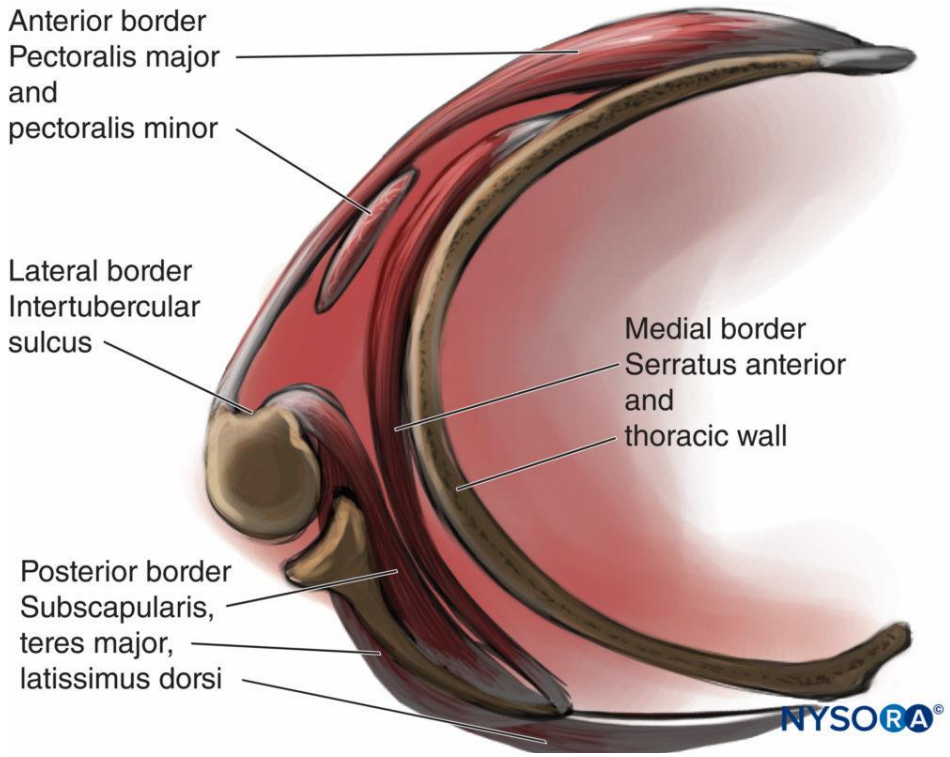

Figure (2): Axillary Region

In the pectoral region, there are four muscles relevant to PECS nerve blocks: the pectoralis major, pectoralis minor, serratus anterior, and subclavius muscles. The pectoralis major and minor muscles are innervated by the lateral and medial pectoral nerves; the serratus anterior is innervated by the long thoracic nerve (C5, C6, and C7); and the subclavius is innervated by the upper trunk of the brachial plexus (C5 and C6) (Blanco and Barrington, 2022).

The axillary area is a pyramidal structure bounded on four sides by the following. The apex or axillary inlet is created by the first rib's lateral border, the scapula's superior border, and the clavicle's posterior border. The anterior

border is defined by the pectoralis major and minor muscles. The humerus as a lateral border. The teres major, latissimus dorsi, and subscapularis muscles form the posterior boundary (Blanco and Barrington, 2022).

The pectoralis major is the largest of the two pectoral muscles. It has a fan-like appearance with three heads: the clavicular, the sternocostal and the abdominal head (Larionov and Filgueira, 2018).

The clavicular head originates from the medial two-thirds of the collar bone; arising from its caudal-anterior and caudal-posterior surfaces, covering approximately half to two-thirds of that surface and converting toward the humerus, resulting in a triangle shape (Hammad and Mohamed, 2006)**.** The clavicular head is more superficial and partially overlaps the sternocostal head ventrally.

The sternocostal head develops from the manubrium and sternum body, as well as from the first six rib cartilages with variations from the sixth and seventh ribs (Ueshima et al., 2019). This section of the pectoralis major is the biggest, thickest, and strongest (Withers et al., 1979).

The abdominal head originates from the rectus abdominis tendon sheath and/or the superficial aponeurosis of the external oblique. It is composed of two layers of muscle fibres that spiral around one another and the caudal edge of the sternocostal head (Larionov and Filgueira, 2018).

The pectoralis minor muscle originates near the costal cartilages of the third to fifth ribs and extends to the medial border and superior surface of the coracoid process of the scapula. The serratus anterior muscle arises from the first to ninth ribs and inserts into the ventral surface of the scapula's medial

border (Ueshima et al., 2019).

The muscles, nerves, and vessels relevant to PECS blocks are summarized in ***Tables 1, 2 and 3*** respectively.

Table (1): Muscles relevant to PECS plane nerve blocks

Muscle	Innervation	Relevance
Pectoralis major	Medial (C8, T1) and lateral (C5–C7) pectoral nerves	Sonographic landmark.
Pectoralis minor	Both pectoral nerves (C5–C8)	Sonographic landmark.
Serratus anterior	Long thoracic nerve (C5–C7)	Sonographic landmark for Pecs II and serratus plane blocks. The intercostobrachial, long thoracic, and thoracodorsal nerves lie on this muscle. The thoracodorsal artery is superficial to this muscle.

Table (2): Nerves relevant to PECS plane nerve blocks

Nerve	Origin	Innervation	Relevance
Lateral pectoral	Lateral cord (C5, C6, C7)	Pectoralis major and pectoralis minor muscles	Penetrates the clavipectoral fascia to supply the pectoralis major directly and, through communication with the medial pectoral nerve, the pectoralis minor. There is no cutaneous branch. Can be located on the deep surface of the pectoralis major.
Medial pectoral	Medial cord (C8, T1)	Pectoralis major and pectoralis minor muscles	Penetrates the deep surface of the pectoralis minor to innervate this muscle before penetrating it to supply the pectoralis major muscle.

Table (3): Vessels relevant to PECS plane nerve blocks

Vessel	Relevance
Axillary	Is the continuation of the subclavian artery after it passes the lateral border of the first rib. It lies lateral to the axillary vein. It gives of the branches listed below.
Thoracoacromial	Arises from the second part (deep to the pectoralis minor) of the axillary artery, close to the upper border of the pectoralis minor; pierces the clavipectoral fascia in the infraclavicular fossa; has four branches that may arise deep or superficial to the clavipectoral fascia.