



**Comparison between Ultrasound Guided
Transversus Abdominis Plane Block versus
Ultrasound Guided Iliolinguinal/Iliohypogastric
Nerves Block for Postoperative Analgesia in
Patients Undergoing Unilateral Oblique Inguinal
Hernia Repair Under General Anesthesia**

Thesis

*Submitted for Partial Fulfillment of the
Master Degree in **Anesthesia***

By

Shrouk Ayman Mohamed Soliman Faramawy
M.B.B.CH Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr. Samia Abdel-Mohsen Abdel-Latif
*Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University*

Dr. Mohamed Abdel-Salam Menshawe Abdel-Atte
*Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University*

Dr. Ibrahim Mohammed El Sayed Ahmed
*Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University*

*Faculty of Medicine
Ain Shams University*

2019

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgments

*First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.*

*I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr. Samia Abdel-Mohsen Abdel-Latif**, Professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for her meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to **Dr. Mohamed Abdel-Salam Menshaawe Abdel-Atte**, Lecturer of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for his sincere efforts, fruitful encouragement.*

*I am deeply thankful to **Dr. Ibrahim Mohammed El Sayed Ahmed**, Lecturer of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for his great help, outstanding support, active participation and guidance.*

And finally, I would like to express my hearty thanks to all my family, my beloved Fiance for their support till this work was completed.

Shrouk Ayman Mohamed Soliman Faramawy

List of Contents

Title	Page No.
List of Abbreviations.....	5
List of Tables.....	7
List of Figures	8
Introduction	- 1 -
Aim of the Work	14
Review of Literature	
▪ Anatomy of Anterior Abdominal Wall	15
▪ Nerve Supply of Anterior Abdominal Wall.....	20
▪ Pharmacology of Local Anesthetics	30
▪ Transversus Abdominis Plane Block (TAP Block)	43
▪ Ilioinguinal/Iliohypogastric Nerve Block.....	50
Patients and Methods.....	46
Results.....	56
Discussion	70
Summary.....	79
Conclusion	82
References	83
Arabic Summary	

List of Abbreviations

Abb.	Full term
%	Percent
ASA	American Society of Anesthesiologists
Cm	Centimeter
CNS	Central Nervous System
COO	Ester linkage
CPR	Cardio-Pulmonary Resuscitation
ECG	Electrocardiogram
EO	External Oblique muscle
Epi	Epinephrine
et al.	And colleagues
G	Gauge
gm	Gram
HCL	Hydrogen Chloride
Hr	Heart rate
Hrs	Hours
HS	Highly Significant
Ht	Height
IH	Iliohypogastric
II	Ilioinguinal
IINB	Ilioinguinal nerve block
IV	Intravenous
Kg	Kilogram
L	Liter
L1-5	Lumbar spinal roots
LA's	Local Anesthetics
LAST	Local Anesthetic Systemic Toxicity
MAP	Mean arterial pressure
Mcg	Microgram

List of Abbreviations cont...

Abb.	Full term
<i>Mg</i>	<i>Milligram</i>
<i>Min</i>	<i>Minute</i>
<i>Ml</i>	<i>Milliliter</i>
<i>MmHg</i>	<i>Millimeters of Mercury</i>
<i>N</i>	<i>Number</i>
<i>NHCO</i>	<i>Amide linkage</i>
<i>NIPH</i>	<i>Non invasive blood pressure</i>
<i>NPRS</i>	<i>Numeric Pain Rating Scale</i>
<i>NS</i>	<i>Non Significant</i>
<i>OR</i>	<i>Operating Room</i>
<i>PACU</i>	<i>Post-Anesthesia Care Unit</i>
<i>PC</i>	<i>Peritoneal cavity</i>
<i>PH</i>	<i>Measure acidity and basicity of solution</i>
<i>pKa</i>	<i>Acid dissociation constant</i>
<i>S</i>	<i>Significant</i>
<i>SD</i>	<i>Standard Deviation</i>
<i>SPO2</i>	<i>Peripheral Oxygen Saturation</i>
<i>T1-12</i>	<i>Thoracic spinal roots</i>
<i>TAB</i>	<i>Block Transversus abdominis Plane block</i>
<i>USG</i>	<i>Ultra-Sound Guided</i>
<i>VAS</i>	<i>Visual Analogue Scale</i>
<i>Vs.</i>	<i>Versus</i>
<i>WI</i>	<i>Wound infiltration</i>
<i>Wt</i>	<i>Weight</i>

List of Tables

Table No.	Title	Page No.
Table 1:	Amides and esters and pKa of each of local anesthetics.....	31
Table 2:	Maximum and toxic doses of local anesthetics.....	32
Table 3:	Intralipid protocol	42
Table 4:	Comparison between Group A: T and Group B: I according to demographic data.....	56
Table 5:	Comparison between Group A: T and Group B: I according to postoperative heart rate (beat/min).	59
Table 6:	Comparison between Group A: T and Group B: I according to postoperative mean arterial blood pressure (mmHg).	61
Table 7:	Comparison between Group A: T and Group B: I according to postoperative respiratory rate (min).....	63
Table 8:	Comparison between Group A: T and Group B: I according to postoperative numeric pain rating score.....	65
Table 9:	Comparison between Group A: T and Group B: I according to time to rescue analgesia (hours).....	67
Table 10:	Comparison between Group A: T and Group B: I according to need of analgesia.....	68
Table 11:	Comparison between Group A: T and Group B: I according to total consumption of pethidine (mg).	69

List of Figures

Fig. No.	Title	Page No.
Figure 1:	Muscles of anterior abdominal wall	19
Figure 2:	Abdominal wall innervation	22
Figure 3:	Abdominal wall innervation (Superficial layer).....	23
Figure 4:	Abdominal wall innervation (intermediate layer)	24
Figure 5:	Abdominal wall innervation (deep layer).....	25
Figure 6:	Iliohypogastric nerve, Ilioinguinal nerve and Genital branch of the genitofemoral	28
Figure 7:	Cutaneous innervation of the abdominal wall	29
Figure 8:	A cross-section of the abdominal wall layers	44
Figure 9:	Anatomical description of the triangle of Petit (lateral view)	45
Figure 10:	The patient is in the supine position, a USG-TAP block (Th10-Th12).....	47
Figure 11:	Local anesthetic injection in transversus abdominis plane	49
Figure 12:	To perform ultrasound guided ilioinguinal nerve block	51
Figure 13:	Oblique ultrasound image demonstrating the acoustic shadow of the anterior superior iliac spine and the muscles layers and facial plane containing the ilioinguinal and iliohypogastric nerves.....	52

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure 14:	Color Doppler demonstration the relationship between the deep circumflex iliac artery and ilioinguinal nerve which both lie within the fascial plane between the internal oblique and transverse abdominis muscles	53
Figure 15:	Sono Site M-Turbo C ® Ultrasound device with HFL – 38 X Linear probe (Japan) with high frequency (6 -13 MHz).....	52
Figure 16:	NPRS (numeric pain rating score)	54
Figure 17:	Bar chart between Group A: T and Group B: I according to age (years).	57
Figure 18:	Bar chart between Group A: T and Group B: I according to BMI.	57
Figure 19:	Bar chart between Group A: T and Group B: I according to ASA.	58
Figure 20:	Bar chart between Group A: T and Group B: I according to duration of surgery (min).....	58
Figure 21:	Comparison between Group A: T and Group B: I according to postoperative heart rate (beat/min).....	60
Figure 22:	Comparison between Group A: T and Group B: I according to postoperative mean arterial blood pressure (mmHg).	62
Figure 23:	Comparison between Group A: T and Group B: I according to postoperative respiratory rate (min).	64

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure 24:	Comparison between Group A: T and Group B: I according to postoperative numeric pain rating score.....	66
Figure 25:	Bar chart between Group A: T and Group B: I according to time to rescue analgesia (min).	67
Figure 26:	Bar chart between Group A: T and Group B: I according to total consumption of pethidine (mg).	68
Figure 27:	Bar chart between Group A: T and Group B: I according to total consumption of pethidine (mg).	69

INTRODUCTION

Since the concept of day case surgeries are getting more popular, surgeons and anesthesiologists are trying their best to provide adequate post operative analgesia. The proper management of post operative pain ensures early ambulation of patients and obviates many post operative complications (*Schug, 2011*).

There are advances in anesthetic techniques, more and more regional blocks are being tried to take care of post operative pain. The choice of anesthetic block technique depends upon the site of surgical incision proposed. Transversus abdominis plane (TAP) block is a novel approach in which local anesthetic agent is injected into the plane between the internal oblique and transversus abdominis muscles (*Kuppuvelumani et al., 1993*).

The technique of TAP block has been found to be a safe and effective tool in a variety of general, gynecological, and urological surgery, and it is suggested as a part of the multimodal anesthetic approach to enhance recovery after lower abdominal surgeries (*Johns et al., 2012*).

Transversus abdominis plane (TAP) block is a regional anesthetic technique which blocks neural afferents from the anterolateral abdominal wall. With the aid of ultrasound or anatomical landmark guidance, local anesthetic is injected into

the transversus abdominis fascial plane, where the nerves from T6 to L1 are located. The initial clinical trials assessing the analgesic effect of TAP blockade showed an effect for up to 24 hr postoperatively (*McDonnell et al., 2007*).

The ilioinguinal-iliohypogastric nerve block provides intraoperative and postoperative analgesia for inguinal surgery. It may be useful for providing analgesia for inguinal hernia repair, orchidopexy, hydrocoele repair, varicocoele surgery. It has also been used, in combination with T11 and T12 intercostal nerve blocks, to provide post-operative pain relief after renal transplant (*Faiz et al., 2019*).

Both the iliohypogastric (IH) and ilioinguinal (II) nerves arise from L1 and emerge from the upper part of the lateral border of the psoas major muscle. The ilioinguinal nerve is a smaller nerve and courses caudal to the iliohypogastric nerve. Both nerves cross obliquely anterior to the quadratus lumborum and iliacus muscles and perforate the transversus abdominis muscle near the anterior part of the iliac crest. In the anterior abdominal trunk, the nerves travel between the transversus abdominis and the internal oblique muscles (*Amid et al., 1994*).

Ilioinguinal nerve then pierces the internal oblique muscle, distributing filaments to it, and then accompanies the spermatic cord (in males) or the round ligament (in females) through the superficial inguinal ring. Its fibres are then distributed to the skin of the upper and medial part of the thigh,

skin over the root of penis and upper part of scrotum in males, and to the skin covering the mons pubis and labia majora in females (*Al-dabbagh, 2002*).

Iliohypogastric nerve divides into lateral and anterior cutaneous branches. The lateral cutaneous branch runs through the internal and external oblique above the iliac crest, a little behind the iliac branch of the T12 spinal nerve, and is distributed to the posterolateral gluteal skin. The anterior cutaneous branch runs between the internal oblique and the transversus abdominis, innervating both muscles. It runs through the internal oblique approximately 2 cm medial to the anterior superior iliac spine and through the external oblique aponeurosis approximately 3 cm above the superficial inguinal ring (*Eichenberger et al., 2006*).

Because the lateral cutaneous branch of the Iliohypogastric nerve may pierce the internal and external oblique muscles immediately above the iliac crest, it is worthwhile to block the nerves as proximal as possible (i.e., posterior to the anterior superior iliac spine) before the nerve branches (*Bischoff et al., 2012*).

AIM OF THE WORK

The aim of this study is to test the analgesic efficacy of ultrasound guided TAP block versus ultrasound guided ilioinguinal/iliohypogastric nerves block in patients undergoing unilateral inguinal hernia repair under general anesthesia, as regard hemodynamic stability, start of pain postoperative, time to rescue analgesia and total amount of postoperative narcotics used.

Chapter 1

ANATOMY OF ANTERIOR ABDOMINAL WALL

Layers of anterior abdominal wall

In human anatomy, the layers of the abdominal wall are (from superficial to deep):

1- Skin.

2- Subcutaneous tissue.

3- Fascia.

- Camper's fascia: Thick fatty superficial layer (*Gray and Henry, 1918*).
- Scarpa's fascia: deep fibrous, membranous layer (stratum membranosum), of the superficial fascia of the abdomen. It is found deep to the Fascia of Camper and superficial to the external oblique muscle (*Ullah et al., 2013*).

4- Muscles.

- External oblique abdominal muscle.
- Internal oblique abdominal muscle.
- Transverse abdominal muscle.