# Comparative Study of Ultrasound Guided Transversus Abdomininis Plane Block using Bupivacaine with and without Hyaluronidase in Laparoscopic Bariatric Surgery

A Thesis

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in Anesthesia

By

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# List of Contents

# List of Abbreviations

| Abbr. | Full-term |
|---|---|
| **ACE** | **:** Angiotensin converting enzyme |
| **ACLS** | **:** Advanced cardiac life support |
| **AF** | **:** Atrial fibrillation |
| **ALT** | **:** Alanine aminotransferase |
| **ARBs** | **:** Angiotensin receptor blockers |
| **ASIS** | **:** Anterior superior iliac spine |
| **ASRA** | **:** American society of regional anesthesia |
| **BMI** | **:** Body mass index |
| **CAD** | **:** Coronary artery disease |
| **CM** | **:** Costal margin |
| **CNS** | **:** Central nervous system |
| **CPAP** | **:** Continuous positive airway pressure |
| **CVS** | **:** Cardiovascular system |
| **DBP** | **:** Diastolic blood pressure |
| **DLCO** | **:** Diffusing capacity of the lung for carbon monoxide |
| **ECG** | **:** Electrocardiogram |
| **EO** | **:** External oblique |
| **ERV** | **:** Expiratory reserve volume |
| **FEV1** | **:** Forced expiratory volume in 1 s. |
| **FRC** | **:** Functional residual capacity |
| **FVC** | **:** Forced vital capacity |

**GERD** : Gastro esophageal reflux disease

**H. pylori** : Helicobacter pylori

**HA** : Hyaluronic acid

**HDL** : High density lipoprotein

**HR** : Heart rate

**IC** : Iliac crest

**IO** : Internal oblique

**IU** : International unit

**IV** : Intravenous

**IVC** : Inferior vena cava

**LABS** : Longitudinal assessment of bariatric surgery

**LD** : Latissumis dorsi

**LDUH** : Low dose unfractionated heparin

**LGBS** : Laparoscopic gastric bypass surgery

**LMWH** : Low molecular weight heparin

**LS** : Linea semilunaris

**N** : Needle

**NAFLD** : Non alcoholic fatty liver disease

**NASH** : Non alcoholic steatohepatitis

**NESARC** : National epidemiologic survey on alcohol and related conditions

**NF** : National formulary

**NIPPV** : Non invasive positive pressure ventilation

**NRS** : Numeric rating scale

**OA** : Osteoarthritis

**OHS** : Obesity hypoventilation syndrome
**OSA** : Obstructive sleep apnea
**PACU** : Postoperative anesthesia care unit
**PCOS** : Polycystic ovary syndrome
**PH** : Pulmonary hypertension
**PSG** : Polysomnography
**QL** : Quadratus lumborum
**SBP** : Systolic blood pressure
**SD** : Standard deviation
**ST** : Subcutaneous tissue
**T2DM** : Type 2 diabetes mellitus
**TA** : Transversus abdominis
**TAP** : Transversus abdominis plane
**TLC** : Total lung capacity
**US** : Ultrasound
**USP** : United States Pharmacopeia
**VC** : Vital capacity
**VLDL** : Very low density lipoprotein
**VTE** : Venous thromboembolism
**WHR** : Waist: hip ratio
**WOB** : Work of breathing

# List of Tables

# List of Figures

# Introduction

Despite the minimally invasive nature of laparoscopic gastric-bypass surgery (LGBS), pain can be moderate to severe in the immediate postoperative period ***(Tufanogullari et al., 2008)***.

Further, pain control in the morbidly obese can be especially challenging because of increased sensitivity to opioid-induced respiratory depression ***(Benumof, 2004)***.

Postoperative analgesia after surgeries under general anesthesia is usually provided by systemic opioids, non-steroidal anti-inflammatory drugs or epidural analgesia. Other techniques which have been effectively used are Transversus Abdominis Plane (TAP) block and paravertebral block ***(Rafi, 2001)***.

Transversus abdominis plane (TAP) block is a new technique of regional anesthesia, which reduces the pain derived from abdominal wall incisions, decreases general anesthesia requirements, and increases hemodynamic stability ***(Walter et al., 2013)***.

The transversus abdominis plane (TAP) block has been demonstrated to improve pain related outcomes after laparoscopic cholecystectomy, open appendectomy, and cesarean section, among other upper and lower abdominal surgical procedures ***(Abdallah et al., 2012)***.

We therefore tested the hypothesis that US-guided TAP blocks can reduce opioid consumption during the first 24 h after LGBS when added to conventional analgesic techniques, specifically trocar insertion site local anesthetic infiltration and systemic analgesia ***(Eric et al., 2013)***.

Transversus Abdominis Plane lying between the internal oblique above and transversus abdominis below, contains the thoracolumbar nerves originating from T6 to L1.TAP block under ultrasound guidance is recently described as an effective component of multimodal postoperative analgesia ***(Hebbard et al., 2007)***.

Local anesthetics (lignocaine, bupivacaine, levobupivacaine or ropivacaine) are injected into this plane either on one or both sides of the abdomen for various procedures ***(Niraj et al., 2009)***.

Hyaluronidase is an enzyme considered as the "spreading factor", facilitating the spread of local anesthetic solutions by hydrolyzing the interstitial barrier. It has been shown to produce reliable blockade with better spread and therefore better quality of block when used with local anesthetics in ophthalmic procedures, plastic surgeries and orthopedic procedures in different concentrations ***(Prajwal 2013)***.

# Aim of the Work

The aim of this study is to compare the efficacy of Injection of Bupivacaine 0.25% and Injection of Bupivacaine 0.25% with Hyaluronidase 1500 U in ultrasound guided Transversus Abdominis Plane block for bariatric surgeries performed under general anesthesia with respect to:

a) Quality of analgesia, time to peak analgesia and duration of post-operative analgesia.

b) Need for rescue analgesic and reduction in 24 hour intravenous opioid consumption.

c) Adverse effects if any.

# Chapter (1)
# Anatomy of anterior abdominal wall

The **anterior abdominal wall** forms the anterior limit of the abdominal viscera. The abdominal wall forms an area of the body bounded superiorly by the xiphoid process and costal arch, and inferiorly by the inguinal ligament, pubic bones and the iliac crest.

## Key Facts

| | |
|---|---|
| Boundaries | Superior: xiphoid process, costal cartilages of the $7^{th}$-$10^{th}$ ribs<br>Inferior: iliac crest, inguinal ligament, anterior superior iliac spine, pubic tubercle, pubic crest, pubic symphysis |
| Layers | *From superficial to deep:*<br>- Skin<br>- Subcutaneous tissue<br>- Fascia: *Camper's fascia* (fatty superficial layer), *Scarpa's fascia* (deep fibrous layer)<br>- Muscles: external oblique, internal oblique, rectus abdominis, transverse abdominis, pyramidalis<br>- Transversalis fascia<br>- Peritoneum |
| Function | Protection of the abdominal cavity. |

## Regions of the Abdominal Wall

To describe the locations of visible abnormalities, masses, and pain in a typical clinical write-up, the anterolateral abdomen is divided into nine regions by four imaginary planes: two verticals (midclavicular/ midinguinal) and two horizontal (transpyloric/intertubercular) planes as in figure 1 ***(LeBlond et al., 2008)***.

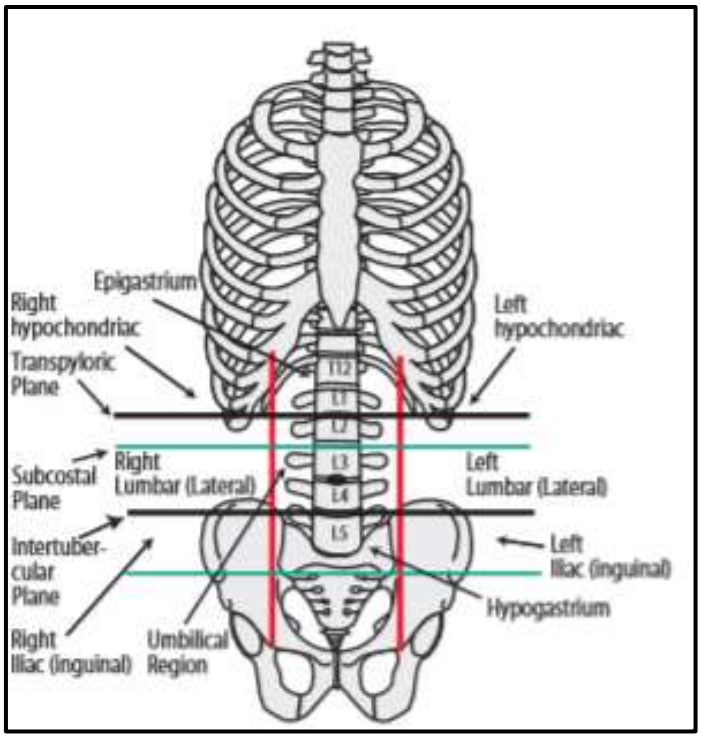


**Figure (1):** Various regions of the anterior abdominal wall ***(LeBlond et al., 2008)***

The transpyloric plane corresponds to the midpoint between the umbilicus and xiphoid process, crossing the pylorus of the stomach at the lower border of the first lumbar vertebra.