



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

A Thesis

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List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
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	: Latissimus 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

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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 Inferior: iliac crest, inguinal ligament, anterior superior iliac spine, pubic tubercle, pubic crest, pubic symphysis
Layers	<i>From superficial to deep:</i> <ul style="list-style-type: none">- Skin- Subcutaneous tissue- Fascia: <i>Camper's fascia</i> (fatty superficial layer), <i>Scarpa's fascia</i> (deep fibrous layer)- Muscles: external oblique, internal oblique, rectus abdominis, transverse abdominis, pyramidalis- Transversalis fascia- 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*).

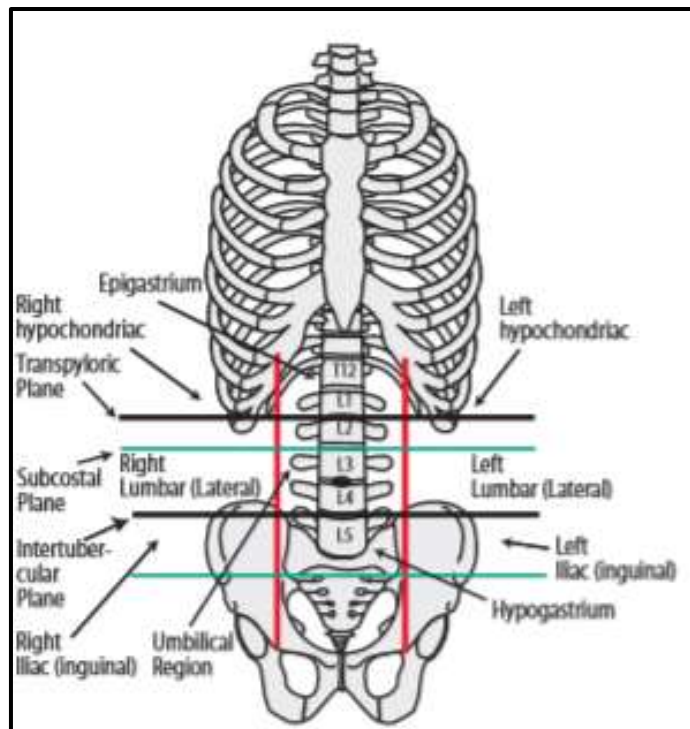


Figure (1): Various regions of the anterior abdominal wall
(*LeBlond et al., 2008*)

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.