INTRODUCTION

Caesarean delivery is a common surgical procedure and rates are increasing ***(Ecker and Frigoletto, 2007).***

Postoperative pain is the greatest concern for women after caesarean delivery ***(Carvalho et al., 2010).***

Postoperative pain may be severe, lasting at least 48 to 72 hours, and may also lead to delayed patient ambulation, prolongation of hospitalization and recovery, atelectasis, vascular thrombosis and ultimately patient dissatisfaction. Pain relief and patient satisfaction are still inadequate in many cases ***(Angle et al., 2002).***

The postoperative pain that follows a Caesarean Delivery with the Pfannenstiel incision has both a somatic component and a visceral component. The somatic pain generated at the incision site is conducted by the ilioinguinal and iliohypogastric nerves which innervate the L1-L2 dermatome distribution ***(Bell et al., 2002).***

The ilioinguinal nerve arises from the first lumbar nerve and emerges from the lateral border of the psoas major just below the iliohypogastric nerve, passes obliquely across the quadrates lumborum and iliacus, perforates the transverse muscle above the iliac crest, and communicates with the iliohypogastric nerve between the transverse and internal oblique muscles ***(Gofeld and Christakis, 2006).***

Injury to the ilioinguinal and iliohypogastric nerves by the Pfannenstiel incision is more likely to occur because of the nerves' superficial course ***(Melville et al., 1990).***

Nerve entrapment significantly was seen more often when the incision was extended laterally beyond the lateral edge of the rectus sheath ***(*****Sippo** ***et al., 1987).***

More than 90% of the population experienced their pain at the level of the incision and in 70% the pain was located at the lateral ends of the incisional scar ***(Loos et al., 2008).***

The ilioinguinal and iliohypogastric (IIIH) block can be used as part of a multimodal analgesic regimen for postoperative pain in patients undergoing lower abdominal and inguinal surgeries ***(Hu et al., 2007),*** including caesarean delivery ***(Gucev et al., 2008).***

The post-operative analgesic benefits of US-guided IIIH blocks have been demonstrated in Caesarean Delivery ***(Gucev et al., 2008). Bell et al. (2002)*** found that the bilateral IIIH blocks significantly reduced the amount of intravenous morphine used by patients during the 24 hours following caesarean delivery ***(Bell et al., 2002).*** Similarly, ***Gucev et al.*** found that IIIH blocks reduced supplemental opioid use, as well as pain and nausea after caesarean delivery ***(Gucev et al., 2008).***

As a result of their predictable analgesic and anesthetic sparing properties; opioids analgesic drugs are often administered during the postoperative period; however, they are associated with many side effects such as dizziness, respiratory depression, paralytic ileus, nausea, vomiting, pruritus and urinary retention. To control and treat pain, opioids drugs need to be frequently injected either intravenous (IV) or intramuscular (IM). In most cases where pain control is affected by the administration of opioid analgesics and based on patient's requirement and demand, sufficient analgesia does not usually develop ***(Bamigboye and Hofmeyr, 2010).***

Because of their analgesic properties and lack of opioids induced adverse effects; local anesthetic drugs are increasingly used in the treatment of surgical pain. The rationale behind the use of local anesthetic given during the operation is to stop pain from starting by blocking the usual response of nervous system to pain. Elimination of some of the superficial components of the pain after caesarean delivery could modulate the perception of deeper visceral pain. The data from previous studies suggest that the infiltration of local anesthesia into the wound during caesarean delivery appears to be effective in reducing postoperative narcotic requirements ***(Azin et al., 2007).***

Bupivacaine is an amide local anesthetic. The potency of bupivacaine is approximately three to four times more potent than lidocaine or mepivacaine and eight times more potent than procaine ***(Debon et al., 2002).***

Its duration of action for local anesthesia is two to three times longer than that of mepivacaine or lidocaine and (20–25%) longer than that of tetracaine. its duration of anesthesia is (5-15 hr) & duration of analgesia (6-30 hr), the duration varies according to the type of the block. Its onset of action is between (5-7 min) and maximum anesthesia is obtained between (15–25 min) ***(Yoshida et al., 2008).***

AIM OF THE WORK

The aim of this study is to determine the efficacy of injection of local anesthetic "Bupivacaine" in both angles of the rectus sheath incision aiming to block ilioinguinal and iliohypogastric nerves bilaterally to reduce postoperative pain after caesarean section in patients receiving general anesthesia.

Anatomy of Anterior Abdominal Wall

The anterior abdominal wall confines abdominal viscera, stretches to accommodate the expanding uterus, and provides surgical access to the internal reproductive organs ***(Cunningham et al., 2010).***

I. *Anterior Abdominal Wall layers:*

The abdominal wall is a layered structure, consisting of skin, subcutaneous fat, fascia, muscle layer, transversalis fascia and the peritoneum ***(Burger and Quinn, 2004).***

a) Skin

Langer lines describe the orientation of dermal fibers within the skin. In the anterior abdominal wall, they are arranged transversely. As a result, vertical skin incisions sustain increased lateral tension and thus, in general, develop wider scars. In contrast, low transverse incisions, such as the Pfannenstiel, follow Langer lines and lead to superior cosmetic results ***(Ellis, 2006).***

b) Fascia of the anterior abdominal wall

This layer can be separated into a superficial, predominantly fatty layer “Camper’s fascia”, and a deeper, more membranous layer “Scarpa's fascia”. These are not discrete layers but instead represent a continuum of the subcutaneous tissue layer ***(Rozen et al., 2008).***

c) Muscles of the anterior abdominal wall

The anterior abdominal wall contains five pairs of muscles that mainly attached above and laterally to the sternum and lower ribs and below to the pelvic bone. Three of the muscles are located laterally and superimposed as sheets one on the other from superficial to deep; they are the external oblique, the internal oblique, and the transverses muscles. The rectus and pyramidalis muscles make up the medial group lying adjacent to the linea alba and enclosed in varying degrees by the rectus sheath ***(Joseph et al., 2006)***.

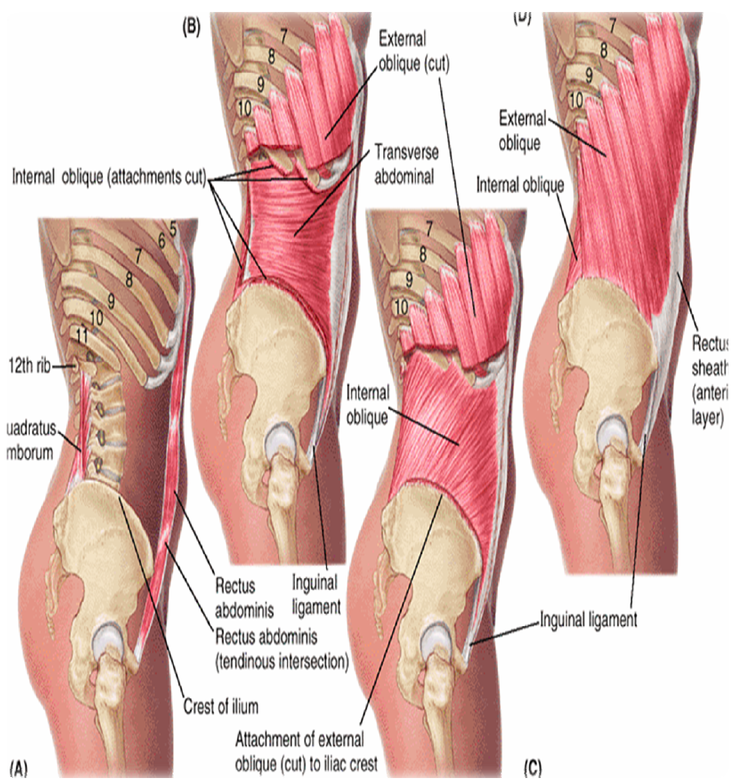

Figure (1): Muscles of the Anterior Abdominal Wall
(Keith and Arthur 2006).

- ***Rectus Sheath:***

The fibrous aponeuroses of the external oblique, internal oblique, and transverses abdominis muscles join in the midline to create the rectus sheath. The construction of this sheath varies above and below a demarcation line, termed the arcuate line. Cephalad to this line, the aponeuroses invest the rectus abdominis bellies above and below. Caudal to this line, all aponeuroses lie anterior to the rectus abdominis muscle, and only the thin transversalis fascia and peritoneum lie beneath ***(Rizk, 1980).***

d) Transversalis Fascia

Each of the three flat muscles is covered on its anterior and posterior surfaces by a layer of investing abdominal fascia. In general, these layers are unremarkable except for the layer deep to the transversus abdominis muscle "the transversalis fascia", which is better, developed ***(Drake et al., 2010)***.

The transversalis fascia is a continuous layer of fascia that lines the abdominal cavity and continues into the pelvic cavity. It crosses the midline anteriorly, associating with the transversalis fascia of the opposite side, and is continuous with the fascia on the inferior surface of the diaphragm. It is continuous posterior with the deep fascia covering the muscles of the posterior abdominal wall and attaches to the thoracolumbar fascia. Transversalis fascia plane block is a novel ultrasound-guided abdominal wall nerve block ***(Hebbard, 2009)***.

e) Peritoneum

The peritoneum forms the deepest layer of the anterior abdominal wall and is the serous membrane lining the peritoneal cavity, in the lower part of the anterior wall, it extends laterally on the deep side of the inguinal canal and is reflect superiorly to line part of the iliac fossa on each side, inferiorly the parietal layer of peritoneum becomes visceral by continuing onto the superior surface of the bladder into vesicouterine pouch to the anterior aspect of the uterus ***(Grevious, 2006).***

II. <u>Blood Supply:</u>

The deep arteries to the anterior wall include branches of the lower five intercostal arteries and the subcostal artery. They sometimes enter the rectus sheath, where they anastomose with their superior and inferior epigastric arteries ***(Metessidou and Skandalakis, 2008).***

The smaller superior epigastric artery is the inferior continuation of the internal thoracic artery. It passes downward behind the seventh costal cartilage, enters the rectus sheath, and becomes buried in the deep portion of the rectus muscle ***(Miller et al., 2008)***.

The larger inferior epigastric artery arises from the external iliac artery behind the middle of the inguinal ligament. It courses medial to the deep inguinal ring diagonally upward and medially between the transversalis fascia and enters the rectus sheath by passing in front of the arcuate line. It ascends on the deep surface of the rectus muscle and buried in it. The lower lateral part of the anterior wall is supplied by the circumflex iliac artery which arises from the external iliac artery ***(Milloy et al., 1960).***

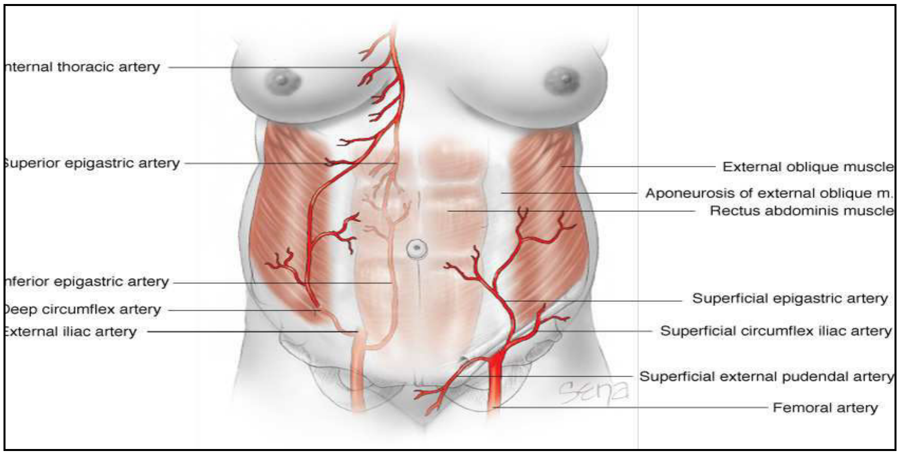

Figure (2): Blood vessels of anterior abdominal wall ***(Cunningham et al., 2010).***

III. Nerve supply:

The skin, muscles and parietal peritoneum of the anterior abdominal wall are innervated by the lower six thoracic nerves (T6-T12) and the first lumbar nerve (L1) ***(Mcdonnell et al., 2007).***

Along their course, T7-T12 and L1supply branches to the anterolateral abdominal wall muscles. All terminate by supplying skin: Nerves T7 to T9 supply the skin from the xiphoid process to just above the umbilicus. T10 supplies the skin around the umbilicus.T11, T12, and L1 supply the skin from just below the umbilicus to, and including, the pubic region ***(Rahn et al., 2010)***.

The ilioinguinal nerve arises from the first lumbar nerve and emerges from the lateral border of the psoas major just below the iliohypogastric nerve, passes obliquely across the quadrates lumborum and iliacus, perforates the transverse muscle above the iliac crest, and communicates with the iliohypogastric nerve between the transverse and internal oblique muscles ***(Gofeld and Christakis, 2006).***

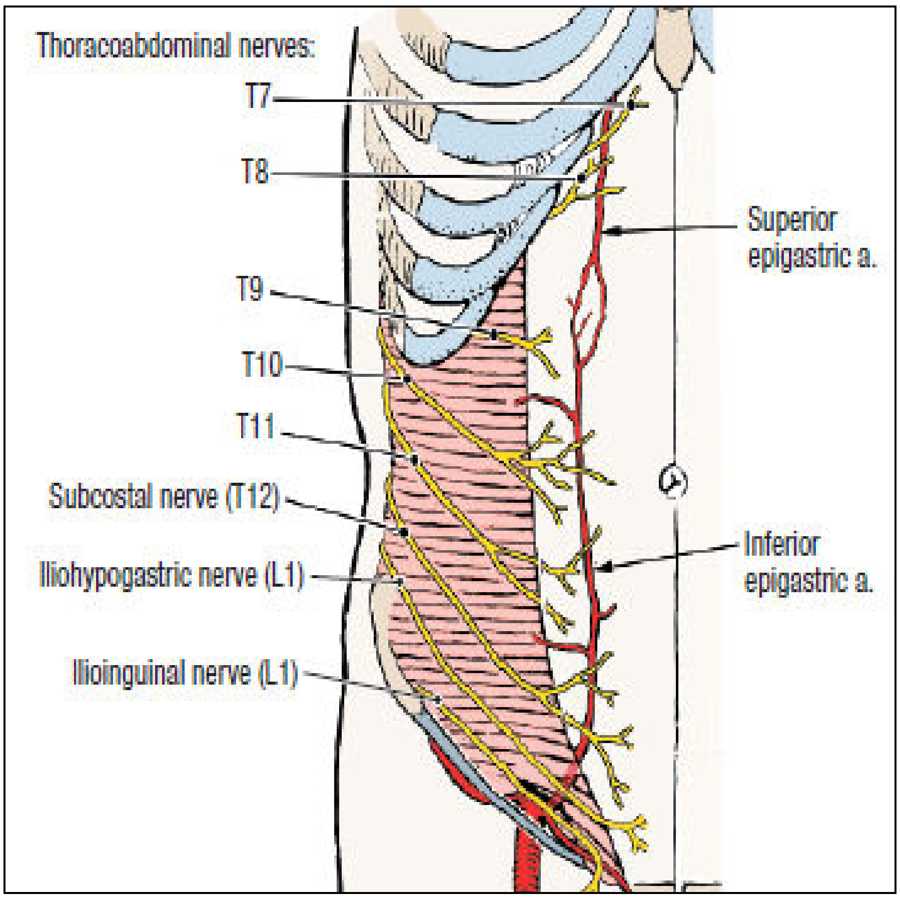

Figure (3): Nerves and arteries within the rectus sheath ***(Tank, 2005).***

CAESAREAN SECTION

Caesarean delivery now is the most common obstetric intra peritoneal operation, and the number of caesarean deliveries is increasing worldwide ***(Antonio et al., 2009)***. Up to that in many settings it may be done without any medical indication which may contribute to this secular trend towards higher rates ***(Stjerholm et al., 2010)***.

Despite this, there is no widely accepted technique for performing CS, numerous approaches have been described and technique often varies from surgeon to surgeon ***(Walsh, 2010)***.

1) Types of Abdominal Incisions:

Usually either a midline vertical or a suprapubic transverse incision is used. Only in special circumstances would a paramedian or midtransverse incision be employed ***(Cunningham et al., 2010).***

a) Vertical Incision

An infra umbilical midline vertical incision is quickest to make. The incision should be of sufficient length to allow delivery of the infant without difficulty; therefore, its length should correspond with the estimated fetal size ***(Cunningham et al., 2010).***

b) Transverse Incision

The two most common transverse incisions used are the pfannenstiel "a gently curved incision 2 centimeter (cm) above the pubic symphysis" and the Joel-Cohen "Which was originally introduced for abdominal hysterectomy and is a straight incision 3cm above a line connecting the anterior superior iliac spine (ASIS) followed by blunt entry into the peritoneal cavity". This technique reduces operative time, blood loss, and analgesic requirements, and was therefore recommended by Cochrane review. However, an absence of long-term effects was noted ***(Hofmeyr et al., 2009).***

2) __Packing around the uterus:__

In an elective procedure soiling of the abdominal cavity by liquor and blood can be avoided to a large extent if a large abdominal pack is inserted alongside the uterus. The pack must be marked with large forceps attached to the tapes which lead out from the abdomen. The insertion of the pack is recorded on the swab count board ***(Catanzarite et al., 2007).***

3) __Bladder Flap Formation:__

Dissection of the vesicouterine peritoneal fold to allow bladder retraction "bladder flap" has become the surgical norm in CS, despite little data to justify its use; a randomized controlled trial (RCT) found bladder flap formation to be associated with increased operating time, postoperative hematuria and analgesic requirements, Although the relative infrequency of bladder injury was markedly underpowered to detect any difference in this complication ***(Hohlag et al., 2001).***

4) ***Types of uterine incisions:***

a) Classical incision

Is a vertical incision into the body of the uterus above the lower uterine segment and reaching the uterine fundus, this incision is seldom used today ***(John et al., 2011).***

b) Lower segment incision

Is an incision made in the lower uterine segment transversely as described by Kerr in 1926.Occasionally,a low-segment vertical incision as described by Kronig in 1912 may be used ***(Lydon et al., 2001).***

- ***Lower uterine segment CS:***

This procedure is the standard method for the surgical removal of the fetus from the uterus. The lower segment of the uterus is that lower part of the anterior uterine wall which is covered by the loose peritoneum of the uterovesical sulcus or pouch ***(John et al., 2011).***

5) ***Expansion of Uterine Incision:***

Different practitioners favor different methods to expand the incision and facilitate delivery. A prospective RCT on twohundred women undergoes primary CS; where women were randomized to either blunt extension "operator expands incision using index fingers in a medial to lateral and cephalic direction" or sharp extension with scissors of the uterine incision. Women undergoing sharp extension had higher blood loss as evidenced by higher estimated blood loss as well as an increased drop in haematocrite and hemoglobin ***(Sekhavat et al., 2010).***

6) <u>Delivery of the presenting part:</u>

a) In cephalic presentation

A hand is slipped into the uterine cavity between the symphysis and fetal head, and the head is elevated gently with the fingers and palm through the incision, aided by modest transabdominal fundal pressure. To minimize fetal aspiration of amniotic fluid, exposed nares and mouth are aspirated with a bulb syringe before the thorax is delivered. The shoulders then are delivered using gentle traction plus fundal pressure. The rest of the body readily follows ***(Renz et al., 2005).***

b) In breech presentation

The lower limbs are delivered and then the breech; the Syntocinon is then given. The arms may be delivered by the Lovset manoeuvre and the head then follows ***(Renz et al., 2005).***

7) ***Removal of the placenta:***

The placenta and the membranes are now removed manually If the uterus is contracting normally following injection of the Syntocinon, then traction on the Cord together with fundal pressure will usually deliver the placenta from the wound. The membranes should be grasped with a sponge holder and gently drawn out, taking care not to tear them and leave fragments within the uterine cavity. If the uterus is soft and placental separation has not quickly occurred, then manual removal may be necessary but this should not become the preferred method of removal ***(Getahun et al., 2006).***

8) ***Uterine Repair:***

Closure of the uterine incision is a key step in CS; particularly give the increasing awareness of future scar dehiscence. The two principal aspects of uterine repair are site of repair "intrabdominal versus extrabdominal" and closure method "single-layer versus double-layer". A recent meta-analysis of 11 randomized controlled trials (RCTS) found no differences in intraoperative or postoperative complications in 3183 women according to site of uterine repair ***(Walsh and Walsh, 2009).***

A Cochrane review of techniques for uterine closure in CS found single-layer closure was associated with significant reductions in blood loss, operative time and post operative pain ***(Dodd et al., 2008).***