INTRODUCTION

Every year several million women have to undergo gynaecological surgery. As a result of that they acquire an abdominal scar. Nowadays women of all ages place extreme importance on the appearance of the scar in addition to the symptoms of pain, tenderness and itching. An aesthetically poor scar can have a negative impact on the overall quality of life causing considerable distress, loss of self-esteem and unhappiness. The appearance of the scar is of significant importance and is often the only reminder of surgery (***Brown et al., 2008)*.**

The outcome of the surgical skin closure is influenced by the indication for the procedure, the location of the surgical site and the associated intra-operative or post-operative complications. The general medical condition of the patient is also of considerable importance. These factors are usually outside the control of the surgeon. The surgeon, however, can choose the technique of closure and the suture material ***(Tully et al., 2002)*.**

The technique of closure should be quick, easy, cost effective and simple, while maximising wound cosmesis and patient satisfaction. The technique should be based on evidence and not only on the surgeon's preference and tradition. Any of

the methods used should be able to restore the physical integrity and function of the injured tissue. Appropriate and careful selection of suture material is important. Choosing the appropriate materials and adhering to good wound closure technique will ensure optimal wound healing**.** The ultimate goal of any skin closure technique is to produce skin approximation and adequate healing with minimum wound complications like pain, infection, scarring and keloid formation. Most important to the patient is the pleasing aesthetic affect .Cost of the procedure should also be considered ***(Meeks et al., 1995)***. Effective wound closure includes elimination of the dead space by approximating the subcutaneous tissues, minimization of the scar formation by careful epidermal alignment, and avoidance of a depressed scar by precise approximation of the skin edges ***(Hollander et al., 1999).***

Many methods are available to the surgeon for apposition of wounds, including the use of non-suture materials (e.g., staples, adhesives, and clips) as well as a variety of suture materials and methods. The ideal closure for surgical incisions is fast and easy to perform, provides optimal wound apposition with sufficient but not excessive tension, and offers a satisfactory cosmetic result for the surgeon and the patient ***(Murtha et al., 2006)***.

Percutaneous metal staples have been used in wound closure over the course of the past 40 years due to the ease and rapidity of their application, efficacy of tissue fixation, and relatively good cosmosis.Metal staples can reduce wound closure times by as much as 80 % with no increase in complication rates. However, metal staples share many of the disadvantages seen with subcuticular sutures, including the potential for staple track formation, inflammation, bacterial migration into the wound bed, and discomfort during staples removal ***(Fick et al., 2005)***.

AIM OF THE WORK

The aim of this work was to compare wound morbidity in surgical staples versus poly-glactin 910 subcuticular suture for skin closure at cesarean deliveries.

ANATOMY OF THE ANTERIOR ABDOMINAL WALL

It is of paramount importance for the surgeon to have detailed knowledge of the anatomy of the anterior abdominal wall and the suspected pathology in order to make the correct choice about the location of the incision. Thorough knowledge is also essential to avoid injury to the vessels and nerves and to close any incision with minimum chance of wound dehiscence and herniation. The abdominal organs are protected by the anterior abdominal wall. The upper part of the abdominal wall lies in the abdomen and the lower part in the pelvis. Cephalad, the abdominal wall extends from the xiphisternum and the costal cartilage of the 7th to 10th rib. Caudally it extends to the iliac crests, anterior superior iliac spines, the inguinal ligaments, pubic tubercle, the pubic crest and pubic symphysis**)** Anteriorly and laterally, the walls are made up of relatively thin expansible muscular sheet. Posteriorly there is thick layer of back muscles and the vertebral column. The integuments of the anterior abdominal wall consist of overlying skin, fascia, subcutaneous tissue and muscles with aponeurosis. These structures are attached to the bony pelvis. The transversalis facia, peritoneal fat and peritoneum are attached to the inside surface. Nerves and blood vessels are present throughout the anterior abdominal wall ***(Flament, 2006).***

(I) Function:

The muscles of anterior abdominal wall assist with respiration and certain expulsive efforts like in urination, defecation, coughing and parturition. They work in conjunction with the muscles of the posterior abdominal wall in rotational movements at the waist and extension movements at the hips. Their tone plays a major role in the protection of the viscera of the abdominal cavity ***(Ellis, 2007).***

(II) Contour:

The shape of the abdomen significantly depends on the lifestyle, BMI, intraabdominal pathology, parity and posture at every age and in both genders. The muscle mass and previous pregnancies can result in variation in the contour and may present problems in correct choice and placement of incisions ***(Ellis, 2007).***

(III) Layers :

(A) Skin:

It is worthwhile to examine the skin as it can influence the selection of the incision. Important points to note are the previous operation scar, any pigmentation or herniation or any bulging due to intra-abdominal pathology ***(Ellis, 2007).***

In 1861, Langer described the cleavage lines of skin that pull the skin edges apart when cut across ***(Ellis, 2007).*** These are named after him as Langer lines.

According to him the bundles of collagen fibres in the dermis run in parallel lines. These lines run horizontally across the abdomen. A vertical incision in the skin of the abdomen cuts perpendicular while a transverse incision cut parallel to these lines. Thus transverse incisions heal with a relatively little scarring and relatively a greater force is needed to disrupt a surgically repaired incision. In contrast vertical incisions will result with a broad scar, especially in the lower abdomen. The skin is supplied by seventh to tenth intercostal nerves and the first lumber nerve in the form of the iliohypogastric nerve ***(Ellis, 2007).***

(B) Superficial Fascia:

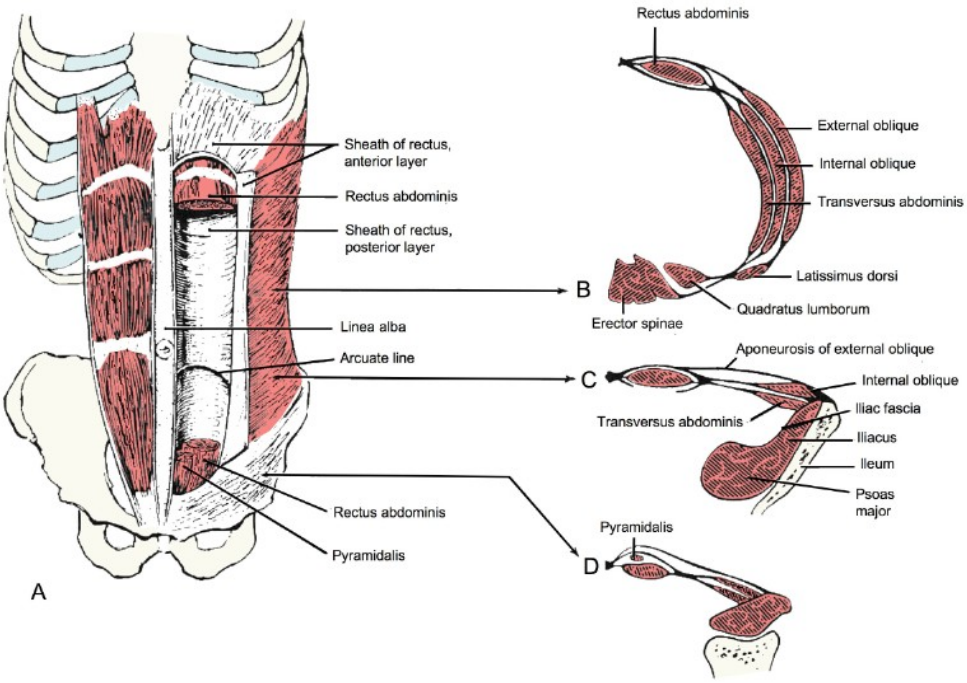
The superficial fascia serves as a major site for the deposition of fat in obese individuals. There are two patterns of distribution. Above the umbilicus, the subcutaneous fascia and fat cells are in a single layer of tissue. Below the umbilicus, it is divided into two layers. The superficial layer is called camper‘s fascia (fatty layer) and the deep layer is called scarpa’s fascia (membranous layer*)* Scarpa’s fascia serves as a firm unit for suturing the subcutaneous fascia in repairs after abdominal surgery. It is continuous with the superficial perineal fascia of the perineum, also with the fascia lata of the thigh inferior to the inguinal ligament ***(Tobin and Benjamin, 1949).***

(C) Abdominal Wall Muscles:

The muscles of the anterior abdominal wall is mainly composed of four paired muscles namely rectus abdominus, internal and external oblique and the transversus abdominus.

1. **Rectus abdominis**: It is long strap like muscle that runs from the rib cage to the pubic bone. It forms the vertical component of the anterior abdominal wall. The paired muscle lie on the either side of the linea alba. The muscles are broad superiorly and narrow inferiorly. They are attached to the fifth, sixth and seventh costal cartilage above and to the pubic symphysis below ***(Cox et al., 1986)*** (see figure 1)**.**

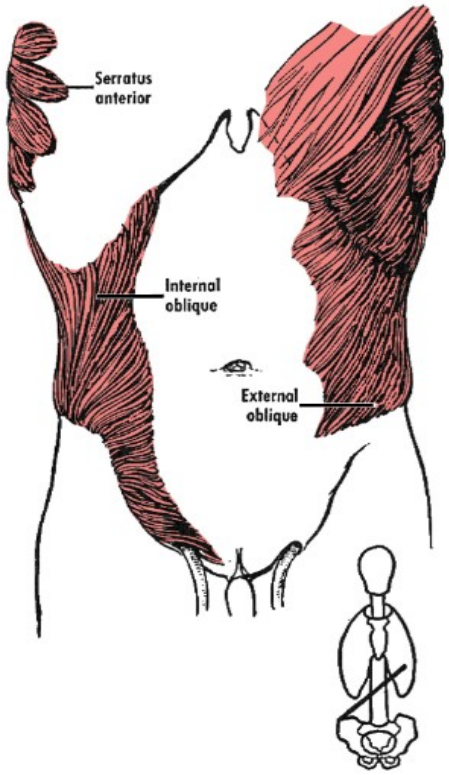
Fig (1): Rectus abdomenis muscle, linea alba and rectus sheath



2. **External oblique**: This broad and thin muscle arises from the outer surfaces of the lower eight ribs. Its fibres fan out and are inserted medially into the xiphoid process, anterior portion of the iliac crest and the linea alba. On its medial side it fuses with its fellow of the other side while inferiorly it forms the inguinal ligament that extends from the anterior superior iliac spine to the pubic tubercle. It has a posterior free border ***(Cox et al., 1986).***

3. **Internal oblique**: This is also a broad and thin muscle that arises from the thoraco-lumber fascia, the anterior two thirds of the iliac crest and the lateral two thirds of the inguinal ligament. It lies deep to the external oblique muscle. From its origin its fibres fans out to be inserted to lower border of the three ribs and their costal cartilages. The intermediate fibres become aponeurotic and forms the rectus sheath before it joins with its fellow on the other side at the linea alba. The lower fibres form a tendon and join with the transverses abdominus tendon to form the conjoint tendon that is inserted at the symphysis pubis ***(Cox et al., 1986)***

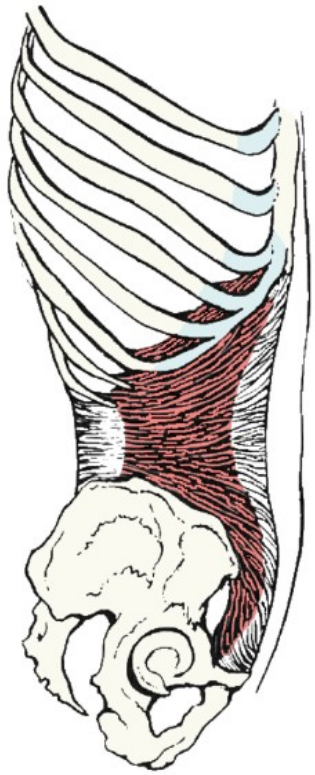
Fig (2): External and internal oblique muscles



(Gary et al., 1997)

4. **Transversus abdominis**: This is the deepest muscle. It arises from the inner surfaces of the lower six cartilages at the tips of the transverse processes of the lumbar vertebrae, the inner lip of the iliac crest and the lateral half of the inguinal ligament. Its fibres run medially and become aponeurotic and form the rectus sheath. Then these fibres join its fellow on the opposite side at the linea alba. The lowermost fibres are attached to the pectineal line by the conjoint tendon ***(Cox et al., 1986).***

Fig (3): Transversus abdominis muscle



(Gary et al., 1997)

5. **Pyramidalis**: This triangular muscle located at the lower end of the anterior abdominal wall. It arises from the superior pubic ramus and the pubic tubercle and inserts into the linea alba ***(Tobika, 2006).***

(D) Linea Alba:

The linea alba stretches from the xiphoid process to the pubic symphysis. It is formed by the fusion of three muscles

namely the internal oblique, external oblique and the transverses abdominus. Its widest margin is 3cm superior to the umbilicus and has varying distances depending upon the point of reference along the anterior abdominal wall. The anterior wall of the rectus sheath is firmly attached to the rectus muscle while the posterior wall is not attached to the muscle ***(Beer et al.,2009)*** (see figure 3).

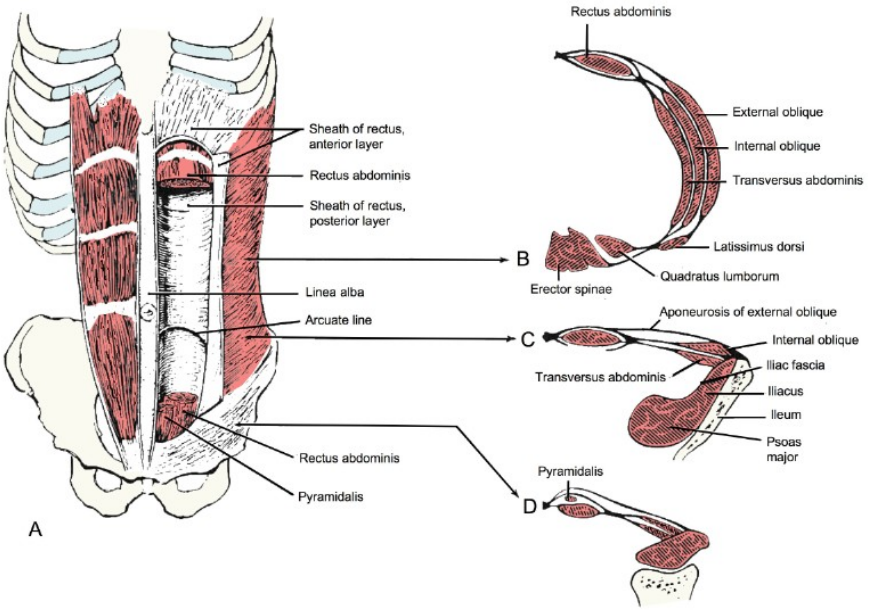
(E) Rectus Sheath:

The rectus sheath is a long fibrous sheath that encloses the rectus abdominus muscle and the pyramidalis muscle. It also contains the anterior rami of the lower six thoracic nerves and the superior and the inferior epigastric vessels and the lymph vessels. It is formed by the aponeurosis of the three lateral abdominal muscles i.e. internal oblique, external oblique and the tranversus abdominis. It is very important to consider this sheath at three levels.

1. **Above the costal margin**, it is formed by the external oblique anteriorly and by the thoracic walls posteriorly i.e. the fifth sixth and seventh costal cartilages and the intercostals spaces.
2. **Between the costal margin and the level of the anterior superior iliac spine,** the aponeurosis of the external oblique is directed in front of the muscle and the aponeurosis of the transverses oblique is directed behind the muscle while the aponeurosis of the internal oblique splits to enclose the rectus muscle.

3. **Between the level of the anterior superior iliac spine and the pubic symphysis**, the aponeurosis of all three muscles forms the anterior abdominal wall. Here the posterior wall is absent and the muscle lies directly on the fascia. The aponeurosis forming the posterior wall pass in front of the rectus at the level of the anterior superior iliac spine, the posterior wall has a curved free border called the arcuate line. At this point the inferior epigastric vessels enter the rectus sheath to anastomose with the superior epigastric vessels. The arcuate line is absent in as many as 30 percent of individuals ***(Mwachaka et al., 2010).***

Rectus abdomenis muscle, linea alba and rectus sheath



(Gary et al., 1997)

(IV) Vasculature:

The anterior abdominal wall is supplied by the superior and the inferior epigastric arteries, the deep circumflex iliac arteries, the posterior intercostals arteries and the four lumber arteries. The superior epigastric artery is a branch of the internal thoracic artery. It supplies the upper central part of the anterior abdominal wall and anastomoses with the inferior epigastric artery. The inferior epigastric artery is a branch of the external iliac artery. It supplies the lower middle part of the anterior abdominal wall and anastomoses with the inferior epigastric artery. The deep circumflex iliac artery is branch of the external iliac artery. It supplies the lower lateral part of the anterior abdominal wall. The lower two posterior intercostal arteries are branches of the descending thoracic aorta and supply the lateral abdominal wall ***(Rozen et al., 2008).***

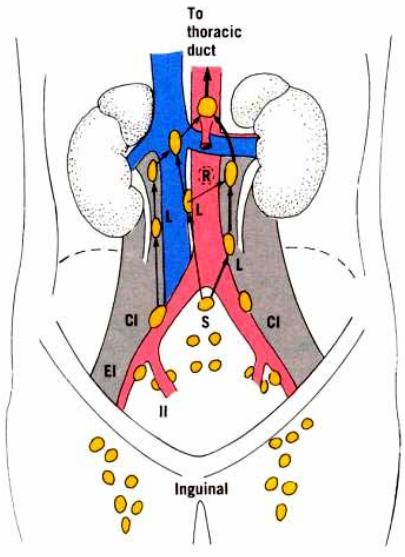


Fig (4): Vasculature and lymphatics of anterior abdominal wall