INTRODUCTION

A hernia occurs when a small sac containing tissue protrudes through a tear, weakening or separation in the muscles in the abdominal wall. Any part of the abdominal wall can develop a hernia. However, the most common site is the groin. A hernia in the groin is called an inguinal hernia. Inguinal hernias account for 90% of all hernias. In an inguinal hernia, the sac protrudes into the groin and sometimes into the scrotum. Although inguinal hernias are most common in men, they can also occur in women. Obesity, pregnancy, coughing, heavy lifting, and straining to pass stool are associated with the appearance of an inguinal hernia. Inguinal hernia exhibits a marked male predominance (20:1) *(Cuschieri, 2002).*

In 1881, a French surgeon, Luca Championniere, performed high ligation of an indirect inguinal hernial sac at the internal ring. Modern hernia surgery started in Italy, more than 100yrs ago, with Eduardo Bassini's presentation of a new method of repair. Bassini did not just invent a new method of inguinal hernia repair; one of his major contributions was that he performed adequate audit and follow-up of patients *(Robert, 1996)*.

Today many methods of repair are used, the majority including reinforcement with various mesh devices. Excellent results have been repeatedly reported from specialized hernia clinics with almost total absence of recurrences *(Amid, 2001).*

The Lichtenstein repair employs a sheet of polypropylene mesh covering the posterior wall of the inguinal canal and extending, for security, over adjacent structures, with a hole to transmit the Cord. It's also described as a tension free repair *(Kirk, 2000).*

The two most important outcome measures following hernia surgery are recurrence rate and chronic postoperative pain *(Haapaniemi, 2001).*

After the introduction of tension-free surgical repair with the use of prosthetic mesh, recurrence rates were reported to be less than 5% and patients comfort was reported to be substantially improved over that obtained by the traditional, tension-producing techniques *(Amid, 2001).*

A laparoscopic method of performing a tension-free repair has subsequently been reported to result in low recurrence rates and to be associated with substantially less pain in the immediate postoperative

period and earlier return to normal activities than the open-repair technique *(McCormack et al., 2008).*

Laparoscopic inguinal herniorrhaphy was described by *Ger, (1992)*, who pointed out its potential advantages such as less postoperative discomfort or pain, reduced recovery time allowing earlier return to full activity, easier repair of a recurrent hernia because the repair is performed in tissue that has not been previously dissected, the ability to treat bilateral hernias, the performance of a simultaneous diagnostic laparoscopy, the highest possible ligation of the hernia sac, and improved cosmoses *(Ger et al., 1992).*

There are different techniques exist for laparoscopic repair of groin hernias. The transabdominal pre-peritoneal (TAPP) repair involves standard laparoscopy with access into the peritoneal cavity and placement of a large mesh along the anterior abdominal wall, thereby repairing the hernia posterior to the defect. This technique was the first laparoscopic hernia repair to be performed *(Vader et al., 1997).*

Totally Extraperitoneal (TEP) procedure is modeled after the Cheatle-Henry preperitoneal hernio-plasties to adress some of the major criticism of the laparoscopic Transabdominal preperitoneal (TAPP)

procedure, namely the need to enter the peritoneal cavity and the attendant risk of injury to an intra-abdominal organ, intestinal obstruction secondary to adhesive complications, or trocar site herniation. Decreased post operative pain and lesser morbidity are the main advantages of TEP over open hernia repair. Laparoscopic hernia repair is now recommended as the method of choice for bilateral and recurrent inguinal hernias *(Watkin, 2002).*

The disadvantages of Laparoscopic inguinal herniorrhaphy are the requirement of general anesthesia (GA), the need to fix the mesh, seroma formation, and the difficult learning curve. Fixation of the mesh with metal staples, apart from increasing the cost, may lead to new post operative groin pain, which can even become chronic in small percentage of patients. This had led to various studies showing that non-fixation of the mesh is safe, cost-effective, and lead to no increased risk of hernia recurrence compared to conventional open hernia repair *(Taylor et al., 2008)*.

AIM OF THE WORK

The aim of this study is to evaluate the results of laparoscopic hernioplasty without mesh fixation as technique for repair of inguinal hernia with reporting:

- Operative technique.
- Operative time.
- Intra-operative complications including:
    1. Injury to the inferior epigastric artery.
    2. Retro-peritoneal hematoma.
- Postoperative pain.
- Early ambulation.
- Postoperative hospital stay.
- The mean time until return to work.
- Postoperative complications.

ANATOMY OF THE INGUINAL REGION

The groin has been defined by "Condon" as: "That portion of the anterior abdominal wall below the level of the anterior superior iliac spine" *(Condon and Nyhus, 1995).*

The inguinal region is the area of the anterolateral abdominal wall that is limited by the inguinal ligament, the lateral margin of the rectus muscle, and horizontal line from the anterior superior iliac spine to the lateral rectus margin *(Mc Vay, 1976).*

The layers of the abdominal wall in the inguinal region consist of:

1. Skin.
2. Subcutaneous fascia (Camper and Scarpa) containing fat (superficial fascia).
3. Innominate fascia (Gallaudet). This may not always be recognized as a distinct entity.
4. External oblique aponeurosis, including the inguinal, lacunar and reflected inguinal ligament.
5. Spermatic cord.
6. Internal oblique muscle, falx inguinale (ligament of Henle) and the conjoint tendon when present.

7. Transversus abdominis muscle and aponeurosis.
8. Transversalis fascia associated with the pectineal ligament (Cooper); the iliopubic tract, the transversalis fascia sling, and the deep inguinal ring.
9. Preperitoneal connective tissue and fat.
10. Peritoneum.

(Skandalakis et al., 2004)

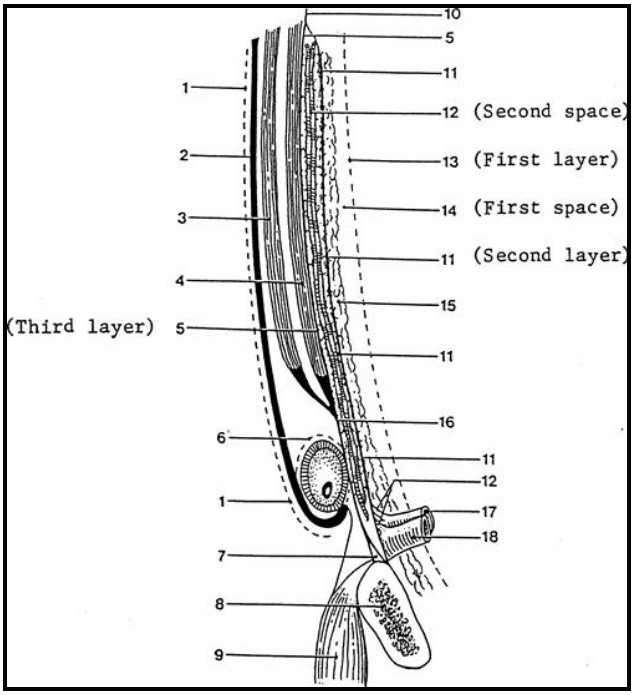

Fig. (1): Representation of the layers of the lower abdominal wall and the inguinal area. 1, indicates the external oblique fascia (fascia of Galaudet); 2, external oblique aponeurosis: 3, internal oblique muscle: 4, transversus abdominis muscle; 5, transversalis fascia anterior: 6, external spermatic fascia; 7, Cooper ligament; 8, pubic bone; 9,. pectineus muscle: 10, transversalis fascia: 11, transversalis fascia posterior lamina; 12, vessels; 13, peritoneum; 14, space of Bogros; 15, preperitoneal fat; 16, transversus abdominis aponeurosis and anterior lamina of transversalis fascia; 17, femoral artery; and 18, femoral vein ***(Skandaiakis el al., 2004)***.

Skin:

Skin of the anterior abdominal wall is thin.

The Superficial Fascia:

The superficial fascia is divided into a superficial part, Camper's fascia and a deep part, Scarpa's fascia. The superficial fascia continues downward over the penis, scrotum, perineum, thigh, and buttocks, as well as upward on the abdominal wall. Scarpa's fascia extends from the lower abdominal wall to the penis as Buck's fascia, to the scrotum as dartos, and to the perineum as Colles' fascia *(Skandalakis et al., 2004).*

Innominate fascia:

It is a thin tissue-like membrane that covers the external oblique muscle (fascia of Gallaudet) and follows the spermatic cord to form the external spermatic fascia *(Skandalakis et al., 2004).*

The aponeurosis of the external oblique muscle:

The external oblique muscle arises by eight digitations from the external surfaces of the lower eight ribs; the upper four digitations alternate with the origins of the serratus anterior and the lower four with those of the latissimus dorsi muscle. The fibers pass downwards and forwards from their origins; the posterior fibers are nearly vertical and are inserted

into the anterior external lip of the iliac crest, in contrast, the uppermost fibers run almost horizontally towards the contralateral side. Along its lower margin the aponeurosis forms the inguinal ligament, which is attached superolaterally to the anterior superior iliac spine and inferomedially to the pubic tubercle *(Anson and Mc Vay, 1984).*

The superficial inguinal ring:

It is a triangular aperture in the aponeurosis of the external oblique, and lays 1.25cm above the pubic tubercle. The ring is bounded by a supero-medial and infero-lateral crus joined by a crisscross intercrural fibers. Normally the ring will not admit the tip of the little finger *(Mann, 1992).*

The Inguinal ligament (Poupart's ligament):

The inguinal ligament is the thick enrolled lower border of the aponeurosis of external oblique, and stretches from the anterior superior iliac spine to the pubic tubercle; its grooved surface forms the "floor" of the inguinal canal. The ligament is curved along its length, the convexity pointing towards the thigh, where it is continuous with the fascia lata *(Peter et al., 1995).*

Lacunar ligament:

The lacunar ligament (pectineal part of the inguinal ligament) extends posteriorly and laterally from the medial part of the inguinal ligament to the medial end of the pectin pubis. It is triangular and measures about 2cm from base to apex. Its thin base directed laterally is concave and forms the medial boundary of the femoral ring, its apex is attached to the pubic tubercle. Its posterior margin is attached to the pectin pubis, its anterior margin continues into the inguinal ligament ***(Anson and McVay, 1984).***

Reflected part of the inguinal ligament (Colles' ligament):

It is an expansion from the lateral crus of the superficial inguinal ring. It passes upwards and medially to join the rectus sheath and the linea alba (Fig. 2) ***(Peter et al., 1995)***.

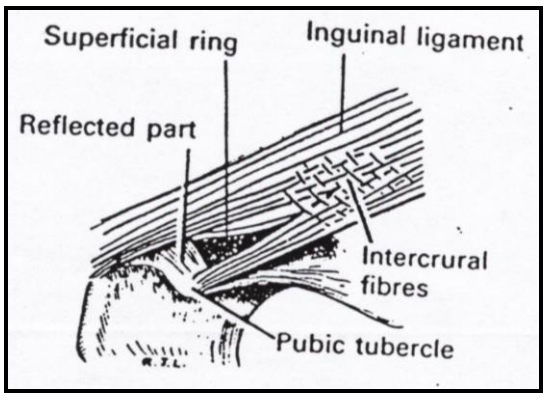

Fig. (2): Left superficial inguinal ring, after removal of the external spermatic fascia which is continuous with the margins of the ring ***(Sinnatamby, 1999).***

The pectineal ligament (Cooper's ligament):

It is a thick, strong tendinious band formed by tendinious fibers of the internal oblique, transversus abdominis and pectineus muscle. It is faced to the periosteum of the superior pubic ramus and laterally to the periosteum of the ileum ***(Skandalakis et al., 2004).***

Ligament of Henle (Falx Inguinalis):

The ligament of Henle is the lateral vertical expansion of the rectus sheath that inserts on the pecten of the pubis ***(Skandalakis et al., 2004).***

Interfoveolar Ligament (Hesselbach's Ligament):

The interfoveolar ligament is a thickening of the transversalis fascia at the medial side of the internal inguinal ring. It lies in front of the inferior epigastric vessels like a spider web ***(Skandalakis et al., 2004).***

Spermatic cord:

The spermatic cord has three coverings and six (groups of) constituents. Of the three coverings of the spermatic cord; the internal spermatic fascia is derived from the transversalis fascia at the deep inguinal ring. As the cord passes through the ring into the inguinal

canal, it picks up a second covering, the cremasteric muscle and cremasteric fascia. The third covering, the external spermatic fascia, is acquired from the fascia of Gallaudet as the cord passes between the crura of the superficial ring *(Sinnatamby, 1999).*

The constituents of the cord (Fig. 3):

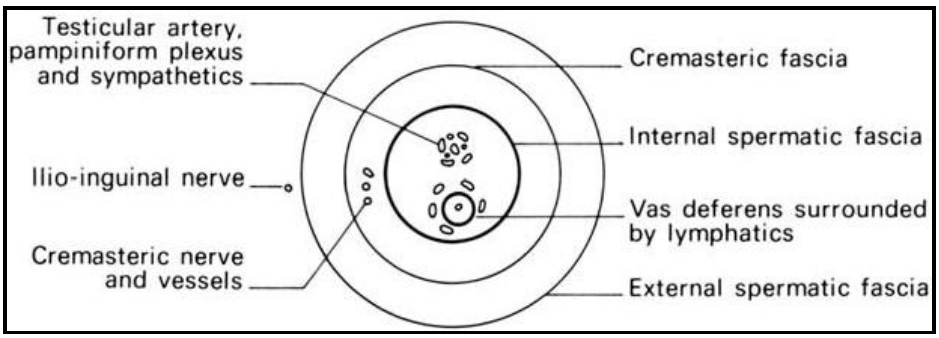

Fig. (3): Spermatic cord and its contents *(Ellis, 2002).*

1. The ductus deferens, which usually lies in the lower and posterior part of the cord.
2. Arteries, the largest is the testicular artery, the artery to the ductus (from the superior or inferior vesical), and the cremasteric artery (from the inferior epigastric) to the coverings.
3. Veins, the pampiniform plexus.
4. Lymphatics, essentially those from the testis draining to para-aortic nodes, but including some from the coverings which drain to external iliac nodes.

5. Nerves, in particular the genital branch of the genitofemoral nerve which supplies the cremasteric muscle. Other nerves are sympathetic twigs.
6. The processus vaginalis, the obliterated peritoneal connection with the tunica testis. When patent it forms the sac of inguinal hernia.

(Sinnatamby, 1999)

The Internal oblique muscle:

Fleshy fibers of the muscle arise from the whole length of the lumbar fascia, from the intermediate area of the anterior two-thirds of the iliac crest and from the lateral two-thirds of the inguinal ligament. From the lumbar fascia the muscle fibers run upwards along the costal margin, to which they are attached, becoming aponeurotic at the tip of the ninth costal cartilage. Below the costal margin, the aponeurosis splits around the rectus muscle, the two layers rejoining at the linea alba. Halfway between the umbilicus and the pubic symphysis the posterior layer ends in a curved free margin, the arcuate line. Below this point, the aponeurosis passes wholly in front of the rectus muscle, to the linea alba *(Sinnatamby, 1999).*

The conjoint tendon:

The conjoint tendon (Fig. 4) is classically described as a band formed by a conjoining of aponeurotic fibers from the internal oblique and transversus abdominis aponeuroses that turns sharply inferiorly along the border of the rectus muscle and sheath to insert into the pubic tubercle and adjacent superior pubic ramus *(Mc Minn, 1996).*

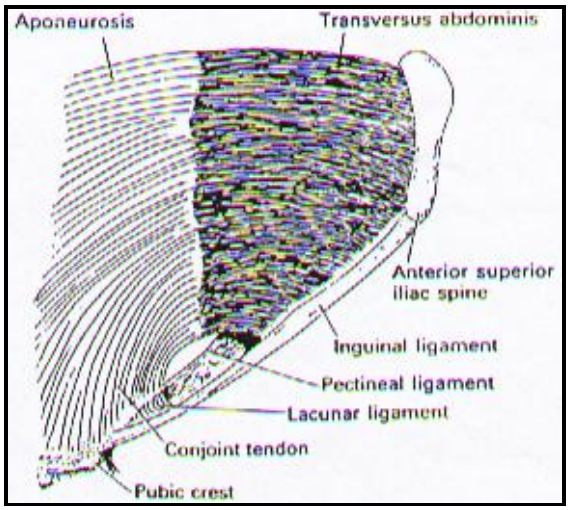

Fig. (4): Left transversus abdominis, showing the lowest fibers arching medially to join the conjoint tendon *(McMinn, 1996).*

Transversus abdominis muscle:

The muscle arises in continuity from the lateral third of inguinal ligament, the anterior two-thirds of the inner lip of the iliac crest, the lumbar fascia, the twelfth rib, and from the inner aspects of the lower six costal cartilages where it interdigitates with the diaphragm. The muscle fibers become aponeurotic and pass behind

the rectus to fuse with the internal oblique aponeurosis into the linea alba. Below the arcuate line the aponeurosis passes wholly in front of the rectus muscle. The lower fibers of the aponeurosis curve downwards and medially with those of the internal oblique as the conjoint tendon, to insert on the pubic crest and the pectineal line *(Sinnatamby, 1999).*

The transversails fascia:

This is the deep fascial layer that covers the internal surface of the transversus abdominis muscle and which, with the fascial layers covering the other abdominal wall muscles *(Mc Vay, 1996).*

The Iliopubic Tract:

It is an aponeurotic band forming the inferior margin of the transversalis fascia, which is mixed with stronger fibers from the transversus abdominis aponeurosis. This band of tissue is anchored superolaterally along the inner lip of the crest of the ilium and at the anterior superior iliac spine, and stretches medially to insert on the superior ramus of the pubis. In its course, it provides reinforcement to the inferior crus of the deep inguinal ring and inferior extension that becomes the anterior portion of the femoral sheath *(Quinn, 2002).*