



## RESEARCH ARTICLE

### ROLE OF MESH IN ABDOMINAL WALL HERNIAS REPAIR

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#### Abstract

A prospective study of patients with abdominal wall hernias, who were admitted and operated upon at Al-Fallouja teaching hospital, Al-Anbar, Iraq, in the period between April 2009 and November 2013. A total of 54 cases, 40 males and 14 females were included in the study sample. Inguinal hernia formed 68.5%, incisional hernia 22.25% and umbilical hernia 9.25% of the study sample.

Patients were all adults between 15-75 years (mean age: 46.6). The duration of their complaints ranged from few months to several years. Hernioplasty was performed using polypropylene mesh (open and laparoscopic technique) to have a tension free repair.

Postoperatively the patients were followed up to one year. The incidence of postoperative complications was 18.5%, seroma was the most frequent 9.2%, followed by wound infection 3.7%. A single case of recurrence was reported.

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#### Introduction:-

##### Abdominal Wall Hernia:-

Hernias of the abdominal wall are the most common condition requiring major surgery. Despite the frequency of surgical repair, perfect results continue to elude surgeons, and the rate of surgical failure (recurrence) is humbling.

The outcome of hernia surgery is highly surgeon- dependent, and Ashly P.Cooper of quoted statement of 1804 is still pertinent, "No disease of the human body, belonging to the province of surgeons requires in its treatment a greater combination of accurate anatomical knowledge with surgical skill than hernia in all its varieties[1,2].

##### Hernias Of The Groin:-

Traditionally the hernias of the groin have been defined as separate entities (indirect inguinal, direct inguinal and femoral hernia) which create confusion.

Fruchaud's (1956) concept of the anatomy of hernias of the groin is important. Rather than viewing hernias solely by their varied clinical presentation (direct, indirect, femoral). Fruchaud emphasized their common origin by noting that all the hernias of the groin begin with a single area that he called the myopectineal orifice.

The myopectineal orifice is the area in the groin bounded superiorly by the internal oblique and transverse abdominal muscles, laterally by the iliopsoas muscle, medially by the rectus muscle and sheath and inferiorly by the pecten pubis [3].

This bony-muscular framework is bridged and bisected by the inguinal ligament, traversed by the spermatic cord and femoral vessels and sealed like a drum on its inner surface by the transversalis fascia only. Therefore the integrity of the myopectineal orifice is dependent on the transversalis fascia. Failure of the transversalis fascia to retain the peritoneum then becomes the fundamental cause of all groin hernias.

### **Basics Of Hernioplasty:-**

The object of groin hernioplasty is to prevent peritoneal protrusion through the myopectineal orifice. The integrity of the myopectineal orifice is restored in two fundamentally different ways, which are based on Fruchaud's concept of groin hernia, namely: (1) Aponeurotic closure of the myopectineal orifice to the extent necessary (2) Replacement of the defective transversalis fascia with a large synthetic prosthesis. The two methods are sometimes combined. Tension is the principle cause of failure of all the hernioplasties that close the myopectineal orifice by aponeurotic approximation. Great efforts to prevent suture-line tension are essential, and sutures must never be drawn up or tied so tightly as to cause necrosis. Permanent synthetic suture are preferable.(4)

### **Anterior classical groin hernioplasty:-**

They are still in use and effective especially in primary hernia. Classical hernioplasty has three parts: Dissection of the inguinal canal, repair of the myopectineal orifice, and closure of the inguinal canal [5]. The following are the most frequently used classic hernioplasties.

### **The Marcy Repair:-**

It consists of tightening an enlarged deep ring only. Used in patients with minimal damage to the deep ring. It is the hernioplasty.

### **The Bassini-Shouldice hernioplasty:-**

Repair of the pectineal orifice superior to the inguinal Ligament i.e. the deep ring and Hesselbach's triangle therefore it is indicated in all direct and indirect inguinal hernias.

Here the internal oblique abdominal muscle, the transverse abdominal muscle and the transversalis fascia (Bassini triple layer) are approximated to both the femoral sheath and the shelving edge of the inguinal ligament with non-absorbable suture (6).

### **The Cooper's ligament hernioplasty (McVay-Lothiessen):-**

Repair the three most vulnerable areas of herniation in the pectineal orifice: – the deep ring, Hesselbach's triangle and the femoral canal- and is therefore indicated for the three common types of hernias of the groin. In this repair the transverse aponeurotic arch is sutured to Cooper's Ligament medially and to the femoral sheath laterally. Relaxing incisions are mandatory because there is otherwise too much tension on the suture line.

### **Disadvantages of the classic hernioplasties:-**

1. Skill and experience is of prime importance in reducing the incidence of recurrence.
2. Tension in different degrees is most present.
3. In patients with connective tissue diseases or very weak tissues it is an unjustifiable method of repair.
4. Continued tissue weakening is attended.
5. Inadequate for recurrent hernias.

The avoidance of these disadvantages as addressed by many surgeons is by the use of synthetic tissue prosthesis.

### **Prosthetic Hernioplasty:-**

They are beginning to replace the classic hernioplasties-A- wide variety of prosthesis is readily available. Synthetic mesh prosthesis currently plays a major role in the management of all groin hernias. Synthetic mesh prosthesis are used to patch or plug the myopectineal orifice to reinforce a classical repair and to replace the transversalis fascia. The ideal mesh is one that is cheap and universally available, easily cut to the required shape, flexible, slightly elastic and pleasant to handle. Besides, it should be practically indestructible and capable of being rapidly fixed and incorporated by human tissues.

It must be inert and elicit little tissue reaction so, consequently, not rejected even in the presence of infection. It must be sterilizable and non-carcinogenic. Polypropylene mesh (prolene and Macules) meets the requirements of the ideal prosthesis and is today the most commonly used material for repair of all hernias. It consists of a monofilament

thread of polypropylene knitted in a fairly loose manner. Usually the prosthesis is placed on top of the posterior wall of the inguinal canal, although behind would seem to be the proper site.

#### **The commonest techniques are:-**

##### **Anterior Approach:-**

(A)-Lichtenstein's tension-free hernioplasty:- Originally a patch of mesh is used to reinforce the classic repair. But they have not significantly improved the results. When the prosthesis is implanted without formal repair so obviating tension, results improve dramatically.

(B)- Gilbert's sutureless hernioplasty: He used mesh plug, plus a patch of mesh over it without sutures.

##### **Posterior approach:-**

(A)-Stoppa's giant prosthetic reinforcement of the visceral sac:- He used a large permanent prosthesis that essentially replaced the transverse fascia.

(B)- Laparoscopic repair:

1. Trans-Abdominal properitoneal approach (TAPP).
2. Totally Extraperitoneal (TEP)

Complications of Groin Hernioplasty:- Ischaemic orchitis and testicular atrophy and residual neuralgia are the two important complications. They are more frequent after anterior than posterior hernia repair.

#### **Non- Inguinal Abdominal Wall Hernias:-**

##### **Umbilical hernia:-**

The umbilicus is one of the weak areas of the abdomen and a common site for herniation. It occurs more frequently in women. Umbilical hernia in adults is acquired and has no relationship to congenital umbilical hernia.

In children. It is common in infants and close spontaneously if the aponeurotic defect is 1.5cm or smaller. Repair is indicated when the defect is greater than 2cm in diameter and in all children with umbilical hernia still present by the age of 3 or 4 years. Umbilical hernias with a small parietal defect are merely closed by a to-and-for, loosely placed polypropylene suture, and those with large parietal defects are managed with prosthesis in a repair resembling that for incisional hernia.

##### **Incisional hernias:-**

They are serious surgical problems. They have a propensity to enlarge, are frequently formidable to repair and are usually accompanied by serious associated condition. Obesity and infection are the two principle causes of these hernias.

##### **Repair of Incisional hernias:-**

The object of incisional hernioplasty is anatomic reconstruction of the abdominal wall. Most of the incisional hernias and all recurrent incisional hernias repair require prosthesis implantation.

##### **Aim of the study:-**

The aim of this prospective study is to determine the outcome of abdominal wall hernia repair with polypropylene mesh, whether they are primary or recurrent, assessing the incidence of recurrence and complication.

#### **Patients and Methods:-**

##### **Study Designs:-**

Prospective study

##### **Study sample:-**

Between April 2009 and November 2013, 54 patients were admitted and operated upon for repair of abdominal wall hernias using polypropylene prosthetic mesh.

**Data Collection:-****Data collection includes:-**

1. Age, name and sex of patients.
2. Type of hernia.
  1. Risk factors for hernia (e.g. smoking, obesity, increased intra-abdominal pressure (chronic cough, constipation, straining at micturition .....etc.), previous abdominal surgery and difficult labour).
  2. Operative findings.
  3. Postoperative complication and follow up of patients for one year.

**Operative techniques:-****Groin hernia: - Open and Laparoscopic.**

**Open:** The modified Lichtenstein's tension free repair under general Anaesthesia was performed, supine position, skin preparation, transverse skin crease incision over the inguinal region is made and the inguinal canal is opened through the fibers of the external oblique aponeurosis. The spermatic cord is identified and secured, the indirect hernia sac is dissected, freed, transfixed and excised, direct sac was merely reduced.

A patch of prolene mesh was prepared with a slit in its upper lateral side to accommodate the cord. The patch is then fixed to the pubic tubercle and medially to the inguinal ligament using interrupted 2/0 Nylon sutures. The slit is also stitched above the cord to make a new deep inguinal ring. haemostasis secured, wound closed in layers with no drain left.

**Laparoscopic technique:-**

(A)Trans Abdominal pro-peritoneal approach (TAPP): three ports technique (sub umbilical for the camera 10mm, two 5 mm ports at the lateral sides 2.5cm below the camera port). CO2 insufflation, peritoneal flap raised over the hernia, spermatic cord identified, sac reduced. Mesh (12x9cm) applied properitoneally and fixed with few clips. Peritoneal Flap resutured over the mesh, haemostasis secured, wounds closed.

(B)Totally Extra-peritoneal approach (TEP):- Three ports technique (CO2 insufflation performed properitoneally through a sub umbilical incision (10mm) for the camera and 2 lateral ports each 5 mm , for dissection ), sac and spermatic cord identified, sac reduced, mesh (12x9cm) applied, deflation performed , haemostasis secured, Wounds closed.

**Non-inguinal hernias:-**

Here abdominal incisions were made over the hernia or through the old scar tissue. The sac is isolated and opened, the contents were examined and reduced the excess sac is cut and removed, then the defect is closed, wide dissection around the defect performed, a sheet of prolene mesh prepared to the shape of the hernia opening and put to cover the defect and the surrounding sheath for about 4 cm, the mesh edges are fixed by 2/0 nylon sutures, haemostasis secured, the area is drained by one or two closed vacuum drains and the wound is closed in layers. In cases where mesh patch is applied, the patients were given parenteral antibiotics.

**Statistical Analysis:-**

Data were translated into codes using a specially designed coding sheet, and then entered into a computer system using DBASE 111 plus computer software. Frequency distribution for selected variables was done first. The statistical significance of age, gender and type of hernia with the development of postoperative complication was assessed by Chi-square test of independence, P value less than the 0.05 level of significance was considered statistically significant.

**Results:-**

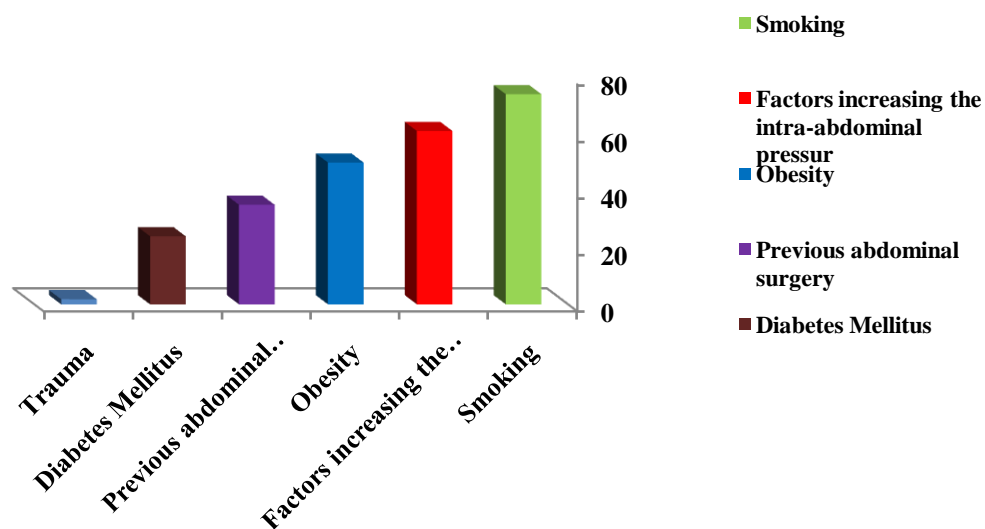
The following results are based on the analysis of data on 54 cases with hernia. These cases had surgical hernioplasty employing mesh Post-surgical complications were looked for during one year of follow up.

**Description of hernia cases:-****Age and Sex:-**

As shown in table 1, the mean age of cases was (46.6years), seven cases (12.9%) were less than 25 years of age, 33 (61.1%) were 26-55 years of age, 14 (25.9%) were older than 56 years of age. Males constituted a higher proportion of cases (74.1%).

**Table 1:-** Distribution of the study sample by age and sex.

Variable	N	%
<b>1-Age in years :</b>		
15-25	7	12.9%
26-35	12	22.2%
36-45	8	14.8%
46-55	13	24%
56-65	11	20.3%
65+	3	5.5%
<b>2-Sex :</b>		
Male	40	74.1%
Female	14	25.9%
	54	

**Figure 1:-** The relative Frequency of certain risk factors for hernia.**Risk factor of hernia:-**

As shown in table 2 and figure 1, the incidence of six possible risk factor for hernia among cases in the study sample were looked for. Smoking was the most frequent factor (74%) followed by factors increasing the intra- abdominal pressure (61.1%), obesity (50%), previous abdominal surgery (35.1%), diabetes mellitus (24%) and lastly trauma accounting for (1.8%). Among the factors increasing the intra-abdominal pressure, chronic cough was the most frequent accounting for 27out of 33 cases (81.8%), constipation (12.1%) and straining on micturition (6.1%), Ascites was not found among the cases studied.

**Table 2:-** Distribution of the study sample by risk factors of hernia.

Possible risk factors for hernia	N	%
<b>Smoking</b>	<b>40</b>	<b>74.07%</b>
<b>Factors increasing the intra-abdominal pressure</b>	<b>33</b>	<b>61.1%</b>
<b>Obesity</b>	<b>27</b>	<b>50%</b>
<b>Previous abdominal surgery</b>	<b>19</b>	<b>35.1%</b>
<b>Diabetes Mellitus</b>	<b>13</b>	<b>24%</b>
<b>Trauma</b>	<b>1</b>	<b>1.8%</b>
<b>Total</b>	<b>54</b>	<b>***</b>

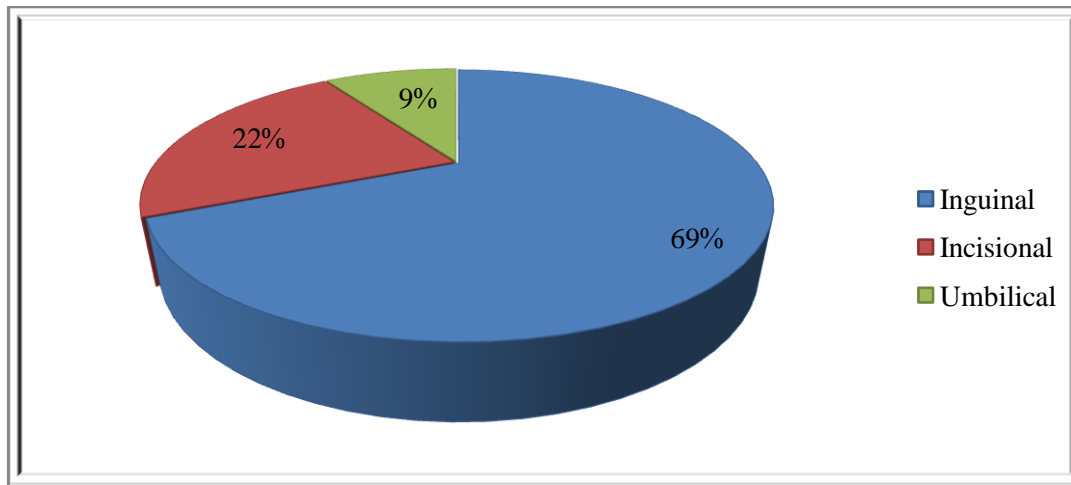
\*\*\*Percentages do not add to 100% since a patient can have more than one risk factor.

**Type of hernia:-**

Inguinal hernia was the commonest type constituting (68.5%), followed by incisional hernia (22.25%) then the umbilical hernia (9.25%). [Table (3), Figure (2)].

**Table3:-** the relative Frequency of different types of hernia the study sample.

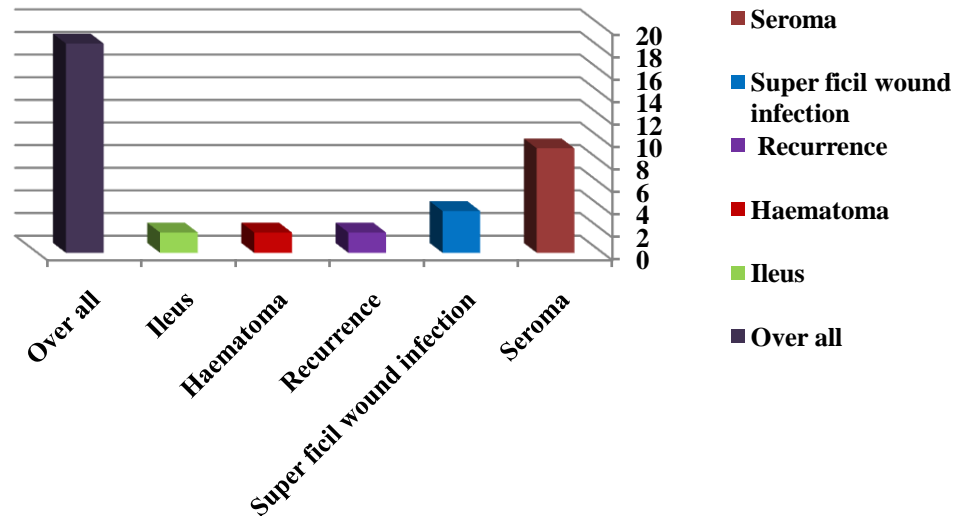
Types of hernia	N	%
<b>Inguinal</b>	<b>37</b>	<b>68.5%</b>
<b>Incisional</b>	<b>12</b>	<b>22.55%</b>
<b>Umbilical</b>	<b>12</b>	<b>9.25%</b>

**Figure 2:-** Pie chart showing the relative frequency of hernia the study sample.**post-operative complications:-****Incidence by type:-**

As shown in table (4) figure (3) during the one year period of follow up after hernioplasty, (10) out of the (54) cases followed developed complications (18.5%). Five types of post-operative complication were observed namely recurrence seroma, heamatoma, ileus and superficial wound infection. Seroma had the highest incidence rate (9.24%) among the study sample followed by superficial wound infection (3.7%) then ileus, heamatoma and recurrence, each with (1.8%)

**Table 4:-** The incidence (% patients) of different types of postoperative complication during one year of follow up

Type of post-operative complication (no.54)	N	%
<b>Seroma</b>	<b>5</b>	<b>9.24%</b>
<b>Superficial wound infection</b>	<b>2</b>	<b>3.7%</b>
<b>Recurrence</b>	<b>1</b>	<b>1.8%</b>
<b>Haematoma</b>	<b>1</b>	<b>1.8%</b>
<b>Ileus</b>	<b>1</b>	<b>1.8%</b>
<b>Over all</b>	<b>10</b>	<b>18.5%</b>



**Figure 3:-** the incidence rate (% patients) of different types of postoperative complication during one year of follow up

#### Time of onset:-

As shown in table 5, table 6 and fig 4, all the 10 cases who developed complications during the one year postoperative follow up period, had one or more type of complication during the early postoperative period, seroma had the highest incidence, then superficial wound infection between (9.24% and 3.7% respectively). Others were rare of (1.8%) incidence each. One case out of the (10) cases who developed such complications during the (1) week of postoperative period (1.8%) % it was the development of haematoma. One case out of the (10) cases with complication developed recurrence in the 2 week of the postoperative period. No complications were reported at the end of the 1 year period of follow up.

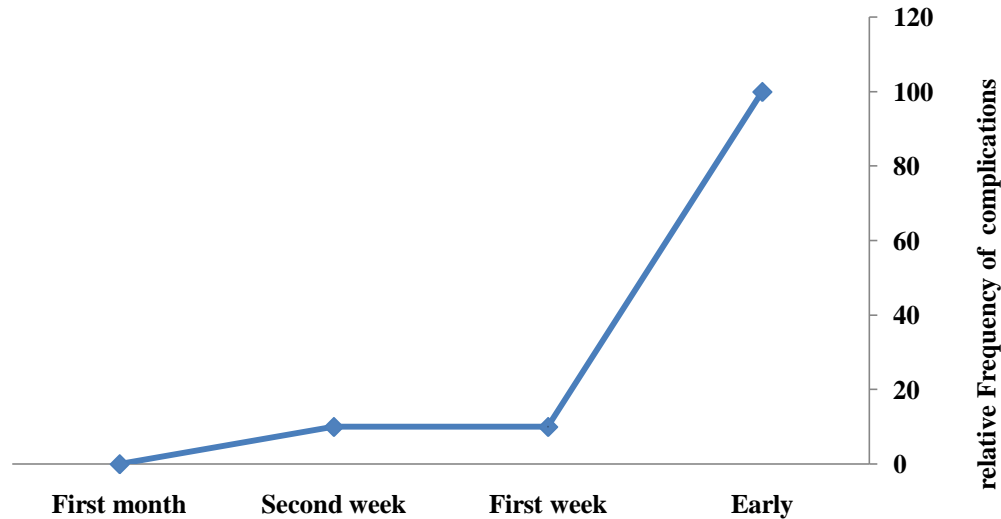
**Table5:-** The relative Frequency of post-operative complications at different follow up intervals among the 10 cases developing complications.

Time of onset of postoperative complication	No	%
<b>Early</b>	<b>10</b>	100%
<b>First week</b>	<b>1</b>	10%
<b>Second week</b>	<b>1</b>	10%
<b>First month</b>	<b>0</b>	0%
<b>Total</b>	<b>10</b>	

None of the cases had complication when examined one year after surgery

**Table 6:-** the incidence (%) and different types of postoperative complications at different postoperative follow up period.

postoperative complications	Early		1 <sup>st</sup> week		2 <sup>nd</sup> week	
	N	%	N	%	N	%
<b>Early</b>	<b>5</b>	<b>9.24%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	0%
<b>First week</b>	<b>2</b>	<b>3.7%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	0%
<b>Second week</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	1.8%
<b>First month</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>1.8%</b>	<b>0</b>	0%
<b>Total</b>	<b>1</b>	<b>1.8%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	0%



**Figure 4:-** Line graphs showing the Time trend of postoperative complications among patients with complications

#### Incidence by certain variables:-

As shown in table (7), among the 6 age groups, the (56-65years) age group (36.4%) had the highest incidence of postoperative complications, the lowest incidence rate (0%) was observed in the 15-25 year in age group. However, the association between age and development of postoperative complication was statistically not significant, males had a slightly higher incidence rate of complication (20%) compared to females (14.4%).

**Table7:-** Age gender and type of hernia specific incidence rate (%) of postoperative complications

Variable	N	%
<b>1-Age in years :</b>		
15-25 (n:7)	0	0%
26-35 (n:7)	2	16.6%
36-45 (n:7)	2	25%
46-55 (n:7)	2	15.3%
56-56 (n:7)	4	36.4%
65+ (n:7)	0	0%
<b>2-Gender :</b>		
Male (n:40)	8	20%
Female (n:14)	2	14.4%
<b>3. Types of hernia</b>		
Inguinal (n:37)	7	18.9
Incisional (n:12)	2	16.6
Umbilical (n:5)	1	20

#### Discussion:-

Inguinal hernia is the most common form of abdominal wall hernia (18). In this study it forms (68.5%) of the patients and it is commoner in males. In the literature, inguinal hernia accounts for approximately (75%) of all abdominal wall hernias (2). Abdominal wall hernia incidence increases with age. Chronic cough, straining on defecation or micturition, heavy weight lifting may all precipitate for hernias in adults. (2). (53.7%) of patients in this study complaining of chronic cough or chronic obstructive pulmonary disease. In children whooping cough is a predisposing factor for hernia.

Dr. Robert Fitzgibbons found in a retrospective study on 416 cases of abdominal hernia that factors increasing the intra-abdominal pressure were present in 66% of the patients with these hernia, in which chronic cough was the most prevalent factor accounting for 58% of his patients.



Smoking for long duration is an important factor, as it can damage the connective tissues in the abdominal wall (due to imbalance between blood proteases and antiproteases) resulting in an acquired hernia. (2.20) In this study it is the most frequent risk factor accounting for (74%) of our patients. Des Conteaux and Sutherland published a review about the risk factor in abdominal wall hernias in 706 of patients stating that smoking is the most common risk factor was found in two thirds of the patients 69% (2.16.27).

Incisional hernia was most prevalent in obese patients, persistent cough and postoperative abdominal distension being its precursors. Prosthetic mesh repair by avoiding tension is the logical treatment for this hernia. (1.2).

In this study (22.25%) of patients had incisional hernias all were obese except one patient. Incisional hernia is unique in that it is the only abdominal wall hernia considered to be iatrogenic (3). Obesity was found in 85% of 106 patients with incisional hernias as published by Bendavid et al. (8) the technique of hernias repair using mesh in not recent, but surgeons used to be reluctant to use mesh in hernia repair unless it was a recurrent one. The teaching was that mesh is a foreign body and should not be used unless the tissues were too weak to maintain their integrity. This was based on the mesh material available at that time, which had basic problem. The principle is that using mesh in patients with hernias would reduce the tension on the tissues and therefore, decreases postoperative pain and disability as well as reduce the rate of recurrence because of lower tension and stronger repair.

Cunningham et al in a prospective randomized trial conducted in Canada found that a reduction of (7.6%) of pain incidence was noted after using mesh in the repair of abdominal wall hernias (7). The claimed drawback of using mesh in adult patients with hernias is that it is a foreign body and could be rejected. (20) In this study, no such complication had happen over a year of follow up, the same was found by a number of other studies carried over the last 30 years. (23).

Another problem is that, if infection occurs it could possibly necessitate removal of the mesh and compromise the hernia repair. (19). this was not the case in the present study and other studies have reported the resistance to infection of the mesh (26). Superficial wound infection was 3.7% In this study, all were treated conservatively on an outpatient basis and mesh was not removed. Amid was in his study stated that using mesh does not increase the risk of infection, provided the mesh is monofilament and microporous (19). Recurrence had happen in one patient treated by TAPP Laparoscopic method (the patient had a large right inguinal hernia and a small left one, the mesh was not properly covering the left one recurred 14 days after the operation). Other studies in more than 150 articles in the surgical literature, the recurrence rate is consistently less than 1%, ranging between 0% to 0.7% (21).

The other complication in this study is seroma happened in (9.24%) of our patients. All were treated by simple aspiration and antibiotics. One patient developed hematomas again treated conservatively with antibiotics with final resolution, postoperative ileus occurs in one patient and resolved with conservative treatment after few days. The complications of the procedure are not life threatening and include less than 2% rate of infection, hematoma or seroma, this was found by Kark et al. review of 1098 cases of abdominal wall hernia which is identical to what was found in this study apart from that seroma showed a higher incidence in this study especially after Laparoscopic procedure probably due to our newly developed experience in the laparoscopic surgery (17).

All these complications appeared early (within 2week postoperatively) and at the end of the follow up period no further complications were encountered. By now propylene mesh is the most ideal mesh for the repair of the abdominal wall hernias, the advantages of this technique were technically easy to be performed, can be done on an outpatient basis, using local anesthesia, if desired, and causes less pain and disability than other methods. Complications and recurrence rates were less (8).

### Conclusions and Recommendations:-

1. The mesh should be large enough to cover the defect well beyond its edges.
2. Mesh should not be used in young patients with strong inguinal floor or if the patient refuses it.
3. Avoid nerves and vascular injuries on incorporating the mesh.
4. Close tire key hole slit.
5. Mesh repair should be routinely used in the repair of all abdominal wall hernias because of its excellent short and long term result.
6. Tension-free hernioplasty is a simple, rapid and safe technique with a very low rate of morbidity.

7. Propylene (polypropylene) mesh is an excellent prosthetic material for repair of all hernias of the abdominal wall. It is biologically inert and resistant to infection.
8. Obese patients with large incisional hernias are especially at risk for postoperative and septic complications, respiratory dysfunction and pulmonary emboli. Preoperative and postoperative prophylaxis for these problems is essential.
9. Prophylaxis of infection is essential, rigid sterile condition precise and meticulous surgical technique, and avoidance of seroma and hematomas with the use of closed suction drains are important points.

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