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Overview of Surgical Repair Techniques for Inguinal Hernias

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Abstract: **This review study was aimed to evaluate and highlight the different surgical repair for inguinal hernias and discuss the most effective and safe techniques to be used in general surgery ward. We conducted an electronic search using the following databases: MEDLINE, the Cochrane Library, Scopus, Embase, searching relevant articles concerned with surgical management approaches of inguinal hernia published until January 2017. Searching was restricted to published articles in the English language. More studies were found through searching the references lists of identified articles. Numerous repair work approaches have been explained to date. Mesh repairs are superior to "non-mesh" tissue-suture repair works. Lichtenstein repair and endoscopic/laparoscopic strategies have comparable efficacy. Information from numerous studies suggest that the Laparoscopic technique repair work leads to less postoperative pain, a quicker return to regular practical status, and enhanced quality-of-life outcomes with comparable reoccurrence rates when compared with the Lichtenstein inguinal hernia repair.**

Keywords: **surgical repair, Cochrane Library, Scopus, Embase, Laparoscopic technique, general surgery ward.**

1. INTRODUCTION

Inguinal hernia repair is most likely the most common procedure in general surgery. It is likewise among the earliest operations in a junior surgical homeowner's postgraduate training duration [(1)]. Many repair strategies have been explained to this day, nevertheless tension-free mesh repairs are widely utilized techniques today because of their low reoccurrence rates [(1,2)]. Because of the high occurrence of the issue, inguinal hernia repair works take in an essential part of health care resources. It is estimated that 20 millions of inguinal hernia repair works are performed internationally every year [(2)]. Roughly 75% of all stomach wall hernias are seen in the groin [(2)]. Inguinal hernia is far more common in men than ladies. Femoral and umbilical hernias are more typical in female population; indirect inguinal hernia is still the most typical type of hernia in females. Age is a factor for incidence and type of inguinal hernia; incidence boosts by age [(3)]. Indirect hernia is more common in young and direct hernia in the elderly [(3,4)]. A hernia is reducible if it takes place periodically (such as on straining or standing) and can be pushed back into the abdominal cavity, and irreducible if it stays permanently outside the abdominal cavity [(5)]. A reducible hernia is normally a longstanding condition, and medical diagnosis is made clinically, on the basis of common signs and signs. The condition may be bilateral or unilateral and might repeat after treatment (frequent hernia) [(6)]. Inguinal hernias are frequently classified as indirect or direct, depending on whether the hernia sac bulges straight through the posterior wall of the inguinal canal (direct hernia) or travels through the internal inguinal ring along with the spermatic cord, following the flowing of the inguinal canal (indirect hernia) (**Figure 1**) [(7)].

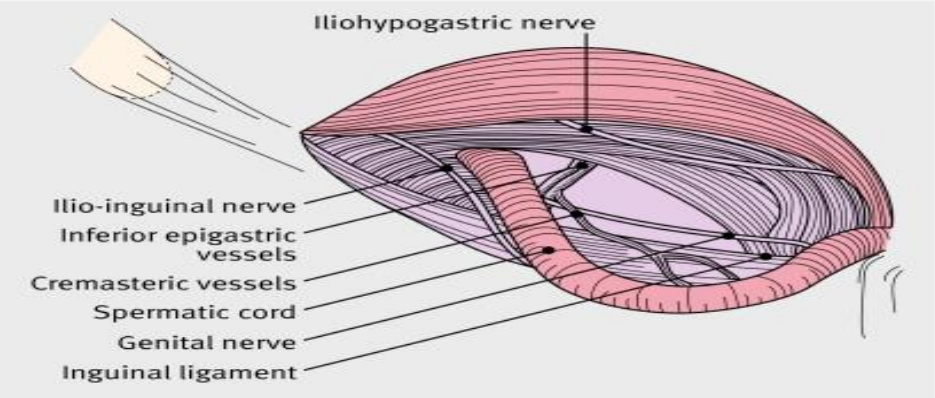

Figure 1: Anatomy of the inguinal canal

This review study was aimed to evaluate and highlight the different surgical repair for inguinal hernias and discuss the most effective and safe techniques to be used in general surgery ward.

2. METHODOLOGY

We conducted an electronic search using the following databases: MEDLINE, the Cochrane Library, Scopus, Embase, searching relevant articles concerned with surgical management approaches of inguinal hernia published until January 2017. Searching was restricted to published articles in the English language. More studies were found through searching the references lists of identified articles.

3. RESULTS

Generally, almost all inguinal hernias are referred for surgical treatment following medical diagnosis. Progression of a hernia by time is natural and most surgeons choose repairing all inguinal hernias as soon as possible. Inguinal hernia is a benign disease and it fix lead to small and only unusual problems in optional setting. Complications developed after emergency repairs may be more remarkable and frequent, even mortality might be tape-recorded [6,7]. It is especially so if patient is elder [8-9] Therefore a repair in elective setting is advised normally.

On the other hand, a restricted variety of current documents have actually reported that careful waiting is a safe and acceptable option for men with minimally symptomatic or asymptomatic cases [10,11,12]. The authors concluded that hernia accidents like incarceration or strangulation happen rarely and can normally be dealt with uneventfully. Delay in treatment does not increase the issue rates. On the contrary, a Scottish team reported that a painless inguinal hernia establishes symptoms in time, for that reason, surgical repair is recommended for medically healthy patients with a asymptomatic hernia [13,14]. Today, inguinal hernias can be treated with really low complication rates. Open repair works like Lichtenstein operation can be carried out with regional anesthesia in a economic and safe way [15,1617]. Laparoscopic repairs are also extremely appealing choices for patients. For that reason, most inguinal hernias are still repaired without any observation unless the basic condition of the patient is really bad.

- **Inguinal hernias Classification:**

More than 10 classifications have actually been described to date. They have differences and resemblances, however usually meet at complexity and trouble in remembering. Probably the most regularly utilized category is Nyhus classification [18]. It describes almost all types including pantaloon and femoral hernias, and gives attention to frequent hernias. Gilbert category is much easier but do not have the description of femoral and combined hernias [19].

Aaachen classification that established by Schumpelick and coworkers is based on an easy system [20]. It mentions both physiological place (indirect or lateral vs. direct or median) and size (<1.5 cm, 1.5-3.0 cm, >3 cm.) of hernia. The European Hernia Society (EHS) Board, including recently new classification based on Aachen system and asked all cosmetic surgeons practicing hernia surgical treatment to report the class of the hernia in the personnel reports [21] (**Table 1**). EHS classification specifies the location of hernia with L: lateral, M: median, and F: femoral. The size of hernia is shown with 1: ≤ one finger, 2: one-two fingers, and 3: ≥ 3 fingers. If the patient has 2 kinds of hernia together (e.g., indirect+direct, direct+femoral, indirect+femoral) appropriate boxes in the table are ticked. In p, r or addition letter is encircled for a primary or reoccurring hernia.

Table 1: The EHS groin hernia classification.

EHS Groin Hernia Classification		Primary	Recurrent		
	0	1	2	3	x
L					
M					
F					

- **Surgical option for inguinal hernia repair:**

Numerous repair techniques were explained given that Eduardo Bassini had published his very first anatomy-based repair with fantastic success in 1890. During the 20th century, the repair trend was altered several times. A summary of present repair work alternatives for inguinal hernias exist in (**Table 3**). Although Shouldice Hospital achieves a very low cumulative recurrence rate by performing its own tissuesuture technique [(22)], today prosthetic repairs are accepted to be superior to "non-mesh" suture repair works. A recent metaanalysis revelaed that Shouldice herniorrhaphy is the very best non-mesh method in regards to reoccurrence, though it is more time consuming and requires a somewhat longer postoperative medical facility stay. The use of mesh is associated with a lower rate of recurrence [(23)].

"Non-mesh" repair works may be thought about as an option in ladies. Transversalis fascia is typically rather strong in ladies and indirect hernias in these patients can be treated without a mesh [(24)]. Marcy repair where internal inguinal ring is narrowed by one or a couple of stitches is likewise seldom utilized in specific cases with a small indirect hernia and a normal-size internal ring.

Different mesh strategies have been described to this day. Single and double layer fits together, and plug repair works all have actually been reported with good results by their defenders and users. Nevertheless, EHS Guideline has actually clearly mentioned that none of the alternative mesh techniques except for the Lichtenstein and endoscopic methods has actually gotten adequate clinical evaluation to be suggested [(25)].

Making use of mesh in emergency situation repair work of complex hernias is under debate. Current proofs favor mesh use in cases with imprisonment, however prosthetic repair work produces a risk for surgical site infection in cases where a gangrenous intestine is met and a resection-anastomosis is required [(26,27)]. Suture repair works like Shouldice- Bassini operation are utilized in those cases.

Today, some strong suggestions exist in favor of Lichtenstein repair. American College of Surgeons select this strategy for "gold requirement"(28), while National Institute of Clinical Excellence [NICE] from UK [(29)] and The National Agency for Accreditation and Evaluation in Health [ANAES] from France [(30)] recommended it for inguinal hernia repair. It is simple to learn and carry out [(31)]. Affordable recurrence and problems rates have actually been gotten worldwide. The Lichtenstein Hernia Institute and the British Hernia Centre reported really low reoccurrence rates in countless cases [(32,33)]. It is also suitable for outpatient surgical treatment in a financial way by using local anesthesia.

Laparoscopic and endoscopic repair works also provide great results where surgeons have expertise in the method. It results in very low postoperative pain, fewer injury infection, and quick go back to day-to-day activity and working [(34)]. A mesh is put either with a total extraperitoneal technique (TEP) or a transabdominal preperitoneal approach (TAPP). A Cochrane evaluation found these 2 methods equivalent regarding duration of operation, haematoma, length of stay, time to go back to usual activity and recurrence [(35)]. A retrospective comparison in the early years of the techniques reported similar results in general, however significant issues like bowel injury was a concern in TAPP [(36)]. EHS has the opinion that a totally extraperitoneal (TEP) repair is preferred to a transabdominal preperitoneal (TAPP) technique when it comes to endoscopic surgery [(37)].

Today a terrific competition is continuing between laparoscopic and open mesh repair works. Majority of hernia repair works are still finished with open methods. Questionnaires amongst cosmetic surgeons revealed that a minority of individuals chosen laparoscopic repair for their fictional unilateral inguinal hernia [(38,39,40,41)], whereas Rattner reported that physicians are increasingly picking a laparoscopic approach for their hernia repairs even when they have primary unilateral hernia [(42)].

A review released in 2007 reported that laparoscopic hernia repair is accounted for the minority of hernia repairs carried out in USA and some European and this technique would likely stay a less typical operation than open mesh repair [(43)]. GOOD, in 2004, mentioned that only 4.1% of the all inguinal hernias were repaired by laparoscopic method in the United Kingdom [(44)]. This low figure was verified very recently by a cross-sectional survey among 784 fellows of the Association of Surgeons of Great Britain and Ireland [(45)]. A study of Japanese basic cosmetic surgeons which questioned the basic operation for adult groin hernias revealed simply a 1% day-to-day use rate for laparoscopic repair work [(46)]. In contrast to these 2 developed countries understood with conservative life patterns, laparoscopic hernia repair has actually gotten appeal in some North American and European nations. Canadian study reported that practically half of Canadian cosmetic surgeons had laparoscopic repair experience and routine laparoscopic repair usage rate was 15% for unilateral, while one third of bilateral and recurrent hernias were repaired with this strategy [(47)]. A German study including 14 healthcare facilities provided a 30% ratio for laparoscopic repair techniques [(48)].

Open and laparoscopic/endoscopic methods have actually been compared in a number of studies. Of all laparoscopic repairs are more pricey than open repair works. Hynes et al. reported that laparoscopic repair work costs an average of $638 more than open in North America [49]. McCormack et al. reported that laparoscopic repair was more expensive to the health service than open repair work, with an estimated extra cost from studies carried out in the UK of about 300-350 pounds per patient(50). A Swedish study revealed that the total hospital cost was 710.6 Euro greater for TEP repair work. When the further costs associated with recurrences and complications within 5 years were taken into consideration [51], this difference increased to 795.1 Euro. Khajanchee et al also reported that the cost of TEP repair was $128.58 more than an open repair [52]. They argued that although the difference could be reduced with very little use of non reusable instruments TEP repair work would stil appear to be an expensive alternative from the payer's viewpoint. In contrast, Jacobs and Morrison specified that despite marginally higher procedure-related non reusable expenses for laparoscopic TEP hernia repair, the institutional earnings is incredibly greater owing to a much better repayment for this procedure in ambulatory surgery centers. From the institution's perspective, laparoscopic hernia repair work is without a doubt the more cost-efficient treatment when compared to an open hernia treatment at today time(53).

The classical 14-center VA Study revealed that recurrences were more common in the laparoscopic group than outdoors group [54]. The rate of complications was also greater in the laparoscopic surgery group than in the open-surgery group, but rates of recurrence after repair work of recurrent hernias were comparable in the two groups (10.0 percent and 14.1 percent, respectively). The laparoscopic-surgery group had less pain initially than the open-surgery group on the day of surgery and at two weeks and returned to regular activities one day earlier. This research study was slammed by others. One study claimed that increased occurrence of reoccurrences may be related not to the laparoscopy but rather to the size of the mesh [55]. In addition, technical experience of some surgeons was insufficient yet in laparoscopy group. A very successful laparoscopic repair group from Germany has actually published a meta-analysis that compared open and endoscopic repair work methods [56]. They have found that endoscopic repair works have advantages over open repairs in regards to pain-associated specifications and local problems. However, Lichtenstein repair work has significant advantages like much shorter operating time, lower occurrence of seroma development, and most importantly fewer hernia recurrences. A Cochrane review comparing open and laparoscopic repairs exposed no apparent distinction in recurrence [57] Laparoscopy appears to cause less continuing pain and pins and needles. Go back to usual activities is likewise faster. Nevertheless, operation times are longer and there appearing to be a higher risk of serious problem rate in respect of vascular and visceral injuries.

Bilateral hernias are another specific issue. Laparoscopic/ endoscopic methods ready options for these cases [56]. EHS advises Lichtenstein and endoscopic repairs [55]. An argument in favor of laparoscopic repair is medically unacknowledged contralateral hernias. Contralateral hernias are discovered in exploration in about %10 of the cases [52]. Ipsilateral or contralateral femoral or obturator hernias can also be diagnosed during laparoscopy. Griffin et al. reported intriguing findings with bilateral laparoscopic exploration [57]. In their series, contralateral hernia was found and repaired in 22% of the cases. In another 20%, the medical suspicion of bilateral hernia was revised at the time of surgical treatment to unilateral just. Four cases were scheduled as femoral repair works, one of which was found to be an inguinal hernia. The total clinical diagnostic precision was only 78%.

Table 2: A classification of repair techniques for inguinal hernias

A.	Tension-free prosthetic repairs
1.	Anterior repairs
	a. Lichtenstein repair and its modifications
	b. Plug repairs
	c. Patch and plug repairs
	d. Double-layer devices
2.	Posterior (preperitoneal) repairs
	a. Open techniques via inguinal incision
	b. Stoppa repair
	c. Laparoscopic/endoscopic repairs
	i. Transabdominal preperitoneal
	ii. Total extraperitoneal
B.	Tissue-Suture repairs
1.	Bassini-Shouldice technique and its modifications
2.	Marcy repair

4. CONCLUSION

Numerous repair work approaches have been explained to date. Mesh repairs are superior to "non-mesh" tissue-suture repair works. Lichtenstein repair and endoscopic/laparoscopic strategies have comparable efficacy. Information from numerous studies suggest that the Laparoscopic technique repair work leads to less postoperative pain, a quicker return to regular practical status, and enhanced quality-of-life outcomes with comparable reoccurrence rates when compared with the Lichtenstein inguinal hernia repair.

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