Open mesh versus laparoscopic mesh repair of inguinal hernia

Ahmed Abd El-Aziz Abd El-Ghaffar, Mohammed H. Elshafey, Amer Y.A. Abd El-Moneam Ghonaim

Introduction Inguinal hernia repair is the most frequently performed operation in general surgery. The standard method for inguinal hernia repair had changed little over a hundred years until the introduction of synthetic mesh which can be placed by either using an open or a laparoscopic approach. The cause of groin hernia is probably multifactorial, with one or more factors applying in any particular case. Among the factors predisposing to groin hernia are persistence of the processus vaginalis, weakness of the shutter mechanism of the inguinal canal, raised intraabdominal pressure, heavy physical exertion, loss of integrity of the fascia transversalis, metabolic factors leading to the production of abnormal collagen fibers, cigarette smoking, genetic influences, spontaneous or iatrogenic abdominal wall trauma, aging, and general factors causing weakness of the abdominal wall muscles and fascia.

Aim To compare the merits and potential risks between cases subjected to open mesh repair versus cases subjected to laparoscopic mesh repair of inguinal hernia.

Patients and methods The patients were selected from those attending the surgical outpatient clinics of Al-Azhar University Hospitals (El-Hussein and El Sayed Galal), during the period from January 2017 till January 2019.

Results This study includes 100 patients with inguinal hernias, where 50 of them were repaired laparoscopically by the transabdominal preperitoneal technique whereas the other 50 were repaired through the Lichtenstein tension-free repair. Patients were followed up by routine clinical examination for 6–18 months (with mean 12 months of follow-up) to calculate the incidence of postoperative complications and recurrence rate during the relatively short period of follow-up.

Conclusion The Lichtenstein tension-free hernioplasty is the gold standard of groin hernia repair owing to the simplicity of the technique, the short learning curve, the low incidence of recurrence, and the low incidence of easily controllable postoperative complications as well as the relative low price and less expensive instruments required. However, transabdominal preperitoneal repair should be reserved for bilateral and recurrent inguinal hernias as long as the case is fit for general anesthesia or it is best suited to the younger patients in good general health who cannot afford an extended time away from work or who are suspected for a contralateral inguinal defect, and that it should be performed by an experienced surgeon to decrease the risk of complications and the operative time as well as the recurrence rates.

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Introduction

For the past 100 years, surgeons have traditionally classified inguinal hernias as indirect, direct, and femoral. The concept of the indirect and direct areas dates back to Cooper in the 1840s, with Hasselbach using the inferior epigastric as the defining boundary between these two areas [1].

Classifications for groin hernias were reviewed at a Consensus Conference Hernia Surgery Workshop of the German Surgical Society in November 2002 in Magdeburg, Germany. The workshop moderator Andreas Hoeferlin felt that there might be five principal categories for groin hernias, namely, (a) indirect, (b) direct, (c) combined, (d) femoral, and (e) recurrent. Moreover, the defect sizes might be listed as postscripts A for less than 1.5 cm, B for 5.1–3 cm, and C for more than 3 cm.

Surgical repair of inguinal hernias is a common procedure in adult men. However, recurrence of hernias has been reported to occur after repair in 10% or more cases, and postoperative pain and disability are frequent. 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. Local anesthesia is used, and patients are discharged within a few hours [2].

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. The laparoscopic technique, however, requires general anesthesia, and it is more often associated with serious intraoperative complications than is open repair [3].

There is little doubt that laparoscopic repair of inguinal hernia is technically more demanding than open repair with longer learning curve, a possible longer operating time, and an obligatory need for general anasthesia (GA) (with very few exceptions) and its associated sequelae. Perhaps most importantly there is the potential for serious visceral or vascular injury [4].

Recurrence rates were higher among patients whose hernias were repaired by the laparoscopic technique. There was significant interaction between the surgical approach and the type of hernia (primary or recurrent). Recurrence rates were significantly higher after laparoscopic repair of primary hernias than after open repair of primary hernias, but recurrence rates associated with the two techniques were similar for the repair of recurrent hernias. The presence of bilateral hernias did not alter the rate of recurrence after either procedure.

Intraoperative, immediate postoperative, and life-threatening complications were more frequent in the laparoscopic-repair group than in the open-repair group, although rates of long-term complications and mortality rates were similar in the two groups [3].

As other studies have reported, patients who underwent a laparoscopic repair returned to their usual activities 1 day sooner than those who underwent an open repair. Differences in activity levels were not apparent 3 months after the procedure and thereafter.

Patients who underwent an open repair experienced significantly higher levels of pain than those who underwent a laparoscopic repair, both on the day of operation and at 2 weeks, but no significant differences were apparent after 2 weeks [5].

Overall the laparoscopic revolution and laparoscopic hernia repair have helped elevate the study of hernia anatomy and herniorrhaphy to a position it deserves, and this made us all better hernia surgeons. What was once the stepchild of general surgery now occupies a more prominent and respectable place.

Aim of the work

The aim of the work is to compare the merits and potential risks between cases subjected to open mesh repair versus cases subjected to laparoscopic mesh repair of inguinal hernia.

Patients and methods

Type of the study

A prospective randomized study was conducted. This study was carried out on 100 patients with inguinal hernia of any type, whether direct or indirect, primary or recurrent, or unilateral or bilateral. All of the patients were included in the study after informed written consent . The study was conducted in accordance with the human and ethical principles of research.

Selection of patients

A total of 100 patients were selected from those attending the surgical outpatient clinics of Al-Azhar University Hospitals (El-Hussein and El Sayed Galal), during the period from January 2017 till January 2019.

Inclusion criteria

Patients undergoing elective hernia repair with age from 17 to 73 years were included.

Exclusion criteria

The following were the exclusion criteria: previous history of lower abdominal surgical procedures, complex inguinal hernia disease (irreducibility, strangulation, hydrocele of the cord, obstruction, and recurrent inguinal hernia), ASA more than 1, age less than 17 years and more than 73 years, prior laparoscopic herniorrhaphy, massive scrotal hernia, prior pelvic lymph node resection, prior groin irradiation, uncorrectable coagulopathy, pregnant women, and patients unfit for general anesthesia.

All the patients involved in the study were subjected to full clinical assessment and required investigations, and there were no specific parameters in patient selection.

Clinical history taking included personal history, including age, occupation, and special habits of medical importance, particularly smoking; complaint and its duration; history of present illness, including analysis of the complaint, and a review of other body systems specially chest complaints, bowel problems like constipation and urinary problems especially prostatism; past history of medical diseases, drug allergy, previous blood transfusion, and previous operations, where history of previous intraabdominal operation was not a contraindication for laparoscopic surgery except if clear history of previous peritonitis; and family history of the presence of inguinal hernia and other diseases in the family.

Clinical examination included general examination including vital data; chest examination for signs of chronic obstructive lung disease; abdominal examination for abdominal masses, and P/R examination for prostatic enlargement; and local examination of the inguinal region and scrotum to confirm the diagnosis of inguinal hernia and its type, and for the presence of complications.

Routine investigations were requested for all patients, including complete blood picture, coagulation profile, liver function and kidney function tests, fasting blood sugar, urine analysis, ECG, chest radiography, and pelvi-abdominal ultrasound. Special investigations were requested for patients with specific complaints as pulmonary function tests for patients with manifestations of chronic obstructive airway disease; sigmoidoscopy for patients with chronic constipation; hepatitis markers and serological tests in patients with elevated liver enzymes; and scrotal ultrasound for cases associated with varicocele or hydrocele.

Preoperative management of comorbidities like smoking, chest disease, diabetes mellitus, cardiac disease, hepatic disease, and chronic constipation was properly carried out so that all patients were properly prepared for the surgery. All patients for transabdominal preperitoneal (TAPP) repair were fit for general anesthesia. Previous intraabdominal operation was not a contraindication for TAPP repair.

Inguinal area at the side of hernia was shaved or whole abdomen in cases of laparoscopic repair just before the operation, and umbilicus was cleaned well. Patient received one dose of antibiotic 1 h before operation.

All patients subjected to TAPP repair were informed that conversion to open surgery may be required, and that if a contralateral defect was found, it would be repaired through the same technique. All of these were included in the consent.

Operative technique

Overall, 50 patients were subjected to Lichtenstein tension-free open-mesh repair and the other 50 underwent TAPP laparoscopic hernia repair.

Preparation

The patient is placed in the supine position on the operating table; the arms are positioned at the patient's side to facilitate access. All patients were asked to void just before the procedure, and no urinary catheter was applied. Elastic stockings were used in case of laparoscopic technique. General anesthesia was introduced in all cases of laparoscopic repair, whereas the choice of anesthesia differed in case of Lichtenstein repair between general or regional (spinal) one. The patient was dripped and draped with the whole abdomen scrubbed in case of laparoscopic repair, whereas only the inguinal region at the affected side of hernia was the exposed operative field in case of Lichtenstein repair. The monitor, in case of TAPP, was placed at the patient's feet with the surgeon standing on the opposite side of hernia, assistant at the patient's head, and nurse on the same side of surgeon. In both techniques, the penis and scrotum were scrubbed to facilitate manipulation intraoperatively.

Access

Transabdominal preperitoneal repair

The patient was placed in a Trendelenburg position at 15–30° and tilted toward the opposite side of hernia to allow the small intestine to move upward exposing the hernial orifices and lower abdominal wall. A 10-mm infra-umbilical skin incision was done, and a Veress needle introduced into the peritoneal cavity. Its position in the peritoneal cavity was verified with the saline drop test. Insufflation was done with maximum pressure of 14 mmHg. After this, a 10-mm surgiport trocar was inserted through the same incision with a 30° camera introduced through the cannula. Initial exploration of the abdomen was done together with identification of the site of hernia, type as well as the contralateral side, which was inspected for unreported defects. Another 10-mm surgiport trocar was introduced under vision in the epigastrium through the midline, and the camera was shifted to the epigastric port. Two other 5-mm trocars were introduced, under vision and using trans-illumination, laterally in the mid-clavicular line at the level of umbilicus. However, in case of bilateral inguinal hernia, they were placed in the same level, whereas in case of unilateral inguinal hernia, the 5-mm ports were modified a little to be directly facing the hernia for better access.

Lichtenstein repair

Through an inguinal incision 1 cm above and parallel to the inguinal ligament, the external oblique was identified and incised, the canal opened, and cord dissected.

Dissection and exposure

Transabdominal preperitoneal repair

Using the ultracision, the peritoneum is incised 1 cm above the internal ring extended from the medial umbilical ligament to the anterior superior iliac spine. Upper and lower flaps created with the Cooper's ligament were identified, sac dissected, and returned to the peritoneal cavity, and triangle of Doom

identified. In case of large indirect sacs, it was divided at the neck with the distal part left open.

Lichtenstein repair

With the cord dissected from the canal, the sac was identified and dissected from the cord, with its relation to the vas and the cord identified, being anterolateral in case of indirect hernia and posteromedial in case of direct one.

Direct sacs were invaginated with fascia transversalis plicated upon, whereas indirect ones were excised with transfixion done under vision. Moreover, plication of fascia transversalis with lateralization of the cord was done with internal ring left to be permitting only the tip of little finger. In case of large indirect sacs, division at the level of the external ring was performed with distal part left open.

Repair

Transabdominal preperitoneal repair

A 10×15 cm polypropylene mesh was introduced through the 10 mm umbilical port after being soaked with saline and its angles fashioned to fit in place, unfolded and placed well with Protack used in fixation of the mesh above the level of the iliopubic tract to the cooper's ligament extending superiorly and laterally using the bimanual technique, taking care of the inferior epigastric vessels not to be injured.

Peritoneal folds were then well closed after making sure of good hemostasis using 2/0 vicryl taking care not to leave any gaps in between stitches.

Ports were then removed under vision with intraperitoneal CO_2 emptied and scrotum squeezed to empty the gas inside through the last 10 mm port before it was removed. Skin was closed in the normal routine way using subcuticular 3/0 white coated vicryl.

Lichtenstein repair

A 6×11 cm polypropylene mesh, as described by Bringman *et al.* [6], was used with its angles fashioned to fit in place and a slit made to surround the spermatic cord. It was fixed in place using 2/0 prolene stitches starting at the midline aponeurotic tissue avoiding the pubic tubercle. Extending laterally, it was fixed inferiorly and in a continuous pattern to the inguinal ligament at different levels taking care of the deeply seated iliac vessels, and fixed superiorly with fixation extended lateral to the internal ring so that the two tails of the mesh overlap lateral to the cord and the internal ring.

External oblique was then closed in a continuous pattern using 2/0 vicryl sutures after making sure of good hemostasis. Closure in layers was done with skin closed using subcuticular 3/0 white coated vicryl sutures.

In rare cases, closure was done after leaving a drain, and in cases of long-standing huge inguinal hernias with too much dissection made and considerable oozing, the drain was placed deep to the external oblique with some pores left to drain subcutaneous space and removed after 24 h.

Postoperative management and follow-up:

Antibiotic coverage was continued 24 h postoperatively. Scrotal support was applied to all patients postoperatively. NSAIDS were used for analgesia. Patients were discharged 24–48 h postoperatively. Follow-up was scheduled for all patients 1 week after at the outpatient clinic.

Statistical analysis

Data were analyzed using IBM SPSS software package, version 20.0 (IBM company, Chicago, USA). Quantitative data were presented as mean and SD. Qualitative data were presented as number and percentage. Logistic regression analysis was used to calculate odds ratio and *P* value. *P* value less than 0.05 was considered significant.

Results

This study includes 100 patients with inguinal hernias, where 50 of them were repaired laparoscopically by the TAPP technique, whereas the other 50 were repaired through the Lichtenstein tension-free repair. Patients were followed up by routine clinical examination for 6–18 months (with mean 12 months follow up) to calculate the incidence of postoperative complications and recurrence rate during the relatively short period of follow-up.

The data of this study include the following items and results.

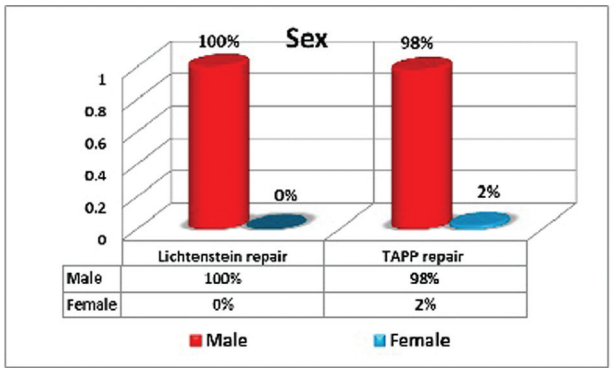
Sex

All patients (100%) of Lichtenstein repair were males, whereas 49 (98%) patients of the TAPP repair were males and one (2%) was female, with indirect inguinal hernia Fig. 1.

Age

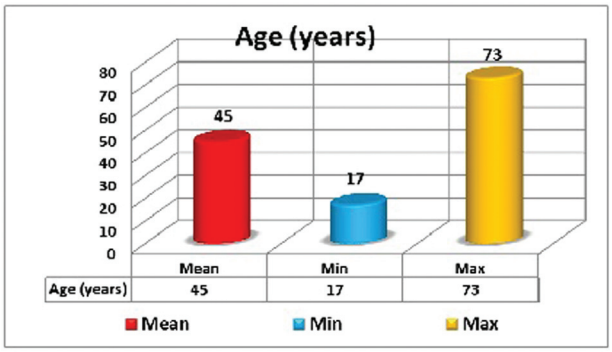
The age of the patients included in the study ranged from 17 to 73 years, with a mean age of 45 years Fig. 2.

Figure 1



Sex.

Figure 2



Age.

Table 1 Types of inguinal hernia encountered in the study

Type of hernia	TAPP [*n* (%)]	Lichtenstein [*n* (%)]
Primary indirect inguinal hernia	32 (64)	44 (88)
Primary indirect inguinal hernia	8 (16)	3 (6)
Combined inguinal (pantaloon) hernia	4 (8)	1 (2)
Recurrent inguinal hernia	3 (6)	2 (4)
Bilateral inguinal hernia	3 (6)	0 (0)
Total	50	50

TAPP, transabdominal preperitoneal.

Types of inguinal hernia

Table 1

Rate of conversion from laparoscopic to open repair

There were no reported cases of technical failure or conversion from laparoscopic to open repair (Table 2).

Table 2 Hospital stay in hours

	Number of cases discharged after Lichtenstein [*n* (%)]	Number of cases discharged after TAPP repair [*n* (%)]
12–24	2 (4)	30 (60)
24–36	41 (82)	19 (38)
36–84	7 (14)	1 (2)

TAPP, transabdominal preperitoneal.

Discussion

Coincidental with the ready acceptance of the Lichtenstein procedure, and other techniques of open tension-free mesh repairs, was the introduction of laparoscopic inguinal hernia repair. A number of groups rapidly adopted this as the procedure of choice, claiming as its main advantages of reduced postoperative pain and an earlier return to normal activities than open repair. This was certainly the case when compared with open sutured or 'conventional' repair, but the difference was not nearly so clear-cut when comparing laparoscopic with open tension-free mesh repair [7].

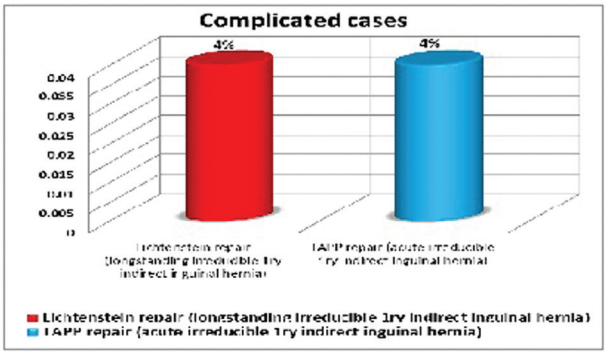
In addition, early enthusiasm for laparoscopy was tempered by reports of rare but serious complications, namely bladder, bowel, and vascular injury, when performed by inexperienced surgeons. Early technical problems with size and placement of mesh led to high recurrence rates and groin pain owing to inadvertent stapling of nerves. These issues were quickly addressed as enthusiasts' experience and skills improved, along with the recognition that the learning curve was long and trainees required close supervision [8].

After a decade of randomized controlled trials from various centers, comparing open with laparoscopic inguinal hernia repair, some sense is starting to emerge. A recently updated analysis suggests that laparoscopic repair is associated with less postoperative pain and a more rapid return to normal activities. However, in general, it takes longer to perform, and visceral (especially bladder) and vascular injuries, though rare, do occur and remain a problem [3].

Therefore, although results for laparoscopic repair performed by experienced specialists are good, the outcomes in the hands of the majority of surgeons in practice are not known. This question is currently being looked at in the United States in a large, multicenter randomized clinical trial that has been designed to give answers regarding recurrence rates, complications, and patient-centered outcomes [9].

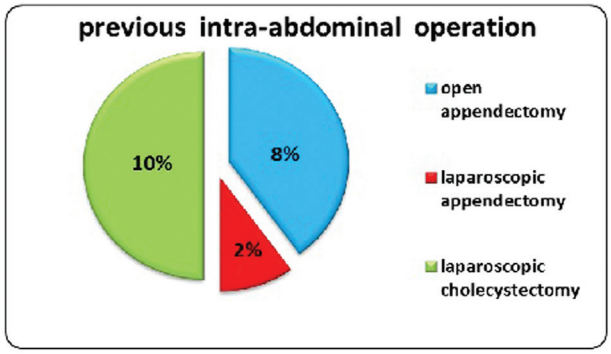
There is little doubt that laparoscopic repair of inguinal hernia is technically more demanding than open repair with a longer learning curve, a possible longer operating time, and an obligatory need for GA and its associated sequelae. Perhaps most importantly,

Figure 3



Complicated cases.

Figure 4



Previous intraabdominal operation.

there is the potential for serious visceral or vascular injury [4].

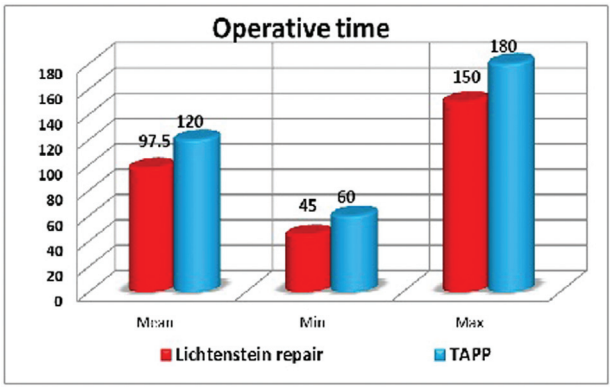
Our study included 100 adult patients (99 males and one female) with inguinal hernias of any type: whether direct or indirect, primary or recurrent, or combined or bilateral. The age of these patients ranged from 17 to 73 years, with a mean age of 45 years. Overall, 50 of these patients were treated by Lichtenstein tension-free hernioplasty, whereas the other 50 had TAPP laparoscopic hernioplasty performed. The patients were followed-up for a period ranging from 6 to 18 months. We compared both procedures regarding the technique, the operative time, the occurrence of intraoperative complications, rate of conversion, postoperative pain, hospital stay, postoperative complications, recurrence rates, and return to normal activity.

This study denoted that laparoscopic repair was superior to Lichtenstein repair in case of recurrent hernias and bilateral inguinal hernias offering less rate of complication (intraoperative or postoperative) and with no much difference in operative time, as well as in detecting unreported contralateral inguinal defects which were identified accidently intraoperatively and repaired, offering an ideal way of prophylaxis and a higher percentage of patient satisfaction.

In this study, history of previous intraabdominal operation was not a contraindication except if there was a clear history of peritonitis, and irreducibility was managed through both techniques; however, the two irreducible cases managed through TAPP became reducible after induction of general anesthesia, and there was no difficulty recorded during the procedure Figs 3 and 4.

However, the study showed that the operative time ranged from 45 to 150 min (with mean operative time of 97.5 min) in case of Lichtenstein repair, whereas in

Figure 5



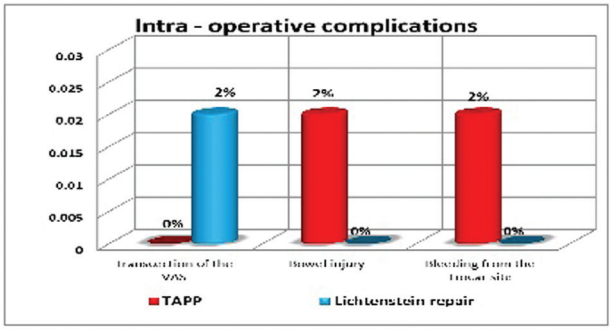
Operative time.

case of TAPP repair, it ranged from 60 to 180 min (with mean operative time of 120 min), making Lichtenstein repair superior to TAPP in this point regarding the majority of ordinary uncomplicated primary inguinal hernias Fig. 5.

The wide range in operative time was owing to variability in the difficulty of the case, experience of the surgeon, and the occurrence of intraoperative complications, and it was found to be longer than the mean operative time in case of laparoscopic inguinal hernia repair reported by Davies *et al.* [10], which was 67 min and ranging from 33 to 108 min. However, in that study, no mesh fixation was used.

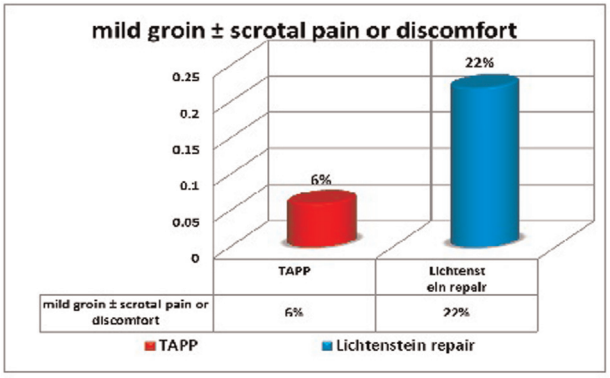
Our comparative study also showed that the rate of intraoperative complications was as follows: one case of injury to the vas during Lichtenstein repair of recurrent inguinal hernia, and one case of bowel injury and two cases of bleeding from trocar site during TAPP repair, which puts TAPP in a different level when compared with Lichtenstein repair regarding the seriousness and

Figure 6



Intraoperative complications.

Figure 7



Mild groin±scrotal pain or discomfort.

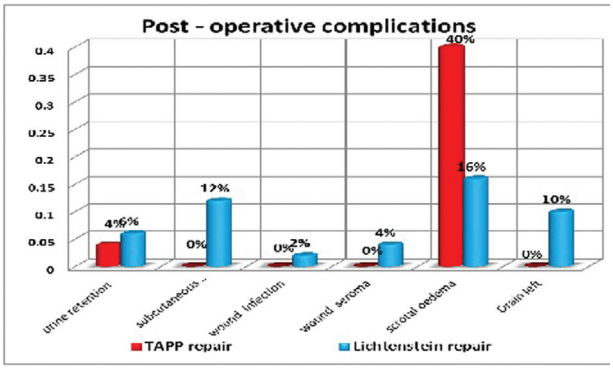
rate of complications in relation to the type of hernia being repaired Fig. 6.

In our study, there were no cases converted from laparoscopic to open repair.

Moreover, our results clarified that TAPP repair was superior to Lichtenstein regarding the common postoperative complications, where there were six cases of postoperative inguinal ecchymosis in case of Lichtenstein repair as well as two cases of wound seroma, one case of wound infection, and eight cases of scrotal edema, whereas no cases were reported with the same complications in case of TAPP. However, there were 20 cases of scrotal swelling owing to remnants of gas (CO_2) recorded in TAPP, which resolved spontaneously within 1 week. One of them was misinterpreted by the patient to be recurrence. There were three cases of postoperative urine retention after Lichtenstein repair and two cases after TAPP. Five cases had drain left and removed after 24 h in Lichtenstein repair Fig. 7.

Bittner *et al.* [4] made TAPP laparoscopic repair the standard method for dealing with inguinal hernias in

Figure 8



Postoperative complications.

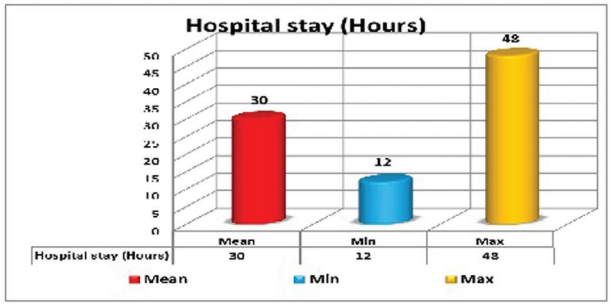
their institution. They reported the results of 8050 repairs in 6950 patients, only excluding elderly patients in whom general anesthesia was contraindicated. Nevertheless, 1411 (21.8%) patients were older than 70 years, and 378 (5.8%) were older than 80 years. Overall, 44 patients had urinary retention, five patients developed deep venous thrombosis (DVT), and one died of a pulmonary embolus. Moreover, nine patients sustained a bowel injury, and there were eight bladder injuries. Although these complications are low in percentage terms, they are all avoidable and virtually unheard of after open tension-free repair using local anesthesia [11].

This work showed that postoperative pain in both techniques was mild and easily controlled by NSAIDs in the form of intramuscular injection in the first 24 h and then oral for the following 3 days.

However, persistent mild groin±scrotal pain or discomfort for 1 week was reported in 11 (22%) cases of Lichtenstein repair, and all resolved completely after 1 month on medical treatment, whereas in TAPP repair, there were only three (6%) reported cases of persistent groin±scrotal pain or discomfort for 1 week postoperative, two of which resolved completely later, on oral NSAIDs, whereas one case had persistent neuralgia up to 1 month, which was re-operated upon again laparoscopically with removal of Protack clips with complete relief thereafter Fig. 8.

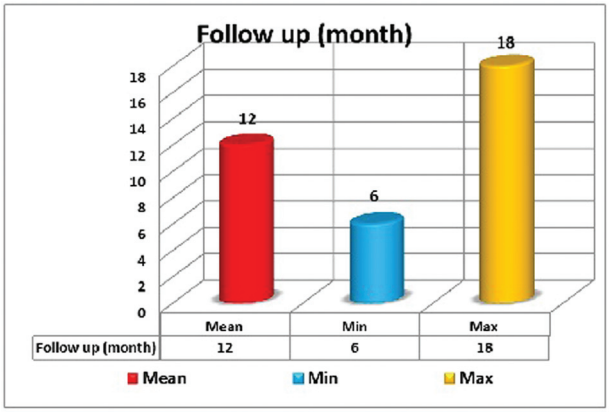
In a review of randomized controlled trials comparing laparoscopic with open mesh hernia repair, the laparoscopic approach was associated with less persisting pain. However, laparoscopic hernia repair is more expensive, has a longer learning curve, and requires general anesthesia [3]. In national guidelines from the United Kingdom [12], and the Netherlands [13], it was suggested that laparoscopic repair should be reserved for specialized centers.

Figure 9



Hospital stay (h).

Figure 10



Follow-up (month).

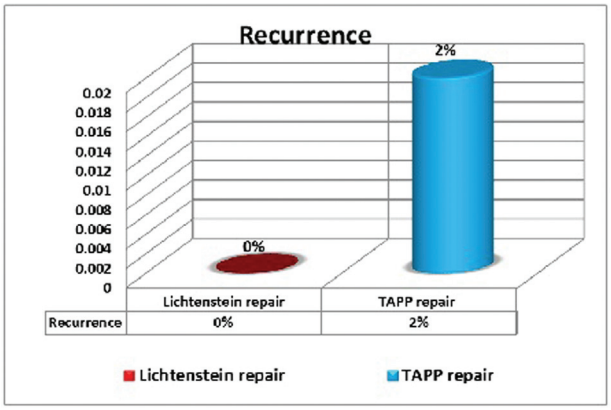
Long-term results are also beginning to appear. Douek *et al.* [14] found that 2% of laparoscopic patients and 10% of patients who had open repair still had pain at 5 years, although in the open group, in only six (12%) cases was it severe (pain analog scores over 50%).

In our study, 30 patients were discharged after 12–24 h in case of TAPP repair, 19 cases discharged after 24–36 h, and one case discharged after 48 h, making it superior to Lichtenstein repair regarding hospital stay as two cases were discharged after 12–24 h in case of Lichtenstein repair, 41 cases discharged after 24–36 h, and seven cases discharged after 36–48 h Fig. 9, Table 2.

Open hernia repair has been compared with the laparoscopic approach regarding the hospital stay. In a meta-analysis of such randomized clinical trials, there were advantages for laparoscopic repair. However, the operating time was significantly longer, perhaps reflecting a learning curve, and this is a clinically important difference [15].

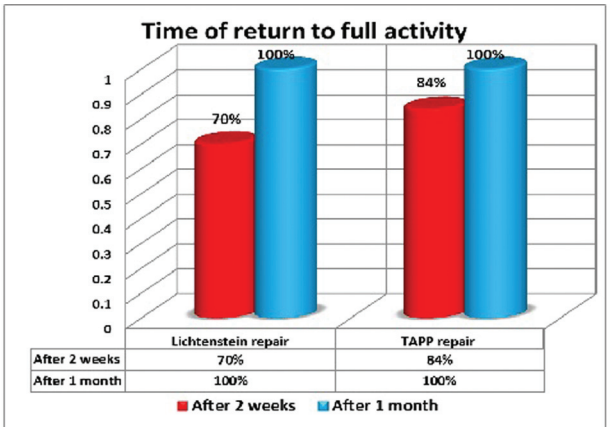
In this study, Lichtenstein repair was superior to TAPP regarding the recurrence rate in which there was one

Figure 11



Recurrence.

Figure 12



Time of return to full activity.

(2%) case of recurrence after 1 year in case of TAPP Fig. 11.

Wright *et al.* [16] have recently reported a median 5-year follow-up of 300 patients randomized to open mesh or laparoscopic repair, with three recurrences in each group. In the open group, these recurrences only occurred in patients having open preperitoneal repair of bilateral hernias and not in any of the patients having a Lichtenstein repair.

Return to full activity was higher in case of TAPP with 42 cases returning to full activity after 2 weeks in case of TAPP, whereas 35 cases recorded after Lichtenstein. However, they were both equal after 1 month Fig. 12.

In a follow-up meta-analysis, two periods were chosen to separate the comparative trials into two equal sizes as a function of time. The early period (before 1996) was referred to as the introductory phase; the period from 1996 was subsequently was referred to as the mature

phase. During the course of the trials, there was an increase in the use of mesh from 25% of the studies in the introductory period (before 1996) to 60% in the mature phase. Combining all data regarding return to work in 21 studies in both introductory and mature periods, early return seemed to be improved with laparoscopic repair versus open hernia repair (14.0 vs. 21.1 days), ignoring the type of control. When mature phase studies were compared with introductory studies, there was a significant improvement in the return to work in open hernia repair (25.9–16.8 days since 1996); with laparoscopic hernia repair, the improvement in return to work was not significant (15.6–12.6 days) [17] Fig. 10.

Laparoscopic repair also results in higher hospital expenses because of the need to general anesthesia, the cost of instrumentation and equipment, and the occasional prolonged stay for unforeseen complications. These issues are of concern to clinicians; a postal questionnaire of more than 300 surgeons in the United Kingdom revealed that the majority preferentially used an open tension-free repair for primary inguinal hernia, and that half of those who had tried laparoscopic repair had since discarded it, being swayed by considerations of both complications and cost [18].

Conclusion

The Lichtenstein tension-free hernioplasty is the gold standard of groin hernia repair owing to the simplicity of the technique, the short learning curve, the low incidence of recurrence, and the low incidence of easily controllable postoperative complications as well as the relative low price and less expensive instruments required.

However, TAPP repair should be reserved for bilateral and recurrent inguinal hernias as long as the case is fit for general anesthesia or it is best suited to the younger patients in good general health who cannot afford an extended time away from work or who are suspected for a contralateral inguinal defect, and that it should be performed by an experienced surgeon to decrease the risk of complications and the operative time as well as the recurrence rates.

Over the next decade, the authors believe that the indications for whether an open or laparoscopic repair of an abdominal wall hernia should be performed in a particular patient will become more clearly defined as surgeons accumulate further experience in both techniques. It is likely that figures for ambulatory surgery after open or laparoscopic hernia repair will continue to rise and many more open repairs will be performed using local anesthesia. In addition, meshes that are used will gradually evolve and improve as surgeons and mesh manufacturers continue the search for the ideal prosthesis.

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Conflicts of interest

There are no conflicts of interest.

References

1 Schumpelick V, Treutner KH. Classification of inguinal hernias. *Abdominal Wall Hernias* 2001; **65**:128–130.

2 Kumar B. Surgical options in inguinal hernia: which is the best? *J Mas* 2006; **4**:191–200.

3 McCormack K, Scott NW, Go PM, Ross S, Grant AM, EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. *Cochrane Database Syst Rev* 2003; **1**:C D001785.

4 Bittner R, Schmedt CG, Schwarz J, Kraft K, Leibl BJ. Laparoscopic transperitoneal procedure for routine repair of groin hernia. *Br J Surg* 2002; **89**:1062–1066.

5 Bird SB, Dickson EW. Clinically significant changes in pain along the visual analog scale. *Ann Emerg Med* 2001; **38**:639–643.

6 Bringman S, Conze J, Cuccurullo D, Deprest J, Junge K, Klosterhalfen B, *et al.* Hernia repair: the search for ideal meshes. *Hernia* 2010; **14**:81–87.

7 Crawford DL, Phillips EH. Laparoscopic totally extraperitoneal herniorrhaphy. *Nyhus and Condon's. Hernia* 2002; **5**:239–253.

8 Arvidsson D, Smedberg S. Laparoscopic compared with open hernia surgery: complications, recurrences and current trends. *Eur J Surg* 2000; **166**(S12):40–47.

9 Jonasson O. Inguinal hernia management. Testing management strategies in two clinical trials. *J Am Coll Surg* 2003; **196**:735–736.

10 Davies NM, Dunn DC, Appleton B, Bevington E. Experience with 300 laparoscopic inguinal hernia repairs with up to 3 years follow-up. *Ann R Coll Surg Engl* 1995; **77**:409–412.

11 Ridings P, Evans DS. The transabdominal pre-peritoneal (TAPP) inguinal hernia repair. a trip along the learning curve. *J R Coll Surg Edinb* 2000; **45**:29–32.

12 National Institute for Clinical Excellence. *Guidance on the use of laparoscopic surgery for inguinal hernia*. London: NICE; 2001.

13 Simons MP, Beets GL, Heij HA, Go PM. The 'inguinal hernia'guideline of the association of surgeons of the Netherlands. *Ned Tijdschr Geneeskd* 2003; **147**:2111–2117.

14 Douek M, Smith G, Oshowo A, Stoker DL, Wellwood JM. Prospective randomised controlled trial of laparoscopic versus open inguinal hernia mesh repair: five year follow up. *BMJ* 2003; **326**:1012–1013.

15 Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR. Meta-analysis of randomized clinical trials comparing open and laparoscopic inguinal hernia repair. *Br J Surg* 2003; **90**:1479–1492.

16 Wright D, Paterson C, Scott N, Hair A, O'Dwyer PJ. Five year follow-up of patients undergoing laparoscopic or open groin hernia repair. A randomized controlled trial. *Ann Surg* 2002; **235**:333–337.

17 Voyles CR. Outcomes analysis for groin hernia repairs. *Surg Clin North Am* 2003; **83**:1279–1287.

18 Beattie DK, Foley RJ, Callam MJ. Future of laparoscopic inguinal hernia surgery. *Br J Surg* 2000; **87**:1727–1728.