

Laparoscopic transabdominal preperitoneal repair versus open preperitoneal mesh repair for inguinal hernia

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Background/Aim

The surgical history of inguinal hernias dates back to ancient Egypt, from Bassini's repair to today's mesh-based open and laparoscopic repairs. The aim of this study was to compare laparoscopic transabdominal preperitoneal (TAPP) repair with open preperitoneal polypropylene mesh repair for treatment of inguinal hernia.

Patients and methods

From June 2010 to June 2012, 40 adult patients with primary inguinal hernia were included in this study, which was carried at New Damietta University Hospital.

The patients were randomly divided into two equal groups: Group A underwent laparoscopic TAPP polypropylene mesh repair and group B underwent open preperitoneal polypropylene mesh repair.

Results

The mean follow-up time was 14.8 months. The mean operative time was 66.8 min for group A and that for group B was 47 min. The mean hospital stay was 1.475 days for group A and that for group B was 1.575 days. Contralateral clinically occult inguinal hernia was discovered and repaired in nine patients (45%) in the TAPP group. As regards group A, the severity of postoperative inguinal pain was mild in 12 patients (60%), moderate in seven patients (35%), and severe in one patient (5%). As regards group B, the severity of postoperative inguinal pain was mild in six patients (30%), moderate in 10 patients (50%), and severe in four patients (20%).

Conclusion

The TAPP technique is an excellent tool for laparoscopic treatment of inguinal hernias. A prerequisite for excellent results is the strict application of a standardized technique. In experienced hands, all types of inguinal hernias, including large scrotal hernias, can be operated upon with low morbidity and recurrence rates. However, to achieve favorable results, a strong educational program on laparoscopy is recommended.

Keywords:

inguinal hernia, laparoscopy, preperitoneal repair, transabdominal preperitoneal

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Introduction

Inguinal hernia repair is considered to be the most common surgical procedure performed worldwide [1]. Edoardo Bassini performed the first true anatomical repair of inguinal hernia using a technique that decreased both the mortality and the recurrence rates of hernia to less than 2% [2].

Nyhus and Stoppa developed the method of preperitoneal repair of inguinal hernia for reduction of the high recurrence rates of the anterior repairs [3].

Kugel developed a preperitoneal tension-free technique combining the utility of the open operation technique with the advantages of minimal access procedures (smaller incision, preperitoneal mesh placement, avoidance of neuropathic pain) [4].

The laparoscopic repair of inguinal hernia was developed during the early 1990s [5]. Inguinal hernia was repaired laparoscopically after the introduction of laparoscopic

cholecystectomy. However, unlike laparoscopic cholecystectomy, which was very quickly accepted by surgeons worldwide, laparoscopic hernia repair has not been widely performed. The earlier laparoscopic techniques of plugging the internal ring with a mesh or simply closing the ring with staples were surgically unsound because they were associated with high rates of recurrence [6].

The laparoscopic technique of reinforcing the posterior wall of the inguinal canal with a mesh placed preperitoneally was based on the concept of the Stoppa procedure [7]. Laparoscopic repair is more difficult than open repair, and there is evidence of a 'learning curve' in its performance [8].

Patients and methods

Between 30 June 2010 and 30 June 2012, 40 adult male patients with primary, unilateral, and uncomplicated inguinal hernias were included in this study, which was

carried in New Damietta University Hospital. Children, patients with recurrent, bilateral, and complicated inguinal hernias, and patients with a past history of lower abdominal operations were excluded from the study.

Forty patients with primary inguinal hernias were randomly divided into two equal groups: group A underwent laparoscopic transabdominal preperitoneal (TAPP) polypropylene mesh repair and group B underwent open preperitoneal polypropylene mesh repair. Randomization was done according to the order of admission. Cardio-pulmonary and urological assessments as well as routine investigations were carried out. Prophylactic intravenous antibiotics were administered routinely at induction.

Operative details for group A: Laparoscopic TAPP hernia repair was performed under general anesthesia; it was advisable to place Foley's catheter and a nasogastric tube before surgery. The surgeon stood on the contralateral side of the inguinal hernia. The patient was made to lie supine with both arms tucked by the side. The head end of the table was tilted down to 15° to facilitate creation of a pneumoperitoneum and to move the bowel away from the operative field. A Veress needle was used to create a pneumoperitoneum. After creation of a satisfactory pneumoperitoneum, the needle was removed, and a 10 mm port was placed through the supraumbilical incision. Two 5 mm ports were placed as working ports for the right and left hand of the surgeon, one on each side, at the level of the umbilicus in the midclavicular line (Fig. 1).

The hernia was inspected and its type (direct or indirect) confirmed by the position of the defect in relation to the inferior epigastric vessels and cord structures (Fig. 2). Anatomically, the spermatic vessels lie laterally and the vas deferens meets the internal ring medially, this forms

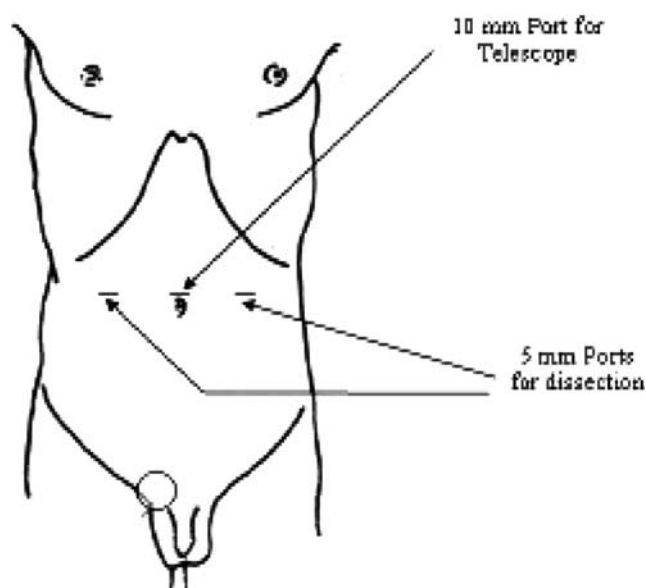
an inverted V. The inferior epigastric vessels can be seen coursing upwards from this point. Contralateral, clinically occult hernias if present may thus be clearly seen. Contents of the hernial sac, if any, were reduced with the help of atraumatic bowel forceps. The structures in the posterior abdominal wall, namely the external iliac artery and the vein in the triangle of doom, were identified after reduction of the contents.

The peritoneal incision was begun at a point midway between the groin crease and the umbilicus, generally about 2 cm above the internal ring. It extended from above the anterior superior iliac spine to the medial umbilical ligament. The flap was raised by both blunt and sharp dissection from the cephalic to caudal direction. It was easier to raise only the lower flap when compared with raising a lower along with an upper flap. The dissection was continued medially to the symphysis pubis to visualize the Cave of Retzius.

In a direct hernia, the hernial sac consists of a peritoneal outpouching with a variable amount of extraperitoneal fat, which may sometimes be excessive. After the medial dissection, the flap was raised lateral to the internal ring up to the anterior superior iliac spine. The hernial sac lies anterior and lateral to the cord structures, and dissection of the sac was performed. Hemostasis should be secured. A polypropylene mesh of 15 cm (transverse) × 12 cm (vertical) was used for the repair (Fig. 3). The mesh was introduced into the operating field through the 10 mm umbilical port by removing the telescope, after which the telescope was reinserted.

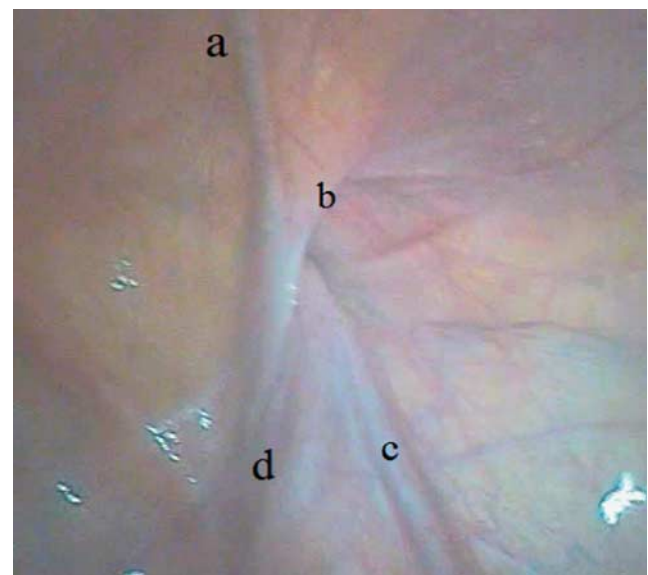
Staples were applied over the medial and upper border of the mesh to anchor it to the underlying muscles. Generally three staples were sufficient: one on the medial border and two on the upper border. After placement of the mesh, the peritoneal flap was closed over the mesh to

Figure 1

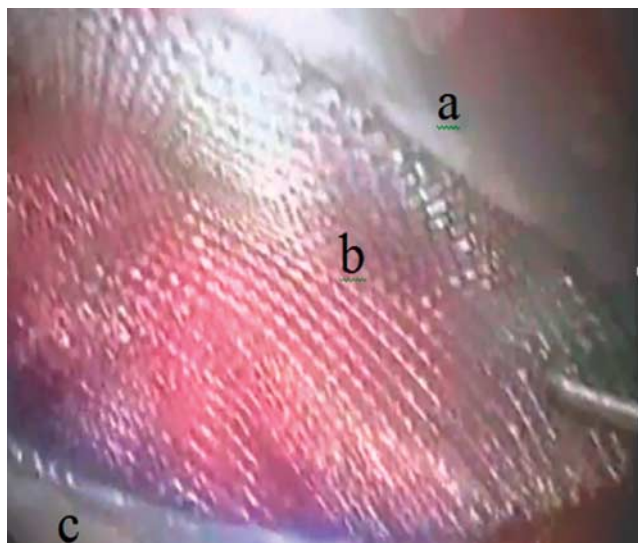


Sites of port placement for transabdominal preperitoneal [9].

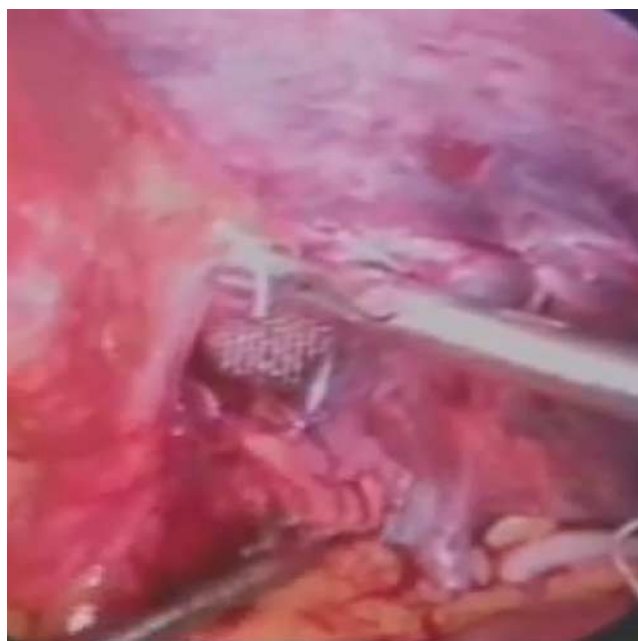
Figure 2



Laparoscopic anatomy of the inguinal region. (a) Inferior epigastric vessels; (b) internal ring; (c) spermatic vessels; and (d) vas deference.

Figure 3

A polypropylene mesh placed laparoscopically into the preperitoneal space. (a) Upper flap; (b) the mesh; and (c) lower flap.

Figure 4

Closure of the peritoneal flaps over the mesh.

prevent bowel and omental adhesions; this can be done either with staplers or with sutures (Fig. 4). The carbon dioxide gas was evacuated to empty the abdominal cavity and scrotum. The ports were removed after lifting the anterior abdominal wall. The sheath of the 10 mm port was closed with vicryl sutures. Skin incisions were closed with simple sutures.

Operative details for group B: Open preperitoneal polypropylene mesh repair was performed under regional anesthesia. A 5–6-cm incision was made 1 inch above the medial two-thirds of the inguinal ligament. Incision of the

Figure 5

Exposure of the preperitoneal space with preservation of the inferior epigastric vessels.

external oblique aponeurosis, followed by delivery of the spermatic cord and herniotomy for indirect hernia were carried out. Incision of the transversalis fascia from the deep inguinal ring to the pubic tubercle as well as blunt dissection was performed to liberate the peritoneum from the adjacent structures to expose the preperitoneal space, with preservation of the inferior epigastric vessels (Fig. 5).

After creation of an adequate space by means of dissection, a polypropylene mesh (12 × 15 cm) was introduced into the preperitoneal space (Fig. 6) to strengthen the posterior wall of the inguinal canal, the femoral ring, and the internal inguinal ring. The mesh was fixed in the transversalis fascia with prolene sutures (No. 2-0). The transversalis fascia was then closed with vicryl sutures. The wound was closed in layers without drainage.

Results

The mean follow-up time was 14.8 months (range 5–23 months). Follow-up comprised a physical examination at the outpatient clinic after 1 week, followed by monthly check-ups up to the end of the study. The mean patient age was 39.37 years (range 18–60 years). All patients were males. As regards the type of inguinal hernia, 13 patients (32.5%) had direct type hernias, 21 (52.5%) had indirect type, and six (15%) had pantaloon type hernias. The mean operative time was 66.8 min for group A and that for group B was 47 min. Oral feeding was resumed after a mean duration of 12.15 h following TAPP repair and 10.5 h following an open preperitoneal polypropylene mesh

repair. Mean hospital stay was 1.475 days for those who underwent TAPP repair and 1.575 days for those who underwent open preperitoneal polypropylene mesh repair.

Contralateral, clinically occult inguinal hernia was discovered and repaired in nine patients (45%) in the TAPP group. As regards group A, postoperative inguinal pain was mild in 12 patients (60%), moderate in seven (35%), and severe in one (5%). As regards group B, postoperative inguinal pain was mild in six patients (30%), moderate in 10 (50%), and severe in four (20%). Postoperative pain was measured using the visual analogue scale, which consists of a line, usually 100 mm long, whose ends are labeled as the extremes ('no pain' and 'pain as bad as it could be'). The patient is asked to put a mark on the line indicating his/her pain intensity [10].

As regards postoperative complications, a seroma was reported in nine patients (45%) after TAPP repair and in one patient (5%) after open preperitoneal polypropylene mesh repair. Seromas were managed conservatively with scrotal support and resolved spontaneously. There were no

cases of superficial wound infections in group A; however, there were seven (35%) such cases in group B. The recurrence rate was 0% for both groups during the time of study. The mean time to return to work for group A was 14.4 days and that for group B was 17.35 days. Conversion to open surgery was not performed for any patient in group A. There were no deaths in the two groups during the time of study. The results are presented in Table 1.

Discussion

The surgical history of inguinal hernias dates back to ancient Egypt. From Bassini's heralding of the modern era to today's mesh-based open and laparoscopic repairs, this history parallels closely the evolution in anatomical understanding and development of techniques of general surgery [11]. Inguinal hernia repair is one of the most commonly performed surgeries in the world [12].

The ideal method of hernia repair should cause minimal discomfort to the patient, both during the surgical procedure and during the postoperative period. It should be simple to perform and easy to learn, should have a low rate of complications and recurrence, and should require only a short period of convalescence. In addition, it must be cost-effective [13].

Although the open mesh-based tension-free repair remains the standard criterion for inguinal hernia, laparoscopic herniorrhaphy, which is performed by trained surgeons, produces excellent results comparable to those of open repair [14]. Regional anesthesia is used during open hernia repair, whereas laparoscopic hernia repair is performed under general anesthesia [15].

In our study, patients returned to normal work activity significantly sooner after laparoscopic repair. Previous reports have listed specific indications for laparoscopy over open repair, including recurrent hernias, bilateral hernias, and the need for earlier return to full activities [16].

In the present study, the operative time was longer for TAPP. Kumar *et al.* [17] reported that the operative time to perform unilateral primary inguinal repair has frequently been observed as being longer for laparoscopic repair compared with open repair.

Figure 6



A polypropylene mesh introduced into the preperitoneal space.

Table 1 Comparison between the studied groups

	Group I (TAPP)	Group II (open)	Total	P value
Age (mean $\pm$ SD)	38.05 $\pm$ 12.72	40.70 $\pm$ 9.15	39.37 $\pm$ 11.02	0.45
Operative time (min)	66.80 $\pm$ 19.68	47.00 $\pm$ 9.26	56.90 $\pm$ 18.19	<0.001*
PO oral feeding (h)	12.15 $\pm$ 3.97	10.50 $\pm$ 3.30	11.32 $\pm$ 3.70	0.16
Hospital stay (days)	1.47 $\pm$ 0.57	1.57 $\pm$ 0.54	1.52 $\pm$ 0.55	0.57
Return to work (days)	14.40 $\pm$ 4.70	17.35 $\pm$ 4.20	15.87 $\pm$ 4.65	0.043*
PO complications [n (%)]				
Seroma	9 (45.0)	1 (5.0)	10 (25.0)	0.003*
Superficial infection	0 (0.0)	2 (10.0)	2 (5.0)	0.14
PO inguinal pain [n (%)]				
Mild	12 (60.0)	6 (30.0)	18 (45.0)	0.040*
Moderate	7 (35.0)	10 (50.0)	17 (42.5)	
Severe	1 (5.0)	4 (20.0)	5 (12.5)	

PO, postoperative; TAPP, transabdominal preperitoneal.

*Significant at P value $\leq$ 0.05.

In the present study, no statistically differences between the two groups as regards postoperative oral feeding and hospital stay were observed. The incidence of inguinal pain was less among those who underwent TAPP. These results are in accordance with those reported by Bignell *et al.* [18], who reported that the mean pain severity score for the laparoscopic group was 2 compared with 3.5 for the open repair group; however, this was not significant ($P = 0.0558$). Interestingly, four patients in the TAPP group registered no pain at all for 4 weeks; in addition three patients reported only mild pain. This is in contrast to the open treatment group, in which all patients rated their pain as being mild or moderate. On comparing open repair with laparoscopic repair after a 5-year follow-up, 1.9% of patients who had undergone laparoscopic repair continued to report moderate or severe pain compared with 3.5% of those in the open repair group [19].

In the present study, seroma was more frequently observed with TAPP and was managed conservatively. Superficial wound infections were more common in group B. Contralateral, clinically occult inguinal hernia was discovered and repaired in the TAPP group; this cannot be achieved with the open technique. TAPP is performed under general anesthesia in comparison to the open technique that can be performed under regional anesthesia.

A large randomized controlled trial comparing laparoscopic with open repair reported that with adequate training, laparoscopic repair produced equivalent recurrence rates but reduced postoperative pain and allowed earlier return to work [20].

It was reported that up to 30% of patients with a unilateral hernia will subsequently develop a hernia on the contralateral side. Moreover, when examined at operation, 10–25% of patients are found to have an occult hernia on the contralateral side. The TAPP approach allows assessment and treatment of the contralateral side during the same operation, without the need for further surgical incisions, very little further dissection, and minimal additional postoperative pain [21].

Recurrence rates after open mesh repair are similar to those of laparoscopic techniques; however, there is a significantly faster recovery after laparoscopy as well as less chronic inguinal pain [22]. Another study revealed that the recurrence rate after laparoscopic hernia repair was comparable to that of traditional and modern open techniques [23]. Laparoscopic repair of hernias is recommended to patients with bilateral or recurrent hernias or to patients with unilateral hernias who desire a minimal period of postoperative disability [24].

For unilateral first-time hernias, either laparoscopic or open repair with a mesh can offer excellent results. The major drawback of laparoscopy is that the technique requires a significant number of cases to master [25].

In short, the TAPP technique is an excellent tool for laparoscopic treatment of inguinal hernias. A prerequisite for excellent results is the strict application of a standardized technique. In experienced hands, all types

of inguinal hernias, including large scrotal hernias, can be treated laparoscopically with low morbidity and recurrence rates. However, to achieve favorable results, a strong educational program on laparoscopy is recommended.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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