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A comparative study of transabdominal preperitoneal verses totally extra-peritoneal mesh repair of inguinal hernia

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ABSTRACT

Background: Transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) mesh repair are two common procedures which are nowadays commonly performed during laparoscopic approaches for inguinal hernias. This randomized prospective study was aimed to compare these two, TAPP and TEP laparoscopic approaches for inguinal hernia repair in terms of various outcomes. **Materials and Methods:** Patients were randomly picked and 30 (50%) were operated by laparoscopic TAPP hernioplasty and the 30 (50%) by laparoscopic TEP hernioplasty. **Results:** Both TEP and TAPP mesh repair techniques were comparable in terms of operative time, intraoperative complications, conversion to open, post-operative pain, time to resume normal activity, and recurrence. Duration of hospital stay was significantly more in TAPP group than TEP group. **Conclusion:** Laparoscopic repair of inguinal hernias is associated comparable results in both techniques TAPP and TEPP and choice between TAPP and TEPP is a personal choice of the concerned surgeon.

KEY WORDS: Hernioplasty, inguinal hernia, postoperative pain, transabdominal preperitoneal repair, totally extra-peritoneal mesh repair

INTRODUCTION

A hernia, an abnormal protrusion of an organ or tissue through a defect in its surrounding wall is a very common surgical problem [1]. Various sites of the body are vulnerable to the occurrence of hernia, but the abdominal wall particularly the inguinal region is most commonly involved region [2]. Approximately seventy percent (75%) of all hernias are usually groin hernias, among which 95% are inguinal region hernias and the remainder being femoral canal defects. Inguinal hernias being very common in men than in women can be either indirect or direct [3,4].

The aims of successful hernia repair include, achieving an effective repair with lowest possible recurrence rate, minimal per and postoperative complications, rapid return to normal work, and performing a cost-effective procedure. To achieve these goals, various methods of repair have been employed which have progressed from open repair to various laparoscopic approaches [5].

Laparoscopic approaches to inguinal hernia repair were introduced in 1991 with the intra-peritoneal only a mesh (IPOM) technique that was developed by Toy and Smoot. It was Arregui *et al.* in 1993 who described the transabdominal preperitoneal prosthetic (TAPP) procedure [6]. In the same year that is in 1993, the totally extraperitoneal prosthetic (TEP) repair was also introduced by McKernan and Laws.

The use of prosthetic mesh for hernia repair has emerged as a great success as it reduces recurrence by around 50%, regardless the method of placement and incidence of pain. The quality of life indicators as assessed by the postoperative pain, hospital stay and return to work strongly favors tension free, and laparoscopic approaches [7].

Present study was designed to compare the two laparoscopic approaches for inguinal hernia repair; TAPP, and TEP and which one can be offered with good results to a patient with groin hernias in this modern era of laparoscopy.

MATERIALS AND METHODS

This prospective randomized study comprised of patients admitted for surgical correction of groin hernia in SMHS Hospital Srinagar, Kashmir, India. A total of 60 patients were included in the study with an uncomplicated primary inguinal hernia and were prospectively randomized into two groups 30 of each: Group I was TAPP group and Group II was TEP group. The patients from either sex above 18 years of age were randomly

selected and subjected to pre-anesthetic check-up. Written consent was taken before each procedure. Detailed history and clinical examination were done in every case. Investigations prior to surgery included, complete blood count, bleeding time, clotting time, platelet count, blood grouping, kidney and liver function tests, serum electrolytes, blood sugar, X-ray chest, electrocardiogram, and ultrasonography abdomen.

Operative Procedure

TAPP

During the whole study, both TAPP and TEP procedures were performed in the same room setup. Patients were operated in trendelenburg position and monitors placed at the foot end of the bed. The surgeon generally was positioned opposite to the hernia in question, although bilateral hernia could be repaired from either side. The assistant would usually occupy a position opposite the surgeon. Pneumoperitoneum was created via umbilicus by veress needle and a 12-15 mm hg pressure was set. This followed a vertical incision through the umbilicus and placement of a blunt 10-mm trocar. Whole of the peritoneal cavity, especially pelvic anatomy was thoroughly inspected through the camera. Two 5-mm working ports were then placed in each lower quadrant so as to maintain triangular configuration.

The peritoneum at the medial umbilical ligament was incised (with either harmonic scalpel or endoscopic scissors) at least 3-4 cm above the hernia defect to allow placement of a large mesh and allow for closure of the peritoneal defect at the end of procedure. The incision was then extended laterally along a horizontal plane until the anterior superior iliac spine was reached. Peritoneal leafs were raised from medial umbilical ligament to anterior superior iliac spine and dissection was done by sharp and blunt dissection so as to create an adequate preperitoneal space for mesh placement. Direct hernia sacs were reduced during the creation of the peritoneal flap. Indirect hernia sacs were dissected free from the cord structures and the cord skeletonized, including removal of any lipomas of the cord. After the creation of adequate preperitoneal space, 10 × 15 polypropylene mesh was placed through 10 mm trocar which was rolled lengthwise. Mesh was then unrolled in the preperitoneal space in such a way that myopectineal orifice was completely covered. Mesh was then secured to Cooper's ligament medially using a spiral tacker, pulled relatively taut and fixed lateral to the anterior superior iliac spine, above the level of the iliopubic tract. Peritoneal defect was then closed back using absorbable sutures.

Totally Extraperitoneal Procedure

The access to the preperitoneal space makes the TEP unique and superior to TAPP. In our study, we made initial incision horizontally, slightly inferior to umbilicus followed by dissection of subcutaneous fat and opening the anterior rectus sheath away from linea alba on the same side of hernia. Rectus muscle was then split and retracted laterally followed by the introduction of dissecting balloon toward the symphysis pubis. The dissecting balloon was then inflated slowly to provide the initial dissection of the preperitoneal space and was kept there for 3-5 min. The dissecting balloon was then replaced with a 12-mm blunt tipped trocar. Carbon dioxide was insufflated to a level of 15 mmHg. Two additional 5-mm trocars were placed under vision in the lower midline or in such a way so as to maintain triangulation of the instruments. Space for placement of mesh was then created followed by dissection of sac from cord structures. Mesh was positioned in the space so as to cover myopectineal orifice.

After the completion of procedure, patients were shifted to the ward and monitored. For the immediate postoperative pain relief injectable diclofenac, 75 mg were used. Patients were made ambulatory same day and orals were started as soon as bowel sounds returned and discharged home next day.

All the patients were called for follow-up at 1 week, 2 weeks, 4 weeks, 2 months, 4 months, and 6 months interval. Various parameters noted were operative time, intraoperative complications, conversion to open, post-operative pain and analgesia requirement, hospital stay, time to resume normal activity, and recurrence.

RESULTS

Most of the patients in both TAPP and TEP group were in the age group of 41-50 years. The mean age of patients in TAPP group (Group I) was 48.2 ± 13.3 years (range = 19-80 years) and that of TEP, Group II was 46.76 ± 13.0 years (range = 20-80 years). There was only one female patient with an inguinal hernia and she was randomized to Group I. There was no statistically significant difference between the two groups in terms of age and sex distribution ($P = 0.675$).

About 88% of the hernias were unilateral and 12% were bilateral. 26 (86.6%) patients of group I had unilateral hernias compared to 27 (90%) in Group II. The difference between the two groups was statistically not significant ($P = 0.90$). 60 patients had a total of 67 hernias of which 16 were direct and 51 were indirect. The majority of the hernias were right-sided 42 (62.6%). There were 7 (20.5%) direct hernias in Group I and 9 (27.2%) in Group II. There were 27 (79.4%) indirect hernias in Group I and 24 (72.7%) in Group II.

Operative Time

There was no difference in mean operative time between the two groups ($P = 0.066$). In Group I (TAPP), the operative time was 75.5 ± 10 min (range = 52-94 min), and in Group II (TEP) it was 80.8 ± 11.97 min (range = 55-108 min).

Conversion

No case from TAPP was converted to open whereas two cases from TEP group were converted to open. However, the difference was statistically insignificant ($P = 0.49$).

Operative Details and Intraoperative Problems

The incidence of scrotal edema was higher in Group I. 3.3% of patients developed scrotal edema in the immediate postoperative period, 1 (3.3%) patients in Group I, and no patient in Group II. No patient in either group developed scrotal hematoma or testicular pain. Vascular injury occurred in one patient in TEP group and none in TAPP group. Urinary retention was noted in 1 patient (3.3%) in Groups I and 2 patients (6.7%) in Group II. No recurrences were noticed in the immediate postoperative period in either of the groups [Table 1].

Post-operative pain

Pain score at 6 h in Group I was 2.96±1.03 and in Group II it was 2.8±0.8 [Table 1]. The difference between the two groups was not statistically significant ($P = 0.488$) patients in Group I had higher pain scores on visual analog scale (VAS) than those in Group II at 6 h after surgery. However, the difference between the two groups was not statistically significant ($P = 0.488$). The difference in pain scores on VAS between the groups after 12 h was also statistically insignificant: The mean pain score was 1.96 ± 0.850 in Group I and 1.66 ± 0.606 in Group II ($P = 0.121$) [Table 2]. None of the patients in either group experienced any numbness or testicular pain during the follow-up.

Hospital Stay

In Group I, the postoperative stay was 23.73 ± 5.58 h and in Group II it was 21.23 ± 6.58 h. It was seen that TEP group patients had less duration of hospital stay than TAPP group however, the difference was statistically in-significant ($P = 0.117$).

Time to Resume Normal Work

The average time to return to non-strenuous work in TAPP group was 14.2 ± 3.6 days and in TEP group 12.46 ± 3.08 days. The difference however was statistically insignificant ($P = 0.0546$).

Table 1: Immediate postoperative complications in TAPP and TEPP groups

Complication	TAPP (n=30) (%)	TEP (n=30) (%)
Scrotal edema	1 (3.3)	0
Vascular injury	0	1 (3.3)
Urinary retention	1 (3.3)	2 (6.7)

TAPP: Transabdominal preperitoneal, TEPP: Totally extraperitoneal procedure

Table 2: Comparison of postoperative pain in TEPP and TAPP groups

Pain score on VAS	TAPP (Group I) (n=30)	TEP (Group II) (n=30)	P value
Pain score at 6 h Mean±SD	2.96±1.03	2.8±1.03	0.488
Pain score at 12 h Mean±SD	1.96±0.850	1.66±0.606	0.121

VAS: Visual analog scale, TAPP: Transabdominal preperitoneal, TEPP: Totally extraperitoneal procedure, SD: Standard deviation

Recurrence

Only one patient in each group had recurrence during a follow-up period of 2 years. The difference is being statistically insignificant ($P = 1.000$).

DISCUSSION

Inguinal hernia repair is one of the common elective procedures in general surgery. The main goal of any hernia repair include minimizing intraoperative and postoperative complications, achieving effective repair, lowest possible recurrence, rapid return to normal life, cost effectiveness, and better cosmetic results. To successfully achieve these goals, the technique of herniorraphy has progressed from open to various laparoscopic techniques. TAPP and TEPP repairs are currently most common inguinal hernia repairs performed by experienced laparoscopic surgeons [7].

Many studies support the fact that the inguinal hernias are more common in males and middle aged people are the commonly seen age group involved [8]. In our study, 59 out of total 60 patients were males and hernia was most common in the middle age group (40-50 years). This could further be justified by the fact that men have more tendency to inherent weakness along the inguinal canal due to different anatomical features. Usually, in the early postnatal period, the inguinal canal closes almost completely but due to some congenital abnormality or due to idiopathic reasons sometimes it does not close properly, leaving a weakened area especially in males. In females, there is less chance that the inguinal canal will not close after birth [5].

Depending on the relationship to inferior epigastric vessels, an inguinal hernia can be direct or indirect. It has been well-established that indirect inguinal hernia is most common abdominal hernia [9]. In our study, we also observed that the indirect inguinal hernia was more common than direct, seen in 19 patients (63.3%) in TAPP group, and 18 patients (60%) in TEP group.

Many studies have estimated duration of operation to be 40-70 min for TAPP and 55-95 min for TEP [10-14]. The range of operating time in our study was 52-98 min in TAPP group with a mean of 73.7 ± 9.9 while as in TEPP repair range was 58-108 min and the mean 81.0 ± 11.1 min. TEP procedure is relatively difficult and usually takes longer time to perform than TAPP mainly due to difficulty in recognizing the anatomy [15]. Although we did find mean operating time in case of TAPP group to be shorter than TEP group, but the difference was statistically insignificant.

In our study, we found that no case from TAPP was converted to open whereas two cases from TEP group were converted to open. However, the difference was statistically insignificant ($P = 0.49$). Many studies have compared the rates of conversion between TAPP and TEP procedure with rates of 0% versus 4%, 0% versus 1.8%, and 5% versus 7%, respectively [16-18]. However, in the large case series the conversion rates between

TAPP and TEP were very similar at 0.24% and 0.23% respectively [19].

In the present study, 1 (3.3%) patient developed scrotal in TAPP group. Vascular injury occurred in one patient in TEP group and none in TAPP group. Khoury 1995, reported a higher rate (3% vs. 0%) in TEP, however like the present study (only 60 patients) this was also a small study of 120 patients [20].

One of the major advantages of laparoscopic repair of inguinal hernia is a substantial reduction in postoperative pain. Most of the previous studies are in favor of similar pain scores in the immediate postoperative period in both the TEP and TAPP procedures [8,21]. This study also observed comparable pain scores on VAS at 6 h and 12 h in both TEP and TAPP groups.

Our study demonstrated that TEP repair had shorter hospital stay as compared to TAPP and it was statistically significant. In the Meta-analysis by Bracale *et al*., there was a significantly longer postoperative hospital stay in the TAPP group, similarly Gass *et al*. also found a significantly longer hospital stay in the TAPP group [22,23].

Resuming daily normal work is an important measure determining the success of any surgical procedure. In our study, the time taken to return to normal activities was comparable in both TEP and TAPP groups. Previous workers have also observed no difference in return to work between the two techniques [16,18,24].

Recurrence is the most important end point of any hernia surgery [25]. It requires a proper and thorough knowledge of anatomy and a thorough technique of repair to keep the recurrence in endoscopic repair to a minimum [26-27]. Previously reported incidence of recurrence in TEP has been approximately 1-2% and for TAPP approximately 0-3% [28]. We observed a recurrence in 2 (3.3%) patients, one from each group.

CONCLUSION

Our study concludes that both TEP and TAPP techniques of laparoscopic repair of inguinal hernia have comparable short-term and long-term outcomes in terms of operative time, intraoperative complications, conversion to open, post-operative pain, time to resume normal activity, and recurrence. Although we observed short period of hospital stay in TEP technique than in TAPP but more large-scale studies are needed to confirm this fact. Laparoscopic inguinal mesh hernioplasty using either TEP or TAPP is a safe and efficacious method of hernioplasty with no recurrence in the immediate post-operative period and negligible pain. Surgeons all over the world experienced in TEP/TAPP should be encouraged to report their long-term experience so that the true potential of these two techniques can be assessed.

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