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Original Article

Laparoscopic transabdominal preperitoneal procedure with and without mesh-fixation for inguinal hernia repairs

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Abstract: The aim of the present study was to comparatively evaluate the outcomes of laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair using a non-fixed mesh technique. Between January 2014 and January 2016, a total of 76 patients with inguinal hernias were included in the study. They were randomly divided into two groups, each involving 38 cases. Median age was 47 years (range, 16-78 years). A total of 38 patients had the TAPP procedure in the study group (Group 1). Mesh was used without fixation. Patients in the control group (Group 2) underwent TAPP inguinal hernioplasty with tacker mesh fixation. Clinical effects were assessed by the following variables: recurrence rate, postoperative complications, analgesic consumption, operation time, hospital stay, and patient costs. Of the 76 study patients, there were no recurrent hernias in either group. Total postoperative complication rate was 28.9% in the control group and 2.6% in the study group ($P<0.05$). The highest number of cases of analgesic use in post-operative patients was from the control group. The percentage of patients prescribed analgesics was 26.3%, while analgesics were used in 1 patient in the study group (2.6%), showing statistically significant differences ($P<0.05$). Moreover, patient costs were significantly lower in study group ($P<0.05$). However, overall operation times did not significantly differ between the two groups ($P>0.05$). In conclusion, laparoscopic TAPP inguinal hernia repair without mesh fixation is safe and feasible with no increase in recurrence rates. Furthermore, this procedure reduced the risk of postoperative complications and patient costs.

Keywords: Inguinal hernia repair, TAPP, non-fixed mesh technique, clinical effects

Introduction

It has been estimated that over 20 million repairs of inguinal hernia are carried out per year, worldwide [1]. During the past few decades, recurrence has become a major problem after inguinal hernia repairs. However, because of the routine use of prosthetic mesh, recurrence rates are low today (1-2%) [2]. Currently, more focus is placed on preventing perioperative complications to improve postoperative quality of life (QoL).

Application of the transabdominal preperitoneal (TAPP) technique for inguinal hernia repairs has produced an alternative to open mesh repair [3]. It offers several advantages over the open operation, including less trauma, fewer early complications, quick postoperative recovery, and so forth. Routine TAPP procedures are as follows. The abdominal cavity is first entered. Peritoneum over the posterior wall of the inguinal canal is incised to enter the avascular preperitoneal plane. It is adequately dissected to place a large mesh over the hernial orifices. Next, the mesh fixation is performed by staples. Even though routine TAPP inguinal repairs have gained popularity due to its results and advantages, complications related to mesh fixation may appear and some can be very serious [4]. The aim of this study was to compare the clinic effects of TAPP inguinal hernioplasty with or without mesh fixation in terms of operative time, postoperative pain, complications, overall cost, and recurrence rates.

Materials and methods

Ethics statement

This research was approved by the Ethics Committee of Zhoushan Hospital.

Patient population

Between January 2014 and January 2016, a prospective randomized trial was carried out, comparing a group of 38 patients that underwent TAPP with a non-fixed mesh technique versus a group of 38 patients that received TAPP with mesh fixation. The median age was 47 years (range, 16-78 years). According to hernia classification guidelines of the Chinese Medical Association, 12 cases (16%) were type I, 32 (42%) type II, 24 (32%) type II, and 8 (11%) were type IV. Of these cases, 63 (65.3%) were indirect inguinal hernias and 13 cases (34.7%) were direct inguinal hernias. There were no statistically significant differences in average age, type of hernia, and other clinical trial data between the two groups.

Surgical procedures

A total of 76 inguinal hernias underwent TAPP repair using polysoft mesh. All surgical procedures were performed by the same surgical team, under general anesthesia with tracheal intubation.

The study group (Group 1) underwent TAPP without mesh-fixation technique. The procedure began by performing carbon dioxide pneumoperitoneum. A Veress needle was inserted through a small supra umbilical incision and insufflation was continued until a pressure of 10-12 mm Hg was reached. Next, the 10 mm optical trocar was placed in midline below the umbilicus and the other two 5 mm operating trocars were placed in the lower abdomen, bilaterally. A curvilinear incision was made over peritoneum at least 2 cm away from the margin of the fascial defect. A large preperitoneal space was created to expose the inferior epigastric vessels, pubic symphysis, Hesselbach's triangle, ductus deferens (or the round ligament of the uterus), and spermatic vessels. Dissection was continued all around the sac to encircle the neck until the sac was freed from adhesions at the fascial defect margin. The transversalis fascia was carefully separated from the sac for the hernia sac to be inverted into the abdomen. In some cases of indirect inguinal hernia, when complete reduction of the sac is not possible, an incision is made over the neck of hernia and the distal part of the sac is left. The spermatic cord or the round ligament of the uterus was detached from the peritoneum and adhered to the abdominal wall to facilitate mesh placement. A large piece of polypropylene mesh (15 × 10 cm) was used for TAPP repairs. Four corners of the mess were rounded off, then the mesh was rolled along its long axis and introduced operating field through the 10-mm umbilical port. The implant was spread out and placed to the preperitoneal space to cover all weak groin areas. The mesh was required to cover the indirect hernia ring, Hesselbach triangle, and femoral hernia ring. The unfolded edge of the mesh should cover the defect with 3 cm extending beyond its edge. Specifically, the top of the mesh covered 2 cm overlapped of the joint tendon and the anterior superior iliac spine should be covered on the outside. Its inside edge reaches to midline, the bottom. The mesh should extend downward 2 cm beyond the Cooper ligament. Flattening the mesh, it was then affixed to the transverse fascia to prevent eventual wrinkling. The fixation of the mesh was not performed. Afterward, the peritoneum was closed with continuous 3-0 absorbable suture. Sucking the gas from preperitoneal space, the surgical instruments were slowly withdrawn. In none of the cases was the mesh fixated with either staples or tackers.

For the control group (Group 2), 38 patients were operated on with the standard TAPP procedure. Mesh fixation was performed under the laparoscope with tackers and the peritoneum was closed by tackers.

Statistical analysis

Statistical analysis was performed using SPSS Version 17.0 statistic software package. Data are expressed as mean ± standard deviation (SD). Comparisons of quantitative data in both groups were analyzed using t-test. Values of $p<0.05$ are considered statistically significant.

Results

Patients in both groups were hospitalized and relevant clinical data were recorded. Timely post-discharge follow-ups were conducted through regular telephone and outpatient clinics. All patients had similar demographic features and indications for surgery. This study reviewed the data of operation times, duration of hospital stays, hospital charges, postoperative complications, and postoperative pain.

Table 1. Comparison of operation time, hospital stay, hospital charges, postoperative complications, and analgesic use between the groups

	Operation time (min)	Hospital stay (day)	Hospital charges (RMB)	Postoperative complications	The number of cases of analgesic use in post-operative patients
Group 1	90.2±9.5 min	6.7±2.0	10898±1203	1	1
Group 2	78.9±8.8 min	8.3±3.4	13564±1309	11	10
P-Value	>0.05	>0.05	<0.05	<0.05	<0.01

Postoperative complications associated to inguinal hernias included scrotal effusion, hernia sac effusion, urinary retention, wound infections, wound hematoma, urinary tract infections, and post-operative pain.

Overall operation times did not significantly differ between Group 1 and Group 2 (90.2±9.5 min vs. 78.9±8.8 min, respectively; P>0.05). Duration of hospital stays did not reveal any statistical significance between the groups (P>0.05). There were no recurrent hernias in either group.

Of the 76 study patients, perioperative complications observed included chronic post-surgical pain (CPSP) in 7 patients, scrotal effusion in 2 patients, hernia sac effusion in 1 patient, a wound infection in 1 patient in Group 2, and hernia sac effusion in 1 patient in Group 1. Total postoperative complication rate was 28.9% (11 of 38 patients) in Group 2 and 2.6% (1 of 38 patients) in Group 1 (P<0.05). The highest number of cases of analgesic use in post-operative patients was from Group 2. The percentage of patients prescribed analgesics was 26.3%, while analgesics were used in 1 patient in Group 1 (2.6%), showing statistically significant differences (P<0.05). Moreover, hospital charges were significantly lower in Group 1 (P<0.05). Data mentioned above are shown in **Table 1**.

Discussion

Inguinal hernias are the most common type of abdominal wall hernias. Surgical repair is the current approach, either by open surgery or by laparoscopy. Laparoscopic repair is technically considered to be superior to the conventional open repair. With the use of the laparoscopic approach, the mesh is positioned at the exact place. Moreover, no large cuts are made on the abdomen, leading to less post-operative pain, improved cosmesis, and faster recovery [5].

It has been generally accepted that the tension-free technique is ideal in preventing recurrence of inguinal hernias. The two most common techniques for laparoscopic inguinal hernia repair are the transabdominal preperitoneal (TAPP) technique and totally extraperitoneal (TEP) technique. Although the choice of approach remains controversial, many clinical trials have reported that intraoperative and general postoperative complication rates, as well as the reoperation rate for complications, showed no significant differences between TEP and TAPP [6, 7]. The newer TEP is technically more difficult to perform than TAPP, thus, TAPP has gained popularity.

In conventional TAPP, the mesh is anchored using metal tacks or staples. This procedure may lead to complications, including seroma or painful neuralgia. Approximately 2-5% of patients may experience persistent pain after laparo-endoscopic inguinal hernia repairs [8]. Seroma is one of the most common complications after laparoscopic ventral hernia repair and its incidence is quite variable (0.5-78%) [9]. Moreover, tacking devices are costly, increasing hospital charges.

Potential complications related to fixation of mesh prostheses using staples or tackers have prompted researchers to explore the use of surgical adhesives. Numerous studies have reported that surgical adhesives, compared with mechanical fixation (tacks, staples, sutures), improved early postoperative outcomes after TAPP [10-15]. Besides the biologically-based sealants (fibrin, thrombogen, etc.), surgical adhesives include a group of synthetic glues and genetically engineered protein glues [16]. A widely used surgical adhesive, fibrin glues enable sufficient implant fixation to abdominal walls, but evidence of local inflammatory response and foreign body reaction have been observed [17]. The use of fibrin sealant may lead to fibrin glue reactions, due to

aprotinin hypersensitivity [18]. Moreover, patch wrinkles due to improper fixation may lead to a traction sensation in the groin area.

TAPP hernia repairs, using non-fixation techniques, in theory, have obvious advantages that tackle the major drawbacks of traditional mesh fixation procedures. First, the use of a large mesh to cover the entirety of the groin area, preventing recurrence of the hernia under tension-free conditions. Second, the non-fixation procedure can avoid the risk of vessel and nerve injury associated to tacker fixation. Third, because of lack of fixation, implanted patches can be adjusted in the tissue to avoid wrinkles in the mesh, further minimizing postoperative foreign body sensation and traction sensation at the surgical site. The risk of adhesion-related complications, such as inflammatory response and fibrin glue reactions, can be also avoided. It is worth mentioning that care must be taken to completely close the peritoneum to prevent potential adhesion between the patch and the intestines.

Low recurrence rates and fewer complications are the main goals today in inguinal hernia repair. The present clinical data indicated that TAPP without mesh fixation can provide an alternative approach to tacker fixation for inguinal hernia repair. Generally, the success of inguinal hernia repairs is evaluated with recurrence rates [19]. After the mean follow-up period of 15 months (range, 6-24 months), no hernia recurrences were observed in either groups, indicating the safety of the procedure.

Postoperative pain is one of the most important factors affecting postoperative life quality [19]. The source of postoperative pain is complex. It may include hernia recurrence, tissue inflammation, and inguinal nerve injuries [20, 21]. Because no tackers or surgical adhesives are used, the risk of nerve injury and tissue inflammation are reduced. A clear difference has been identified between the two groups regarding postoperative pain and complications. Patients in the study group experienced less postoperative pain and analgesic consumption. The only postoperative complication observed was hernia sac effusion in 1 patient in the study group (2.6%). Total postoperative complication rate was 28.9% in the control group, indicating that the procedure of TAPP with non-fixation can positively impact postoperative complications rate. Additionally, omission of staples or surgical adhesives reduced hospital charges. No significant differences between the two groups were identified in terms of operative times and hospital stays, however.

In conclusion, the present study results indicate that laparoscopic TAPP inguinal hernia repairs without mesh fixation are safe and feasible, with no increase in recurrence rates. Furthermore, this procedure reduces the risk of postoperative complications, along with hospitalization expenses. Classic TAPP may be performed effectively with better results, without mesh-fixation, although further studies with larger control and study groups are necessary to confirm these encouraging results.

Disclosure of conflict of interest

None.

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