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Application of shaft method assisted biological mesh in laparoscopic inguinal hernia repair

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Abstract

To compare the feasibility and advantage of traditional tiling method and shaft method to place biological mesh following laparoscopic repair of inguinal hernia.

Sixty cases from January 2013 to January 2014 treated with laparoscopic inguinal hernia neoplasty with biological patches were included. All the cases were randomly divided into control group and observation group. Observation group was treated with shaft method to place biological mesh, while control group was treated with traditional tiling method. The length of the operation, hospital fees, and rate of occurrence of surgical complications were compared.

All 60 cases were successfully treated with laparoscope inguinal hernia repair. None were converted to open operations. Total operation times for the observation group and control group were 54 ± 4.5 and 71 ± 7.2 minutes, respectively ($P < .05$). The hospital fees of the observation group and control group were 21,280 ± 365 RenMinBi Yuan (RMB) and 24,280 ± 428 RMB, respectively ($P < .05$). The rates of occurrence of surgical complications were 3.33% (1/30) and 16.7% (5/30), respectively ($P < .05$).

The shaft method can be applied in laparoscopic inguinal hernia repair with biological mesh. Compared with the traditional method, the shaft method has apparent advantages, fewer complications during and after the operation.

Abbreviations: RMB = RenMinBi Yuan, TAPP = transabdominal preperitoneal.

Keywords: biological mesh, hernia neoplasty, laparoscope

1. Introduction

Transabdominal preperitoneal (TAPP) is a classic procedure for laparoscopic treatment of inguinal hernia. Because of its wide field of vision, high security, short learning curve, etc., TAPP is currently widely used in clinical.[1]

Mesh has been suggested as a strategy to prevent recurrences, with a principle similar to groin hernia repair, initially by Frantzides et al,[2] and since then, the use of mesh in laparoscopic surgery of hiatus hernia has increased. However, the indications for mesh reinforcement and some technicalities including mesh type, shape, and position are still debated.

Polypropylene plain film is mostly used in the traditional TAPP technique. It was reported that it had the disadvantage of postoperative prone to shrinkage and postoperative adhesions and increase the incidence of postoperative pain.[1] Therefore, the major concern regarding the use of mesh is the long-term risk of mesh erosion into the esophagus and other adjacent vital structures.

Biological mesh is considered as the best compatibility with the human body, in recent years it has been used in laparoscopic hernia repair surgery.[3] The clinical commonly used biological patch is the acellular center capsule patch, but because of its material specificity in laparoscopic hernia surgery, it has the disadvantages of the difficulty of highly laying fixed, prone to misuse and patch damage, prolonging the operation time, and increasing hospitalization costs.[4]

Previous researches[5–7] have summarized available data surrounding mesh neoplasty but without a separate analysis between synthetic and biological mesh. Biological mesh would possibly offer an improved safety profile, the different characteristics of synthetic and biological mesh require separate evaluation.

Therefore, this study was aim to compare the feasibility and advantage of traditional tiling method and shaft method to place biological mesh following laparoscopic repair of peritoneum hernia.

2. Materials and methods

2.1. Patients

Sixty cases in our hospital from January 2013 to January 2014 were included and divided into observation group and control group according to the random number table. Observation group was treated with shaft method to place biological mesh, while control group was treated with traditional tiling method. Surgery was performed by the same surgeon with more than 10 years experiences in laparoscopic surgery.

The inclusion criteria were patients diagnosed with inguinal hernia, between 20 and 60 years old, no abdominal surgery

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before. Exclusion criteria were recurrent hernia, bilateral hernia, acute incarcerated hernia, refractory hernia, a serious cause of abdominal pressure increased disease such as severe benign prostatic hyperplasia, severe constipation, chronic cough, decompensated liver cirrhosis caused by a large number of ascites, and the existence of cancer or immune system diseases. This study was approved by the animal Ethics Committee of Dongguan People's Hospital, Southern Medical University hospital. The informed consent was obtained from all the included patients before the study.

2.2. Surgical methods

Sixty patients were successful treated with laparoscopic TAPP surgery, no transit open surgery was performed. Patients were treated with conventional indwelling catheter, tracheal intubation after general anesthesia satisfaction. Supine, 10 mm arc incision was made in the umbilical hole, pneumoperitoneum was established to maintain the pressure in the 13 to 15 mm Hg (1 mm Hg = 0.133 kpa); 10-mm Trocar was inserted into the laparoscopic, two 5-mm Trocars were placed in front and left flat umbilical axillary respective as the operating hole.

The head was set on the high side and tilted 15°. The peritoneum was cut by the electric coagulation hook or the ultrasonic knife from the upper edge of the inner ring 1 to 2 cm. Separating the preperitoneal space from the lateral side of the inner ring to the lateral peritoneum of the medial umbilical ligament. The structure of the hernia sac, the symphysis pubis to the anterior space, lateral to anterior superior iliac spinous surface of the musculus are to be freed as far as possible. The pubic tubercle and pubic comb ligament were exposed, and the spermatic cord was made ventral to separate the spermatic cord from the peritoneum and lay the biological patch.

2.2.1. Observe the group ("shaft " 5 steps). First (stitching curtain), a 12-cm long sterile hose was taken, the biological side of the long side of the patch to the line 1 suture was fixed on the hose (Fig. 1A and B)

Second (rolling curtain), suture the biological patch to the hose as the axis of tightly rolled up to put the abdominal cavity (Fig. 1C).

Third (placing curtain), 5 mm diameter clamp has been curled one end of the biological patch through the umbilical 10 mm puncture tube into the abdominal cavity. The curled biological patch was placed in the separation of the peritoneal Gap and pubic bladder space, and initial development of biological patches (Fig. 1D).

Fourth (hanging curtain), the hose as the axis slowly spread out the patch, the formation of the hose as the support of the "curtain" appearance (Fig. 1E).

Fifth (nailing curtain), clamp the middle of the hose, the abdominal wall under the blood vessels and the hose sideways on the inner ring 2 cm, the application of hernia repair patch will be nailed in the arc. Then continue to hernia fixation patch in the pubic bone, pubic comb ligament, rectus abdominis lateral margin and arcuate edge, patch the outer edge of at least more than 2 cm hernia ring, and full coverage of the pubis muscle. Cut the fixed hernia patch on the hose suture, the hose from the operating hole was removed (Fig. 1F).

2.2.2. Control group (traditional method). The biological patch folded curl, the umbilical hole into the pubis muscle as the center of the pavement, with the law to hernia repair fixation patch. After fixation of the 2 groups, 3-0 polydioxanone self-closing line continuous suture was performed to close peritoneum, then close puncture hole.

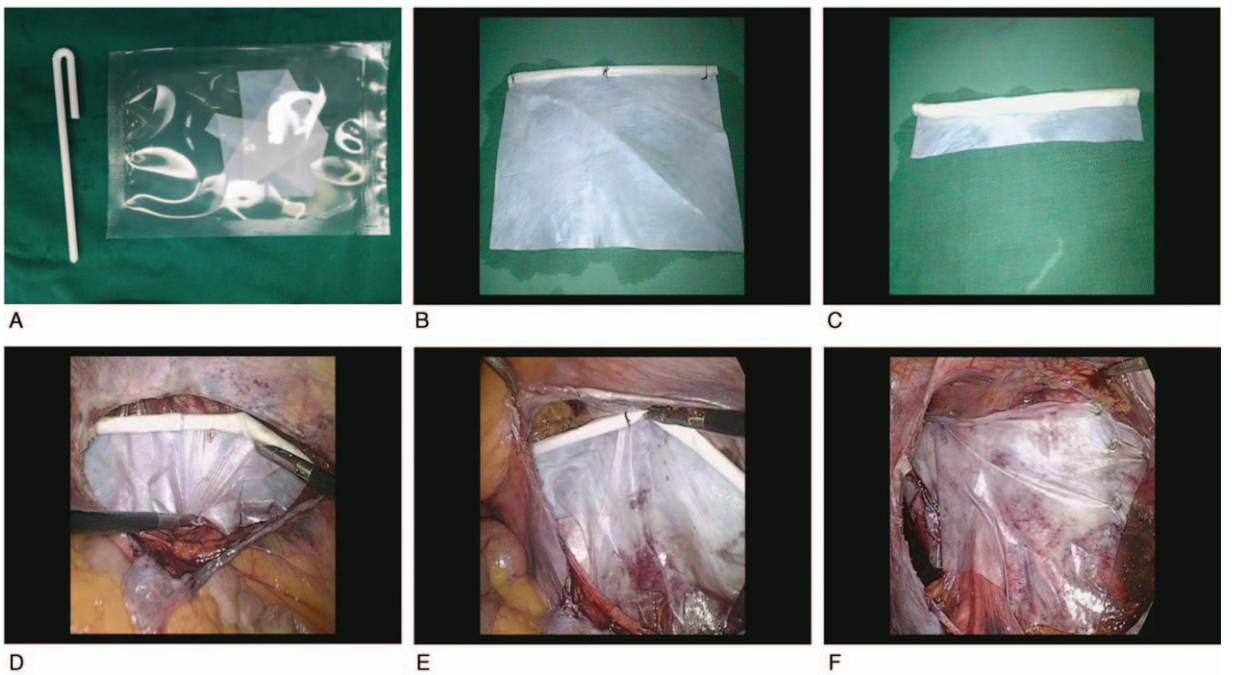

Figure 1. "Shaft" method. (A) Biologic mesh and self-made sterilized plastic support hose; (B) "stitching curtain": stitch the long side of biological mesh with line No. 1 and fix it on the hose; (C) "rolling shutter": roll the biological mesh tightly with rubber tube as the axis to put into the abdominal cavity; (D) "placing curtain": place the biological mesh with the hose as the axis; (E) "hanging curtain": the biological mesh was hanged with the hose as the axis to cover the defect; (F) "nailing curtain": after fully expanding the patch, the screw is fixed to the biological patch and the support hose was removed.

2.3. Observation index

The total operation time, placement and fixed patch time, the average hospital costs, the incidence of complications, and other data of the 2 groups were analyzed. The incidence of complications included intraoperative vascular injury and bleeding, patch damage, postoperative pain, scrotal hematoma, and postoperative recurrence. The data were followed up for 1 to 3 years.

2.4. Statistical analysis

The measurement data with normal distribution were expressed by mean ± standard deviation ($\bar{x} \pm s$), the count data expressed as a percentage, while t test and chi-squared test were used to compare data between 2 groups. SPSS 13.0 statistical software was used to analyze to results. $P < .05$ was considered as statistically significant difference.

3. Result

3.1. Basic characteristics

Thirty patients included in the control group were treated with traditional tiling method, in which the average age was 52 ± 3.8 years old. Other 30 patients included in the observation group were treated with shaft method, while the average age of observation group was 54 ± 2.4 years old.

3.2. Intraoperative and postoperative comparison

All patients in the 2 groups were successfully treated with laparoscope inguinal hernia repair. None were converted to open operations. The operation length was 54 ± 4.5 minutes in the observation group, while it was 71 ± 7.2 minutes in the control group. There was significant difference between the 2 groups ($t = 2.28$, $P < .05$).

The hospitalization costs of observation group (21,280 ± 365 RenMinBi Yuan [RMB]) was also significantly lower than control group (24,280 ± 428 RMB) ($t = 2.01$, $P < .05$).

The incidence of complications was 3.33% (1/30) in the observation group, while it was 16.7% (5/30) in the control group. The difference was statistically significant ($\chi^2 = 5.93$, $P < .05$) (Table 1).

4. Discussion

Laparoscopic inguinal hernia repair has advantages of small incision, light postoperative pain, quick recovery, etc. compared with the traditional open surgery.[8,9] The main surgical procedures, including intracavitary mesh, preretroperitoneal repair, and total peritoneal repair, have their own advantages and disadvantages. Due to the large operating space, high security, relatively short learning curve, the abdominal peritoneal hernia repair was widely used by surgeons, and it was known as the best treatment of inguinal hernia.

The most widely used repair material for clinical hernia repair is polypropylene mesh, which has good histocompatibility and tolerance to infection. However, the implantation of the body will produce scarring shrinkage. Li et al[10] reported a shrinkage rate of about 16% and our unpublished data showed that the overall incidence was about 15% to 30%. The shrinkage of the mesh is accompanied by a corresponding increase in complications such as postoperative pain, especially in adolescents and newborn male patients, the use of nonabsorbable synthetic patches should be prudent because the chronic foreign body reaction stimulus is likely to cause Vas deferens adhesion and thus affect reproductive function.[3] Therefore, clinicians have attempts to use different materials of the mesh to reduce the incidence of chronic pain and foreign body discomfort after laparoscopic surgery.[11]

Biological mesh has been used for more than 10 years and achieved satisfactory results in the use of repair of abdominal hernia and defect. Laparoscopic biologic mesh hernia repair in the treatment of abdominal hernia also has unparalleled superiority, including reduced the risk of infertility, postoperative incision infection, postoperative intestinal adhesions, intestinal obstruction, and rejection. Song et al[4] reported 27 cases of inguinal incarcerated hernia treated with biomesh laparoscopic and lumbar tension-free hernia repair. Biological mesh was efficacy in laparoscopic incarcerated hernia repair and worth further clinical application. However, there were also some doubts on the effect of soft biological mesh on the defects repair. Due to the poor adhesion and flexibility, vulnerable, and other characteristics, the use of biological mesh under the laparoscopy is relative difficult, which leads also to prolonged operation time. In this study, we summarize the "shutter" 5-step and the laparoscopic hernia repair biopsy was made before and during the treatment to improve the endoscopic biopsy placement method, thereby reducing the operation time and the surgical complications and recurrence rate. The difference of the total operation time between the observation group and the control group was mainly due to the time spend on mesh fixing. The operation time of the "shutter" method was significantly less than that of the control group. Moreover, it was significantly less than the laparoscopic fixation time (mean 48.1 minutes) reported in previous research.[4] Reducing the operation time is conducive to reduce the use of narcotic drugs and hospital costs. Our experience for this method included, first, take the hose as the axis, expand the mesh as hanging a "curtain," which solve the easy paste problem. Second, spread the mesh after hosing a "curtain rod" as support, which provides a certain amount of tension support, so that the mesh is not easy to shift and improving the repair effect.

In conclusion, "shaft" method of placing biological mesh is better than the traditional tiling method, its operation time, hospital costs, and complications are improved. Through the shaft 5-step placement of biological mesh, it would provide better treatment for patients with abdominal hernia.

Table 1

Intraoperative and postoperative comparison between the 2 groups.

Project	Control (30 cases)	Observation group (30 cases)
Total operation time, ($\bar{x} \pm s$) min	71 ± 7.2	54 ± 4.5
Place the patch time, ($\bar{x} \pm s$) min	28 ± 2.5	15 ± 3.2
Patch damage, Example (%)	2 (6.67)	0 (0)
Blood (clear) swollen, Example (%)	1 (3.3)	1 (3.3)
Postoperative recurrence, Example (%)	2 (6.67)	0 (0)
Average hospitalization cost, ($\bar{x} \pm s$) Yuan	24,280 ± 428	21,280 ± 365

Author contributions

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