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Comparative Analysis of the Efficacy of Transabdominal Pre-Peritoneal Vs Open Tension-Free Hernia Repair in Treating Inguinal Hernia

Danguang Liu*

Zhenjiang Hospital of Traditional Chinese Medicine, Zhenjiang 212001, Jiangsu Province, China

***Corresponding author:** Danguang Liu, 13775363220@139.com

Abstract: *Objective:* To investigate and analyze the clinical outcomes of inguinal hernia patients treated with transabdominal pre-peritoneal repair (TAPP) versus open tension-free hernia repair. *Methods:* The study was carried out from January 2021 to August 2023, and a total of 50 inguinal hernia patients were selected for this study. The patients were randomly divided into a study group (n = 25) and a control group (n = 25) by the numerical table method. The patients in the control group were treated with open tension-free hernia repair, whereas the patients in the study group were treated with TAPP. The surgical and postoperative recovery indexes, complication rates, and recurrence rates of the two groups were compared. *Results:* There was no significant difference in the operative time and intraoperative blood loss between the two groups ($P > 0.05$), and the postoperative feeding time, time out of bed, and hospitalization time of the study group were shorter than those of the control group ($P < 0.05$); the incidence rate of postoperative complications in the study group was lower than that in the control group ($P < 0.05$); and there was no significant difference in the recurrence rate of the two groups after operation ($P > 0.05$). *Conclusion:* Compared to open tension-free hernia repair, TAPP offers a shorter postoperative recovery duration and hospitalization time, and reduces the incidence of complications. Therefore, this surgical method should be popularized in the treatment of inguinal hernia.

Keywords: Transabdominal pre-peritoneal repair; Open tension-free hernia repair; Inguinal hernia

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1. Introduction

A hernia occurs when there is a displacement of organs or tissues from their normal anatomical position through a weak point or opening in the body. When this displacement takes place in the inguinal area, it is referred to as an inguinal hernia [1]. Clinical studies have shown that inguinal hernia is the most common type of hernia. It is characterized by the presence of a reproducible mass in the inguinal region, resulting in symptoms such as swelling and pain with the increase in the size of the mass [2,3]. Inguinal hernia is mainly treated via surgery, and

the main surgical options include laparoscopic transabdominal pre-peritoneal (TAPP) repair and open tension-free hernia repair. However, the superiority between these two methods remains debatable [4]. In this study, 50 inguinal hernia patients were selected to investigate and analyze the clinical effects of TAPP compared to open tension-free hernia repair.

2. Information and methods

2.1. General information

The study was carried out from January 2021 to August 2023, and a total of 50 inguinal hernia patients were selected for this study. The patients were randomly divided into a study group (n = 25) and a control group (n = 25) by the numerical table method. The study group consisted of 21 males and 4 females, aged 42–71 years (mean = 56.96 ± 4.48 years old); among them, 21 cases were hiatal hernias and 4 cases were rectal hernias. The control group consisted of 23 males and 2 females, aged 44–70 years old, (mean = 57.02 ± 4.51 years old); among them, 22 cases were hiatal hernia and 3 cases were rectal hernia. There were no significant differences in the general data between the two groups of patients ($P > 0.05$).

Inclusion criteria: (1) Diagnosed with inguinal hernia based on the "Guidelines for the Diagnosis and Treatment of Inguinal Hernia in Adults," (2) met the indications for surgery, (3) informed of the content of the study and agreed to it.

Exclusion criteria: (1) Combined with serious underlying diseases, (2) could not tolerate surgical treatment, (3) did not cooperate till the completion of the study.

2.2. Methods

The patients in the control group were treated with open tension-free hernia repair, the patients were laid down, and spinal anesthesia or epidural anesthesia was performed. After the anesthesia took effect, a 6 cm oblique surgical incision was made above the inguinal ligament. The extra-abdominal oblique muscle tendon membrane tissues were incised. The spermatic cord status was observed and the spermatic cord was freed. The hernia sacs were located by probing, and subsequently released towards the area of the inguinal ring, and the large hernia sacs were transversely treated. If the hernia sac was large, it was transected, and the dissection was performed in a standardized manner. The proximal end was closed, and the distal end was carefully hemostatized. The surgeon then tailored the mesh according to the patient's condition, creating a small aperture in the corresponding region of the inner ring to facilitate the passage of the spermatic cord. The mesh was meticulously sutured and secured, with the medial aspect affixed to the pubic symphysis area, ensuring coverage of the symphysis pubis by 1.5-2cm. Suturing extended to the outer edge of the rectus abdominis muscle sheath area, the lower edge of the mesh was secured to the inguinal ligament region, and the upper edge was sutured and fixed to the dorsal area of the abdominal external oblique muscle. The spermatic cord was then retracted, relocating it to the inner ring area. Interrupted sutures were then applied to the tendinous tissue of the external abdominal oblique muscle.

The patients in the study group were treated with TAPP. The patients were instructed to maintain a lying position with the feet about 15° above the head, and general anesthesia was administered by endotracheal intubation through the three-hole approach. After the anesthesia took effect, a 10 mm surgical incision was made above the umbilicus of the patient. A Trocar and laparoscope were inserted through the incision to set up an artificial CO_2 pneumoperitoneum, and the pneumoperitoneal pressure was controlled at 12–15 mm Hg. Two 5-mm incisions were made in the outer edge of the rectus abdominis muscle area and bilaterally at the iliac spine. A 5-mm trocar and surgical instruments were then inserted into these incisions. Utilizing laparoscopy,

the surgeon observed the patient's lesions and employed an electric hook to liberate the peritoneal flap within the inner ring region. This maneuver allowed for a complete exposure of the pubic tubercle, Cooper's ligament, and the inguinal ligament. If the patient had a hiatal hernia, the hernia sac tissue was removed through the lower region of the spermatic cord; if the patient had a straight hernia, the abdominal wall and the hernia sac tissue were peeled off, and the large hernia sac was ligated and transected to ensure that the spermatic cord was abdominally walled. After completing the above procedures, a patch was inserted to cover the area of the pubic symphysis. The edge of the patch had to be 3 cm larger than the hernia ring. The patch was secured with protein adhesive, followed by the release of pneumoperitoneum, and the peritoneal tissues were closed.

2.3. Evaluation criteria

The evaluation criteria included the surgical and postoperative recovery indexes, the complication rate, and the recurrence rate.

2.4. Statistical analysis

SPSS23.0 software was used to analyze the research data. The measurement data were expressed as mean ± standard deviation and compared using a *t*-test; the count data were expressed as percentages and compared using a χ^2-test; $P < 0.05$ indicated a statistically significant difference.

3. Results

3.1. Surgical and postoperative recovery indicators

As shown in **Table 1**, there was no significant difference in the operative time and the intraoperative blood loss between the two groups ($P > 0.05$). However, the postoperative feeding time, time out of bed, and hospitalization time of the study group were all shorter than those of the control group ($P < 0.05$).

Table 1. Comparison of surgical and postoperative recovery indexes between the two groups (mean ± standard deviation)

Group	Operative time (min)	Intra-operative blood loss (mL)	Post-operative feeding time (h)	Post-operative time out of bed (h)	Duration of hospitalization (d)
Study group ($n = 25$)	68.74 ± 5.82	10.38 ± 1.04	5.42 ± 0.88	4.89 ± 0.95	4.72 ± 1.03
Control group ($n = 25$)	68.69 ± 5.77	10.47 ± 1.09	19.75 ± 2.36	18.26±1.84	7.91±1.88
t-value	0.031	0.299	28.447	32.283	7.441
P-value	0.976	0.766	0.000	0.000	0.000

3.2. Complication rate

As shown in **Table 2**, the complication rate of patients in the study group was lower than that of the control group ($P < 0.05$).

Table 2. Comparison of complication rates between the two groups (*n* [%])

Group	Pain	Inguinal hematoma	Scrotal edema	Cutaneous infection	Complication rate
Study group (*n* = 25)	1	1	0	0	2 (8.0)
Control group (*n* = 25)	2	2	3	1	8 (32.0)
χ^2-*value*					4.500
P-value					0.033

3.3. Recurrence rate

None of the patients in the study group had recurrence after surgery. However, one patient in the control group had one recurrence, indicating a recurrence rate of 4.0%. There was no significant difference in the recurrence rates of both groups ($P > 0.05$).

4. Discussion

Epidemiological survey data show that the incidence of inguinal hernia in people over 60 years old in China is about 5%, with the most common types being hiatal hernia and straight hernia [5]. Adult inguinal hernia cannot heal by itself, and surgical treatment is required. Therefore, surgeons will need to choose the appropriate surgical procedure based on the patient's condition and perform the surgery with high standards to ensure maximum therapeutic effect [6].

Open tension-free hernia repair is a standard clinical approach for treating inguinal hernias. It effectively addresses issues associated with postoperative pain and reduces the size of the traumatic area compared to traditional tension hernia repair methods. This technique ensures a successful repair outcome and is associated with a low postoperative recurrence rate [7]. However, the technology related to open tension-free hernia repair is confined to the anatomy of the inguinal canal. During the intraoperative phase, hernia ring filler repair involves the use of large mesh plugs, but this approach may not guarantee complete flatness. Furthermore, the filler can create a cavity, increasing the risk of patch infection, blood accumulation, and higher incidences of effusion. The repair process poses a risk of damaging nerve tissue, leading to a higher likelihood of postoperative complications and an extended recovery time [8,9]. In this approach, a small incision is made, and the surgical procedures are meticulously executed under laparoscopic observation. This technique offers the advantage of significantly reducing surgical trauma, contributing to a less invasive and potentially faster recovery for the patient [10]. During TAPP, the abdominal wall and the hernia sac are properly separated, and the transversal abdominal fascia is reconstructed, allowing the complete repair of the weak inguinal area. By doing so, it effectively acts as a buffer against the impact of internal abdominal cavity pressure. This methodology aligns with the theoretical understanding of inguinal hernia etiology, considering both anatomical structure and mechanical principles [11]. Compared to open tension-free hernia repair, TAPP offers a clear field of vision This allows surgeons to precisely identify the contents of the hernia, enabling the detection and proper handling of hidden hernias on the contralateral side. For patients with bilateral hernias, there is no need for bilateral surgical incisions. Additionally, in cases of recurrent hernias, TAP allows for surgery at a distance from the original access point, providing a larger operating space and a clear field of vision. This improved visibility in TAPP procedures helps avoid damage to blood vessels and nerve tissues, leading to a significant reduction in the rate of postoperative complications and a shorter recovery time for patients [12].

The results of this study show that there is no significant difference between the operative time and intraoperative blood loss of the two groups of patients. Nevertheless, the postoperative recovery time and

hospitalization time of the patients in the study group were shorter than those of the control group, suggesting that TAPP can accelerate the recovery of inguinal hernia patients. Open tension-free hernia repair is considered a conventional approach compared to TAPP. Besides, TAPP has been shown to reduce postoperative pain. The TAPP procedure is characterized by its simplicity, contributing to a lower postoperative recurrence rate. This makes TAPP a preferred option due to its effectiveness in minimizing pain and enhancing surgical outcomes. Open tension-free hernia repair has a large incision area, which causes more damage to the structure of the abdominal wall. The increased size of the incision makes it more prone to damaging blood vessels and nerve tissues during the procedure. The patch material inserted during the operation can cause strong stimulation to the peritoneal tissues and the tissues around the incision, leading to inflammation and scar formation. This makes the patient's abdominal wall stiff, which will affect the patient's recovery and hospitalization time. TAPP is a minimally invasive surgical technique that only requires a small incision. A small incision results in a more aesthetically appealing outcome, which is essential for many patients. Besides, the surgery's impact on the patient's abdominal wall structure is minimal, with negligible effects on the function of the tissues. This results in less severe postoperative pain and the patient can eat and get out of bed at an early stage, which will shorten the hospitalization time after the operation [13]. The results of this study show that the complication rate of patients in the study group is lower than that of the control group, suggesting that TAPP can reduce the incidence of postoperative complications. This is also attributed to its smaller incision area compared to the open tension-free hernia repair incision area. A bigger incision area will result in more damage to the abdominal wall, leading to an increase in the complication rate [14]. In the TAPP method, the surgeon carefully considers the patient's internal anatomical structure of the abdominal cavity. This allows for a precise separation of the abdominal wall and hernia sac, facilitating the accurate placement of the patch. This approach minimizes damage to the abdominal wall structure during surgery. Importantly, it effectively safeguards blood vessels and the hernia sac, reducing the risk of complications. The meticulous technique of TAPP not only minimizes damage to the abdominal wall structure but also provides effective protection for blood vessels and nerves. Additionally, the smaller incision area in TAPP significantly lowers postoperative pain levels and reduces the overall incidence of complications [15]. Lastly, the results of this study showed that there was no significant difference in the recurrence rates of the two groups of patients, suggesting that both surgical protocols can treat inguinal hernia effectively, with a low rate of recurrence. Both TAPP and open tension-free hernia repair are both effective in treating inguinal hernia. However, TAPP is recommended for patients who experience recurrence of the disease and have large hernia sac volume.

5. Conclusion

In conclusion, TAPP treatment for inguinal hernia patients demonstrates advantages over open tension-free hernia repair, including shorter recovery and hospitalization times, and reduced complication rates. However, the sample size of patients with inguinal hernia selected in this study was relatively small, and no multicenter controlled study was conducted, so further analysis will be needed to determine the best surgical plan for inguinal hernia patients.

Disclosure statement

The author declares no conflict of interest.

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