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Transabdominal preperitoneal (TAPP) laparoscopic versus Lichtenstein surgery for unilateral primary inguinal hernia in elderly men

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ABSTRACT

Objective: Transabdominal preperitoneal laparoscopic surgery (TAPP) inguinal hernia (IH) repair has been an alternative to the Lichtenstein procedure. However, there have been concerns about the risks of TAPP in the elderly. We aimed to compare surgical outcomes between the two surgeries in older men with IH. **Methods:** We retrospectively recruited elderly men with IH who underwent either Lichtenstein or TAPP surgery from 2020 to 2022 in a tertiary hospital. Inclusion criteria were patients aged 60 years or older with unilateral inguinal hernia. Patients with recurrent, incarcerated, strangulated hernia, and femoral hernia were excluded from the study. Study indicators included characteristics of patients and surgical and postoperative outcomes. The follow-up time was 6 months and one year after surgery. **Results:** The mean age of patients who underwent Lichtenstein and TAPP surgery was 71 and 67 years, respectively. BMI, prevalence of comorbidities, and Nyhus classification of hernia did not differ between the two groups. Lichtenstein procedure was likely to take longer than TAPP (61.2 mins versus 40.5 mins, p = 0.002). Intraoperative complications were not frequent in both groups. Meanwhile, the pain duration of patients who underwent Lichtenstein surgery was longer than those of TAPP (3.5 days versus 2.1 days, respectively). Additionally, TAPP surgery offered shorter hospital stays than Lichtenstein surgery (3.3±1.6 days versus 5.3±2.1 days, respectively). The most prevalent postoperative complications were seroma, accounting for about 10% in each group. The postoperative complication rate and recurrent rate were similar. **Conclusion:** Lichtenstein and TAPP surgery are safe and feasible for elderly patients with inguinal hernia. However, TAPP offers shorter operation time, pain duration, and hospital stay than the Lichtenstein procedure.

Keywords: Inguinal hernia, Lichtenstein, Transabdominal preperitoneal (TAPP)

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INTRODUCTION

Inguinal hernia (IH) repair is a common surgical procedure, particularly prevalent among the elderly due to age-related weakening of the abdominal wall [1]. Two widely used techniques for inguinal hernia repair are the Transabdominal Preperitoneal

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(TAPP) approach and the Lichtenstein tension-free mesh repair. Both techniques have been extensively studied, yet there remains ongoing debate regarding their respective advantages and disadvantages, especially in the geriatric population [2].

The TAPP method, a laparoscopic technique, involves the placement of a mesh through the abdominal cavity to cover the hernia defect from the inside. This minimally invasive approach is often praised for reduced postoperative pain, quicker recovery times, and lower rates of chronic pain and recurrence. Conversely, the Lichtenstein method, an open surgical technique, places the mesh over the hernia defect externally and has long been considered the gold standard due to its simplicity, effectiveness, and low complication rates [3].

Elderly patients, however, present unique challenges and considerations due to comorbidities, decreased physiological reserves, and potentially increased susceptibility to postoperative complications [4]. Therefore, a comprehensive comparison of the TAPP and Lichtenstein techniques in this demographic is crucial to guide clinical decision-making and optimize patient outcomes.

This study aimed to compare the TAPP and Lichtenstein approaches for IH repair in the elderly, evaluating factors such as surgical outcomes, complications, and recurrent rates. Through this comparison, we seek to provide evidence-based recommendations for the most effective and safe surgical intervention for elderly patients suffering from IH.

METHODS

Patients

We retrospectively recruited elderly men with IH who underwent either Lichtenstein surgery or TAPP surgery from 2020 to 2022 in a tertiary hospital. Inclusion criteria were patients aged 60 years or older with unilateral inguinal hernia. Patients with recurrent, incarcerated, strangulated hernia, and femoral hernia were excluded from the study. The study was conducted in accordance with the guidelines of the Declaration of Helsinki and was approved by the Institutional Review Board.

Sample size was estimated with alpha = 0.05, power = 90%. The mean and SD of the two groups were obtained from a previous study [5] and the enrollment ratio was set as 1:1. Subsequently, at least 29 patients were needed in each group.

Lichtenstein surgical technique

The Lichtenstein hernia repair is performed under spinal anesthesia with the patient in a supine Trendelenburg position, arms either outstretched or alongside the body, and legs together, secured to the operating table with straps at the knees. An oblique incision is made over the inguinal region, followed by dissection through the subcutaneous tissues and external oblique aponeurosis to expose the inguinal canal. The spermatic cord, ilioinguinal nerve, and hernia sac are identified and isolated. For indirect hernias, the sac is isolated, its contents reduced, and either excised or ligated, while for direct hernias, the contents are reduced back into the abdominal cavity. A polypropylene mesh is placed over the inguinal floor, extending 2-3 cm beyond the hernia defect to cover the deep inguinal ring, pubic bone, and Cooper's ligament. The mesh is secured

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with non-absorbable sutures to the surrounding tissues, including the pubic tubercle, rectus sheath, and inguinal ligament. Finally, the external oblique aponeurosis is closed over the mesh with absorbable sutures, and the subcutaneous tissues and skin are closed in layers.

TAPP surgical technique

Patient under general anesthesia, in a supine Trendelenburg position (head down 10-15 degrees), arms positioned alongside the body, tilted to the side opposite the hernia. The surgeon stands on the opposite side of the hernia, with the screen and laparoscopic equipment. Standard laparoscopic instruments are used.

Make a skin incision vertically downward through the umbilicus, about 1 cm in length, entering the peritoneal cavity using the Hasson technique, and place the 10 mm trocar. Through this port, inflate the peritoneal cavity with CO2 and maintain a pressure of 10-12mmHg. Insert a 10mm trocar and two 5mm to introduce instruments into the peritoneal cavity.

Identify anatomical landmarks, evaluate, and classify the inguinal hernia, measure the size of the hernia defect, and separate the contents from the hernia sac. Check the opposite side to detect any additional hernia defects. Incise the peritoneum from the medial umbilical ligament to the anterior superior iliac spine on the same side as the hernia, 2 cm above the hernia defect. Lower the peritoneal flap, identify the inferior epigastric vessels, and dissect to expose the entire inguinal region, including the deep inguinal ring, pubic bone, Cooper's ligament, iliopubic tract, iliopsoas muscle, spermatic cord, and the Pain and Doom triangles. After identifying the hernia sac, for direct inguinal hernias, pull the sac into the abdominal cavity; for indirect inguinal hernias, ligate and cut the sac. Remove any extraperitoneal fat near the deep inguinal ring.

Roll a polypropylene mesh and introduce it into the abdominal cavity through the 10mm trocar, adjusting according to the size of the hernia defect. Flatten the mesh to cover the entire inguinal region and the deep inguinal ring. Ensure that the edge of the mesh extends at least 3 cm beyond the hernia defect, with the inner edge overlapping the pubic symphysis and the outer edge reaching the anterior superior iliac spine on the same side, overlapping the spermatic cord. Fix the mesh with Protacks at Cooper's ligament, iliopubic tract, rectus abdominis muscle, and transverse abdominis muscle. Be careful not to place Protacks in the Pain triangle, Doom triangle, or along the paths of nerves and blood vessels. Cover the mesh with the peritoneum and close the peritoneum with Protacks.

Study indicators included characteristics of patients such as age, BMI, comorbidities, classification of hernia, and surgical outcomes such as operation time, intra- and postoperative complications rate, and postoperative outcomes. The follow-up time was 6 months and one year after surgery.

Statistical analysis

Continuous variables were expressed as mean and SD while categorical variables were expressed as percentages. Independent Student’s T test or Fisher’s Exact test were applied when appropriate. The significant level was set at 0.05.

RESULTS

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The mean age of patients who underwent Lichtenstein repair was 71.2 years, slightly older than those who underwent TAPP surgery, but the difference was not statistically significant. Other characteristics such as BMI, prevalence of comorbidities, and Nyhus classification of hernia did not differ between the two groups. (Table 1)

Table 1. *Patients' characteristics*

	Lichtenstein (n =35)	**TAPP (n = 31)**	**p**
Age (year)	71.2±12.1	67.3±6.8	0.6
BMI (kg/m^2)	24.1±2.2	23.3±3.7	0.9
Comorbidities			
Hypertension	12 (34.3%)	10 (32.3%)	0.08
Diabetes	3 (8.6%)	2 (6.5%)	
BPH	4 (11.4%)	2 (6.5%)	
Nyhus Classification			
II	16 (45.7%)	13 (41.9%)	0.5
IIIA	15 (42.9%)	17 (54.8%)	
IIIB	4 (11.4%)	1 (3.3%)	

Values were shown as mean±SD or value (percentage). p-value was obtained using the T-test for continuous variables or Fisher's Exact test for categorical variables. BPH stands for Benign prostate hyperplasia. BMI refers to Body mass index.

Table 2. *Surgical outcomes*

	Lichtenstein (n =35)	**TAPP (n = 31)**	**p**
Operation time	61.2±15.3	40.5±20.7	0.002
Intraoperative complication			0.9
Spermatic cord injury	2 (5.8%)	1 (3.2%)	
Epigastric vessel injury	1 (2.9%)	1 (3.2%)	
Intestine injury	1 (2.9%)	0	
Postoperative outcomes			
Pain duration (days)	3.5±2.4	2.1±1.5	0.001
Hospital stays (days)	5.3±2.1	3.3±1.6	0.001
Postoperative complication			0.4
Seroma	4 (11.6%)	3 (9.6%)	
Hematoma	2 (5.8%)	1 (3.2%)	
Wound infection	2 (5.8%)	0	
Inguinal chronic pain	2 (5.8%)	2 (6.4%)	
Testis atrophy	1 (2.9%)	0	
Recurrence	1 (2.9%)	0	

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Values were shown as mean±SD or value(percentage). p-value was obtained using the T-test for continuous variables or Fisher's Exact test for categorical variables.

Regarding surgical outcomes, the Lichtenstein procedure was likely to take longer than TAPP (61.2±15.3 mins versus 40.5±20.7 mins, p = 0.002). Intraoperative complications was not frequent in both groups. Only one or two cases of vessel injuries or intestine injuries were observed. Meanwhile, the pain duration of patients who underwent Lichtenstein surgery was longer than those of TAPP (3.5±2.4 days versus 2.1±1.5 days). Additionally, TAPP surgery offered shorter hospital stays than Lichtenstein surgery (3.3±1.6 days versus 5.3±2.1 days).

The most prevalent postoperative complications were seroma, accounting for about 10% in each group. The postoperative complication rate and recurrent rate were similar. (Table 2)

DISCUSSIONS

Our study showed that the surgical outcomes of Lichtenstein hernia repair and TAPP surgery for the elderly were almost similar. However, TAPP outweighed Lichtenstein surgery in terms of the operation time, pain duration, and hospital stay. Therefore, TAPP could be a good alternative option for elderly patients with IH.

The operation time was the primary outcome of the present study. We found that the Lichtenstein procedure took longer than TAPP surgery. There were several factors contributing to this positive effect on TAPP. First, operations were done by one senior surgeon (TPV) who was familiar with laparoscopic surgery and laparoscopic anatomy of IH. Second, hernia content in older patients usually adheres to surrounding tissue so it is difficult to dissect in open surgery, leading to longer operation time in Lichtenstein surgery. Third, Protact was used to fix the mesh and close the peritoneum instead of suturing. This shortens the operation time of TAPP surgery. In bilateral IH, the TAPP technique may be more efficient due to the ability to perform both repairs simultaneously through a single incision [6]. This can reduce the overall operating time compared to performing two separate Lichtenstein procedures. Furthermore, the TAPP technique does not require the dissection of muscle in the groin, which can also contribute to a shorter operating time.

There have been some concerns about the use of transabdominal laparoscopic surgery in the elderly regarding the physiological changes during the procedure [7]. These include high pressure on cardiopulmonary systems, gas embolization, collection of carbon dioxide, and deep vein thrombosis [8]. In addition, older patients usually have comorbidities such as cardiovascular diseases, pulmonary diseases, and diabetes which negatively affect surgical outcomes[9]. Therefore, some authors even choose local anesthesia for open IH repair in the elderly to reduce the risk of general anesthesia [10]. However, in our study, the complication rate of TAPP repair was not higher than that of the Lichtenstein procedure. This result may be attributed to similar baseline characteristics between the two groups and the shorter operation time of TAPP surgery compared to Lichtenstein surgery.

TAPP surgery was also beneficial for the elderly with IH in terms of pain and hospital stay. It is understandable that laparoscopy, which has smaller incisions, and less trauma

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to the inguinal muscles and nerves, was less painful than Lichtenstein surgery. Previous studies found that laparoscopic IH repair allowed faster recovery than open surgeries [6, 11]. Therefore, patients can be discharged sooner from the hospital. TAPP surgery did not outweigh Lichtenstein surgery in the short term but also in long term. Indeed, after 5 years of follow-up, laparoscopic surgery offered less chronic pain than Lichtenstein hernia repair [12]. This may be due to laparoscopy providing a good vision for surgeons to identify the anatomic structure of the inguinal area, preventing nerve injury.

We acknowledge the limitations of our study. First, the non-randomized nature could lead to bias in patient selection. Second, the study enrolled patients with primary unilateral only so the results should be viewed within this group of patients. Third, the follow-up time was not long enough to have a robust conclusion about the recurrent rate.

CONCLUSIONS

Lichtenstein and TAPP surgery are safe and feasible for elderly patients with inguinal hernia. However, TAPP offers shorter operation time, pain duration, and hospital stay than the Lichtenstein procedure.

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