Laparoscopic Iliopubic Tract Repair with Transabdominal Preperitoneal Hernioplasty after Radical Prostatectomy

Sung Ryul Lee, MD, PhD, FACS, Geon Young Byun, MD

Department of Surgery, Damsoyu Hospital, Seoul, Republic of Korea.

ABSTRACT

Background and Objectives: In patients with inguinal hernias who have undergone radical prostatectomy, dissecting the medial preperitoneal space is difficult because of the presence of fibrotic scars. It is also difficult to guarantee sufficient space for mesh implantation. We added laparoscopic iliopubic tract repair (IPTR) to transabdominal preperitoneal (TAPP) hernioplasty, and evaluated this for the treatment of inguinal hernias after radical prostatectomy.

Methods: This retrospective study included 29 male patients with inguinal hernias after radical prostatectomy who underwent TAPP hernioplasty between January 1, 2015 and October 31, 2018. Laparoscopic IPTR was performed first, followed by TAPP hernioplasty.

Results: All patients had an indirect inguinal hernia. The mean time from radical prostatectomy to TAPP hernioplasty was 2.1 years (range, 0.3–11 years). In one patient, the peritoneal flap was insufficient, and the operation was performed using a dual-layer mesh. All other patients underwent conventional TAPP hernioplasty. The mean operation time was 42 min (range, 30–50 min), and the mean duration until return to normal activities was 8.4 days. There were two minor postoperative complications (one hematoma and one seroma). The mean follow-up period was 45.8 ± 14.0 months (range, 22–67 months), and chronic pain or recurrence was not observed.

Conclusion: Adding laparoscopic IPTR to TAPP hernioplasty in patients with a history of radical prostatectomy is feasible and safe, with a low risk of chronic pain and recurrence.

Key Words: Inguinal hernia, Hernioplasty, Prostatectomy, Laparoscopy.

INTRODUCTION

Inguinal hernia repair is among the most frequently performed operation in general surgical practice. The lifetime risk of developing a groin hernia has been estimated at 27% for men and 3% for women.[1] Because inguinal hernia frequently occurs in childhood, the prevalence of inguinal hernia in adults is lower than the lifetime risk. Radical prostatectomy for prostate cancer increases the risk of postoperative inguinal hernia, with a reported incidence of 12.4%–23.9%.[2,3] Lifetime inguinal hernias include both pediatric and adult periods, whereas inguinal hernias after radical prostatectomy only involve adult patients with prostatic cancer. Therefore, the likelihood of radical

prostatectomy patients developing an inguinal hernia is likely to be relatively high.

Damage to the transversalis fascia during radical prostatectomy leads to inguinal hernia development, so radical prostatectomy is a risk factor for inguinal hernia. There are many surgical techniques for managing inguinal hernia, with the most commonly used laparoscopic methods being transabdominal preperitoneal (TAPP) hernioplasty and totally extraperitoneal (TEP) hernioplasty. Among these, TAPP hernioplasty is a useful procedure even in complicated cases.[4] Previous studies have reported the effectiveness of TAPP hernioplasty for inguinal hernia after radical prostatectomy.[5–7] However, in patients with inguinal hernia after radical prostatectomy, sufficient dissection of the medial space (Hesselbach's triangle) is difficult because of the presence of fibrotic scars from the previous surgery. Moreover, excessive medial space dissection in these patients increases the risk of adjacent vessel and bladder injury.

Conventional radical prostatectomy is performed through an incision in Hesselbach's triangle for pelvic lymph node dissection. After performing radical prostatectomy, the fibrotic scars in Hesselbach's triangle hamper dissection of the preperitoneal space. Additionally, a narrow preperitoneal space increases the risk of recurrence because large mesh implantation is difficult.[8] Nyhus[9] reported the efficacy of iliopubic tract repair (IPTR) during open surgery. The iliopubic tract can be readily identified as a thickening of the transversalis fascia deep into the inguinal ligament,[10] and the tract lies on the posterior aspect of the inguinal region and plays an important role in hernia repair. Although IPTR is used in open hernia repair, the iliopubic tract anatomy can be accurately identified with the aid of a laparoscope, and the laparoscopic suture technique is adequate for intraabdominal IPTR once mastered by surgeons.

We believe that laparoscopic IPTR is a good surgical method for use in laparoscopic hernioplasty in complicated cases, such as radical prostatectomy cases. Hernia defects can be closed using IPTR, so large mesh implantation can be performed without excessive dissection of the medial space, and recurrence from mesh bulge can be reduced. To the best of our knowledge, few published reports have evaluated the efficacy of laparoscopic IPTR in TAPP hernioplasty after radical prostatectomy. The purpose of this study was to evaluate laparoscopic IPTR added to TAPP hernioplasty for treating inguinal hernias after radical prostatectomy.

MATERIAL and METHODS

Patients

This study was a retrospective analysis of the case records of 29 patients who underwent TAPP hernioplasty for inguinal hernias after radical prostatectomy at our institution between January 1, 2015 and October 31, 2018. All patients developed inguinal hernias after undergoing radical prostatectomy at an external tertiary medical institution. All patients referred because of a unilateral or bilateral inguinal hernia occurring after radical prostatectomy for prostatic cancer at a tertiary hospital were included in the study; there was no patient selection. We excluded patients with a history of recurrent hernia or lower abdominal surgery other than radical prostatectomy. The pre-operative diagnosis was confirmed by ultrasonography, and all TAPP hernioplasty procedures were performed by a single surgeon. All procedures were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the guardians of all individual participants included in the study.

Surgical Technique

All 29 patients underwent TAPP herniorrhaphy using a three-port laparoscopic system. We adopted a previously reported laparoscopic IPTR method,[11–13] and the procedures were performed with the patients under general anesthesia and in the supine position. The laparoscopic system used a 5 mm camera and 5 mm instruments. A 5 mm transumbilical incision was made with a 5 mm trocar to create pneumoperitoneum, and the carbon dioxide pressure was maintained at 8–10 mmHg. Two other 5 mm instruments were inserted through separate 5 mm stab incisions in the lateral abdomen.

After identifying anatomical landmarks and the hernia location (**Figure 1**), a peritoneal incision was made from the lateral to internal ring and then to the medial umbilical fold. The medial space was carefully dissected to expose the transverse abdominis muscle inside the inferior epigastric vessels. The medial side dissection was not excessive because of the fibrotic scars from the previous radical prostatectomy. Dissecting the peritoneum revealed the hernia anatomy (Figure 2a). During the medial preperitoneal space dissection, one patient suffered an inferior epigastric vessel injury, and ligation was performed with a
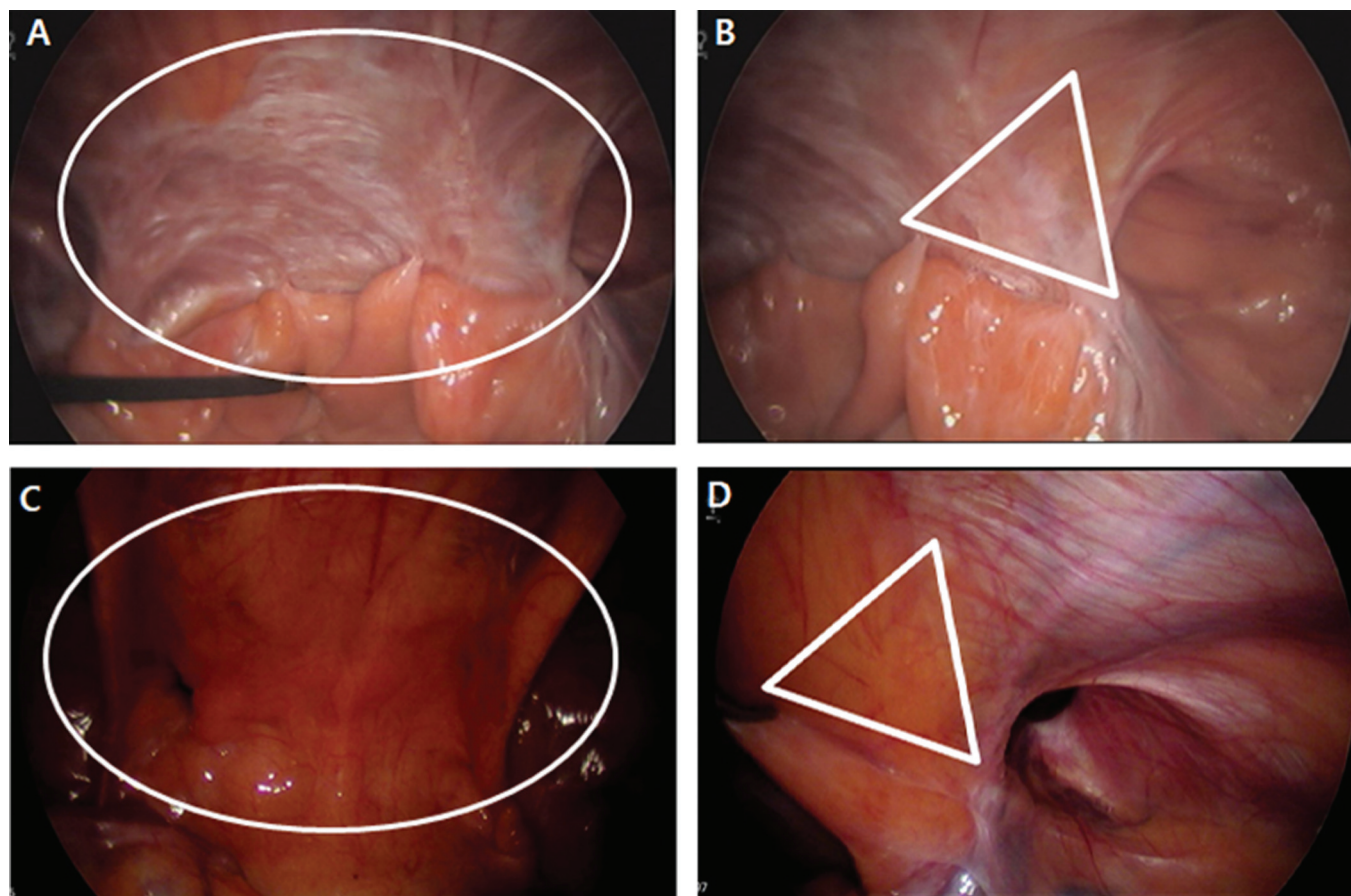
Figure 1. (a) Whole fibrotic scars from the previous radical prostatectomy (white circle). (b) Fibrotic change in Hesselbach's triangle (white triangle) in a patient with a right indirect inguinal hernia after radical prostatectomy. (c) Whole peritoneal space in a patient without radical prostatectomy (white circle). (d) Right indirect inguinal hernia in a patient without radical prostatectomy showing no fibrotic change in Hesselbach's Triangle (white triangle).

metal clip. After the dissection, the iliopubic tract was sutured using a nonabsorbable multifilament suture (1–0 silk). The initial suture was performed for the iliopubic tract and transversalis medial arch with sufficient space for the gonadal vessels to pass through (Figure 2b). A 13×10 cm^2 prosthetic polyester mesh (Figure 2d) was placed into the dissected preperitoneal space. Peritoneal closure was performed with Vicryl (Ethicon Inc., Somerville, NJ, USA) when the peritoneal flap was able to cover all of the mesh, and a dual-layer mesh was used when the peritoneal flap was unable to cover the mesh (**Figure 3**). A dual-layer mesh was used in one patient.

Protocols and Follow-up

Patients were permitted to ingest liquids postoperatively after 2 h of observation. The protocol for our institution stipulates that patients can be discharged once their condition remains stable and they are comfortable performing daily activities, such as walking and eating. Post-hernio-plasty pain was evaluated using a visual analog scale (VAS) with scores ranging from 1–10. Routine outpatient follow-up included physical examinations 1 week, 1 month, and 1 year postoperatively and a telephone interview every year until August 2020. The follow-up period ranged from 22–67 months (mean, 45.8 ± 14.0 months). Telephone interviews were performed to obtain information on patients' postoperative statuses, such as pain and complications.

RESULTS

Patients' characteristics are shown in **Table 1**. The mean age of the patients was 65.8 ± 6.4 years (range, 53–
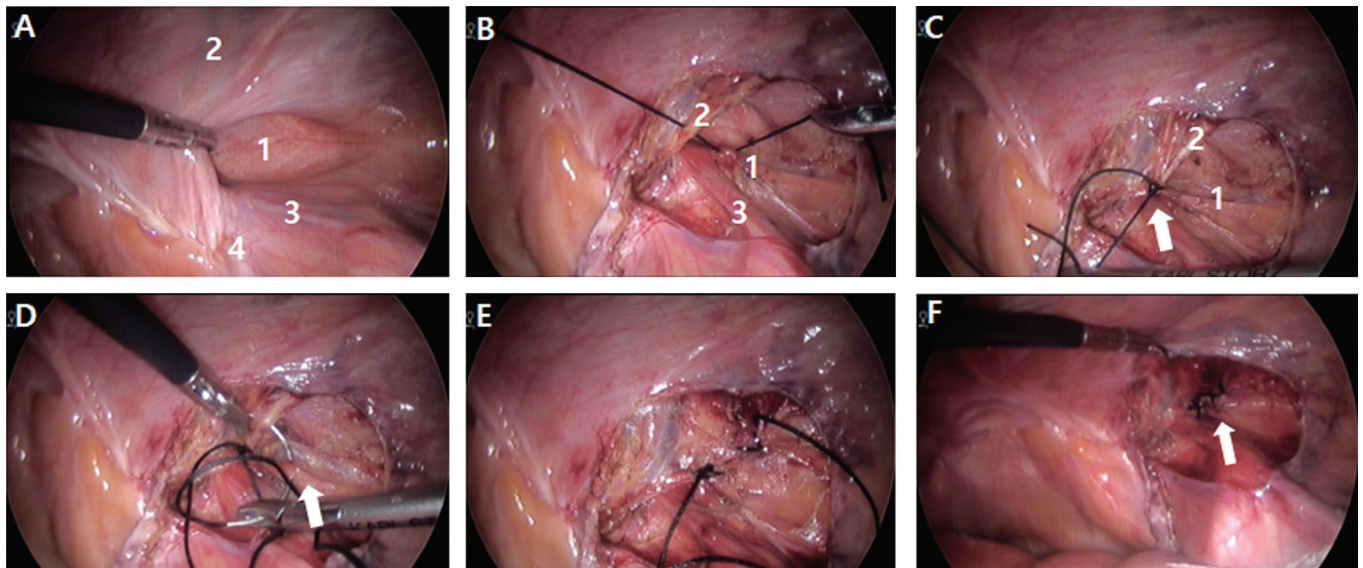
Figure 2. Procedure for laparoscopic iliopubic tract repair. (a) Right indirect inguinal hernia. 1; Indirect defect, 2; Inferior epigastric vessel, 3; Iliopubic tract, 4; Gonadal vessels. (b) Dissected preperitoneal space. The initial suture was performed for the iliopubic tract (1) and Transversalis medial arch (2) with sufficient space for the Gonadal vessels (3) To pass through. (c) Finishing the first suture (white arrow). 1; Iliopubic tract, 2; Transversalis medial arch. (d) Second suture of the iliopubic tract (white arrow). (e) Third suture of the iliopubic tract and Transversalis medial arch. (f) Finishing iliopubic tract repair (white arrow) using a nonabsorbable multifilament suture (1 – 0 silk).
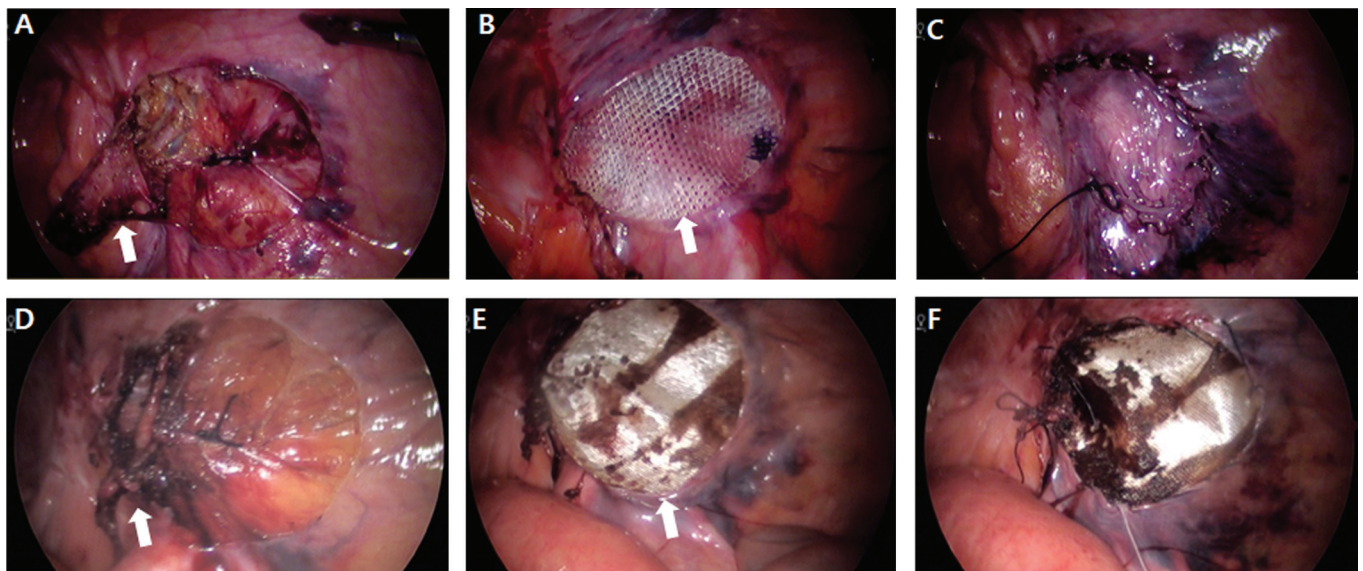
Figure 3. (a) Finishing iliopubic tract repair. A Sufficient peritoneal flap (white arrow). (b) A 13 × 10 cm² Prosthetic mesh was placed into the dissected preperitoneal space. (c) Peritoneal closure was performed using Vicryl (Ethicon Inc., Somerville, NJ, USA). When the peritoneal flap was able to cover all the mesh. (d) Finishing iliopubic tract repair. insufficient peritoneal flap (white arrow). (e) A 13 × 10 cm² Dual-layer mesh (white arrow) was placed into the dissected preperitoneal space. (f) Suture of peritoneum and mesh was performed using Vicryl when the peritoneal flap was unable to cover the mesh.

Table 1.
Characteristics of Inguinal Hernia Patients after Radical Prostatectomy

	Total (n = 29)
Age (years)	65.8 ± 6.4 (53 – 77)
Hernia location	
Bilateral	5 (17.2%)
Right side	18 (62.1%)
Left side	6 (20.7%)
Body mass index	22.8 ± 2.2 (18.4 – 27.5)
Defect size (29 patients, 34 cases)	
I (< 1.5 cm)	2 (5.9%)
II (1.5 – 3.0 cm)	25 (73.5%)
III (> 3.0 cm)	7 (20.6%)
Type of hernia	
Indirect	29 (100.0%)
Direct	0 (0.0%)
Method of initial prostatectomy	
Open	4 (13.8%)
Laparoscopy	4 (13.8%)
Robot-assisted	21 (72.4%)
Interval between surgeries (years)	2.1 ± 2.4 (0.3 – 11.0)
≤ 1	18 (62.1%)
> 1 to ≤ 2	5 (17.2%)
> 2 to ≤ 5	4 (13.8%)
> 5	2 (6.9%)
Operation time (min)	41.6 ± 6.8 (30 – 50)
Hospital stay (h)	15.6 ± 9.4 (7 – 50)
Intraoperative complications	
Bladder injury	0 (0.0%)
Gonadal vessel injury	0 (0.0%)
Inferior epigastric vessel injury	1 (3.4%)
Postoperative complications	
Hematoma	1 (3.4%)
Seroma	1 (3.4%)
Wound infection	0 (0.0%)
Chronic inguinodynia	0 (0.0%)
VAS pain score 1 week postoperatively	2.3 ± 1.4 (1 – 8)
Time until return to normal activities (days)	8.4 ± 4.3 (1 – 19)
Recurrence	0 (0.0%)
Follow-up period (months)	45.8 ± 14.0 (22 – 67)

Categorical variables are represented as n (%) and continuous variables as mean ± standard deviation (range).
VAS, visual analog scale.

77 years). Twenty-four patients had a unilateral hernia, and five had bilateral hernias; all patients had indirect hernias. The mean interval between radical prostatectomy and TAPP hernioplasty was 20.1 years, and was < 1 year in most patients (n = 18). The radical prostatectomy methods were open surgery in four patients, laparoscopic surgery in four, and robot-assisted surgery in 21. The mean operation time was 41.6 ± 6.8 min (range, 30–50 min), and the mean duration of postoperative hospital stay was 15.6 ± 9.4 h. No patients required conversion to open surgery. One hematoma and one seroma occurred postoperatively, and no patients developed chronic inguinodynia. The mean VAS pain score 1 week after the procedure was 2.3 ± 1.4, and the mean period until normal activities were resumed was 8.4 ± 4.3 days. There were no recurrences.

DISCUSSION

In 1996, Regan et al.[14] reported that inguinal hernia was one of the common postoperative complications after radical prostatectomy; the incidence of inguinal hernia was 12% after radical prostatectomy, and all hernias occurred within 6 months postoperatively. The greatest difficulty associated with performing TAPP hernioplasty after radical prostatectomy is the inability to guarantee sufficient preperitoneal space for mesh implantation. Additionally, the fibrotic scars from the radical prostatectomy can be so severe that it can be challenging to accomplish sufficient medial dissection, so bladder injuries can occur during medial dissections. Therefore, mesh implants of sufficient size in the medial space are difficult to achieve, which can result in higher recurrence rates compared with uncomplicated cases.

Several reports evaluating inguinal hernia after radical prostatectomy have described TAPP hernioplasty as a safe and effective surgical procedure when performed by an experienced skilled surgeon.[5,15] When TAPP hernioplasty is performed after radical prostatectomy, sufficient dissection of the medial side is difficult, and it is also challenging to secure sufficient preperitoneal space. IPTR closes hernia defects; therefore, mesh bulging can be prevented, and mesh implantation can be performed stably. Although IPTR has mainly been performed in open preperitoneal hernioplasty, and can be difficult to perform in laparoscopic hernioplasty because of the difficulty of intraabdominal suturing, we believe that this approach can be useful in complicated hernia patients who have undergone radical prostatectomy. Lee et al.[12] described laparoscopic IPTR and mesh implantation for treating recurrent inguinal hernia patients. They used IPTR to

resolve difficulties dissecting the preperitoneal space caused by the previous mesh implantation and reported no re-recurrence. Peitsch et al.[7] applied a 13×13 cm mesh after suture closure for hernia gap sizes exceeding 1×1 cm in patients with inguinal hernia after radical prostatectomy, and observed one recurrence during a follow-up period of 2–17 years. In our study, a 13×10 cm mesh was implanted after laparoscopic IPTR, and there was no recurrence.

Most cases of inguinal hernia after robot-assisted radical prostatectomy were reported to be indirect hernias (90% – 95% of cases).[16,17] In the present study, all cases were indirect hernias, similar to previous findings. The fibrotic scars in Hesselbach's triangle may reduce direct hernia development. Indirect hernia development is considered to arise from trauma to the transverse fascia during radical prostatectomy. In previous studies, most intervals to inguinal hernia development after radical prostatectomy were < 2 years.[18,19] Similarly, in the present study, hernias developed within 2 years after prostatectomy in 23 patients (79.3%). The occurrence of hernia within 2 years after prostatectomy means that the cause of the inguinal hernia was the prostatectomy.

Recently, laparoscopic hernioplasty for inguinal hernias has been widely performed, and has the advantages of short recovery time and better cosmetic outcomes compared with open surgery.[20] Laparoscopic TAPP and TEP hernioplasty are standard techniques, and postoperative complications and outcomes do not differ significantly between the two types of surgery. Most surgeons prefer TAPP or open hernioplasty in complicated cases with a history of incarceration, large scrotal hernia, and pelvic surgery. In patients with inguinal hernia after radical prostatectomy, surgeons are hesitant to use the laparoscopic approach because of severe scarring in the preperitoneal space.[21] The advantage of TAPP hernioplasty is that it can clearly identify the intra-abdominal anatomical status. In this study, laparoscopic surgery was selected by all patients after completing a presurgery questionnaire providing the details of open hernia repair and laparoscopic hernia repair. In our opinion, performing a laparoscopic surgery for cancer followed by open surgery for a benign operation is less appealing to the patient. Additionally, TAPP hernioplasty has the advantage of directly evaluating the peritoneal invasion of prostate cancer in the pelvic cavity.

Previously, the operation time was shown to be longer for patients undergoing TAPP hernioplasty after radical prostatectomy than in those in the uncomplicated group (59 min. vs. 40 min, respectively).[5] The authors of this study also reported higher morbidity (5.7% vs. 2.8%, respectively) and urinary injury in 0.7% of cases. We experienced a mean operation time of 41 min, and minor postoperative complications occurred in two patients (one hematoma and one seroma).

Claus et al.[6] evaluated postoperative pain in patients who underwent TAPP hernioplasty after radical prostatectomy, using a VAS, and also described the times for returning to usual activities. In the study, 75%, 85%, and 90% of patients reported no discomfort or pain 12 h, 24 h, and 7 days postoperatively, respectively. The time to resume usual activities was 3.1 ± 1.3 days, and the time taken to return to work was 5.6 ± 2.2 days. In our study of TAPP hernioplasty with laparoscopic IPTR, the mean VAS score for pain 1 week postoperatively was 2.3 ± 1.4, and the time to return to normal activities was 8.4 ± 4.3 days. Thus, there was no difference in pain scores resulting from pain or tension caused by the suture.

This study has a number of limitations. The follow-up period was short, and some patients who underwent surgeries more recently will require observation for longer periods to determine the "true" recurrence rate. Additionally, this was a single-center study, so the results may not be generalizable to other institutions and populations. Future multicenter studies are therefore required to confirm our findings. Additionally, a study comparing patients undergoing IPTR with those not undergoing IPTR should be performed.

CONCLUSION

The addition of laparoscopic IPTR to TAPP hernioplasty in patients with a history of radical prostatectomy appears to be feasible and safe, with low risk of chronic pain and recurrence.

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