Submitted: 25 August, 2025 Accepted: 15 October, 2025 Published: 30 January, 2026 DOI:10.22514/jomh.2026.010

ORIGINAL RESEARCH

JOMH Journal of Men's Health

Comparative effects of laparoscopic TAPP and TEP hernia repair on pelvic floor nerve and erectile function in male patients: a retrospective study

Guofeng Yu[1], Yan Wang[2,*], Haibo Deng[3,*], Jianming Ju[1], Wei Xu[1], Yousheng Yang[1], Lei Huang[1]

[1]Department of General Surgery, Suzhou Hospital of Integrated Traditional Chinese and Western Medicine, 215101 Suzhou, Jiangsu, China
[2]Department of Nosocomial Infection Management, Suzhou Hospital of Integrated Traditional Chinese and Western Medicine, 215101 Suzhou, Jiangsu, China
[3]Department of Urology, Suzhou Hospital of Integrated Traditional Chinese and Western Medicine, 215101 Suzhou, Jiangsu, China

***Correspondence**
yan_wangy084@163.com
(Yan Wang);
dhb51@126.com
(Haibo Deng)

Abstract

Background: The long-term impact of laparoscopic inguinal hernia repairs on pelvic floor nerve and erectile function in men remains unclear. This study compared the transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) techniques. **Methods**: The data of 170 male patients with unilateral inguinal hernia who underwent surgery at our institution between June 2020 and June 2023 were retrospectively reviewed, comprising 85 cases treated with TAPP and 85 with TEP. Comparative analyses were performed for operative parameters, indices of pelvic floor nerve function, erectile function quantified by the International Index of Erectile Function-5 (IIEF-5), the incidence of (erectile dysfunction) ED, and postoperative complications. **Results**: The mean operative time was significantly longer in the TAPP group than in the TEP group (68.72 ± 10.66 min *vs.* 58.62 ± 11.84 min, $p < 0.001$), whereas the total hospitalization cost was higher for TEP (2.68 ± 0.48 *vs.* $2.40 \pm 0.49 \times 10^4$ yuan, $p < 0.001$). At both 6 months and 1 year postoperatively, the TAPP group showed higher incidences of neuropathic pain (15.29%/10.59% *vs.* 5.88%/2.35%) and ED (27.06%/14.12% *vs.* 9.41%/4.71%) compared with the TEP group (all $p < 0.05$); however, these differences were no longer significant at 2 years after surgery. At 6 months postoperatively, the abnormal epididymal reflex in the TAPP group (18.82% *vs.* 7.06%) was significantly higher than that in the TEP group, and the difference disappeared one year after surgery. Multivariate logistic regression identified TEP as an independent protective factor against postoperative ED (odds ratio = 0.308, $p = 0.020$). **Conclusions**: Compared to TAPP, TEP repair demonstrated better early preservation of pelvic floor nerve and erectile function, likely due to less extensive dissection. Functional outcomes equalized by two years, suggesting the surgical approach should be individualized based on patient characteristics and needs.

Keywords

Inguinal hernia; Laparoscopic transabdominal preperitoneal hernia repair (TAPP); Totally extraperitoneal hernia repair (TEP); Pelvic floor nerve function; Erectile dysfunction

1. Introduction

Inguinal hernia is a common condition in general surgery, with a particularly high lifetime incidence among men worldwide, estimated at approximately 27%–43% [1]. With the increasing adoption of minimally invasive surgical techniques, numerous studies have confirmed that laparoscopic repair offers distinct advantages over conventional open procedures, including reduced postoperative pain, faster recovery, and lower recurrence rates [2]. Among these laparoscopic techniques, transabdominal preperitoneal hernia repair (TAPP) and totally extraperitoneal hernia repair (TEP) have become the two principal approaches because of their minimal invasiveness and favorable clinical outcomes [3]. Clinically, TAPP is favored for complex cases such as recurrent or bilateral hernias or when intra-abdominal exploration is required, whereas TEP is preferred for primary unilateral hernias because its extraperitoneal approach reduces intra-abdominal interference and minimizes the risk of visceral complications.

Although comparative studies on TAPP and TEP have established a solid clinical basis, most reported that both procedures achieve satisfactory outcomes, and current evidence remains insufficient to demonstrate the clear superiority of TEP over TAPP [4]. Moreover, due to their distinct anatomical approaches, the long-term impact of these two techniques on pelvic floor nerve integrity and male reproductive function

has not been fully elucidated [5]. Long-term preservation of pelvic floor nerve function is of particular importance for male patients, as the inguinal region contains a dense network of nerves, including the genitofemoral and ilioinguinal nerves, that are responsible for sensory transmission and for regulating spermatic cord motility and erectile function [6]. Intraoperative factors such as mesh implantation, staple fixation, or postoperative adhesions may compress or damage these nerves, potentially resulting in chronic pain or erectile dysfunction (ED) [7].

Clinical observations indicate that postoperative ED occurs in approximately 3%–5% of male patients following inguinal hernia repair [8]. However, previous studies have mainly emphasized short-term outcomes such as pain relief and recurrence rates, with relatively limited attention to the long-term effects on pelvic floor nerve and sexual function [9]. In terms of reproductive function protection, maintaining the integrity of the spermatic vessels is essential, as the spermatic artery provides the blood supply to the testis and the spermatic vein contributes to temperature regulation, together sustaining the physiological environment required for spermatogenesis [10]. In addition, alterations in testicular hemodynamics may disturb this microenvironment, influence testosterone secretion, and subsequently impair erectile function [11].

Recent evidence further suggests that modified TAPP procedures incorporating urogenital protective techniques yield significantly higher postoperative International Index of Erectile Function-5 (IIEF-5) scores and seminal α-glucosidase levels than conventional repairs, supporting the value of technical optimization in functional preservation [12]. Therefore, this study retrospectively analyzed and compared the long-term effects of TAPP and TEP on pelvic floor nerve function and erectile function in male patients. By determining the differences in neural protection and reproductive outcomes between the two procedures, we aim to provide evidence-based guidance for surgical approach selection and intraoperative protection, thereby promoting surgical standardization, individualized treatment strategies, and improved postoperative quality of life for male patients.

2. Materials and methods

2.1 Study subjects and grouping

All eligible male patients with unilateral inguinal hernia who underwent laparoscopic repair at our institution between June 2020 and June 2023 were included in this retrospective analysis. Based on the surgical approach performed, 85 patients were assigned to the TAPP group and 85 to the TEP group. No additional case selection or matching was conducted to minimize selection bias (Fig. 1). Sample size was determined based on the primary outcome, namely the 6-month incidence of ED. Assuming an incidence of 25% in the TAPP group and 10% in the TEP group, with a significance level (α) of 0.05 and statistical power of 80%, at least 76 patients per group were required. To account for an estimated 10% loss to follow-up, 85 patients were ultimately enrolled in each group. *Post-hoc* power analysis confirmed that the study retained a power greater than 85% for the main comparisons. Ethical approval was obtained from the Ethics Committee of Suzhou Hospital of Integrated Traditional Chinese and Western Medicine (Approval No. 2025029, 15 March 2023). Written informed consent was obtained from all participants for the use of anonymized clinical data in research.

Eligible participants were required to meet all of the following inclusion criteria: (1) male patients aged between 18 and 70 years; (2) a diagnosis of unilateral inguinal hernia, including direct, indirect, or femoral hernia, established in accordance with the Update of the International HerniaSurge Guidelines for Groin Hernia Management [13]; (3) first-time inguinal hernia repair; (4) no prior history of pelvic floor nerve injury such as lumbar spine surgery or pelvic radiotherapy; (5) a preoperative IIEF-5 score of 17 or higher, indicating the absence of definite ED [14]; and (6) complete clinical as well as follow-up data.

Patients were excluded if they had: (1) severe organ dysfunction (heart, liver, or kidney) or coagulation disorders; (2) bilateral inguinal hernia or complex hernia (*e.g.*, concurrent incisional hernia); (3) incarcerated or strangulated hernia requiring emergency surgery; (4) comorbidities known to affect pelvic floor nerve function, such as benign prostatic hyperplasia or diabetic peripheral neuropathy; and (5) loss to follow-up or a follow-up period of less than two years.

2.2 Surgical methods

All surgeries were performed by the same lead surgeon, who had completed over 100 laparoscopic hernia repair procedures, assisted by a fixed operative team to maintain procedural uniformity. The mesh used for all operations was standardized to either Bard 3DMax® or Covidien Parietex™, and the use of non-absorbable staples was strictly prohibited. Each patient received general anesthesia and was positioned supine with a 15° Trendelenburg tilt to optimize the surgical field.

For patients in the TAPP group, pneumoperitoneum was established to a pressure of 12–14 mmHg. A 10 mm trocar was inserted at the umbilicus for the laparoscope, and two 5 mm trocars were positioned lateral to the rectus abdominis muscles. The peritoneum was then incised to enter the preperitoneal plane, and dissection of the Bogros space was performed to expose the pubic symphysis, Cooper's ligament, and spermatic cord structures. The spermatic cord was mobilized extensively along the abdominal wall, with a dissection length of no less than 6 cm, to ensure adequate visualization and tension-free placement of the prosthesis. A lightweight large-pore mesh (15×10 cm) was introduced to cover the myopectineal orifice completely and was fixed either without staples or with no more than three absorbable staples, depending on intraoperative conditions. The peritoneal flap was subsequently closed with continuous sutures to restore anatomical integrity.

For patients in the TEP group, a small infraumbilical incision was made in the posterior rectus sheath, and a balloon dissector was used to develop the preperitoneal space. A 10 mm trocar was placed for the laparoscope, and two 5 mm working trocars were inserted bilaterally in the lower abdomen. The preperitoneal space was bluntly dissected to the same anatomical extent as in TAPP; however, dissection of the spermatic cord was limited to the area around the hernia

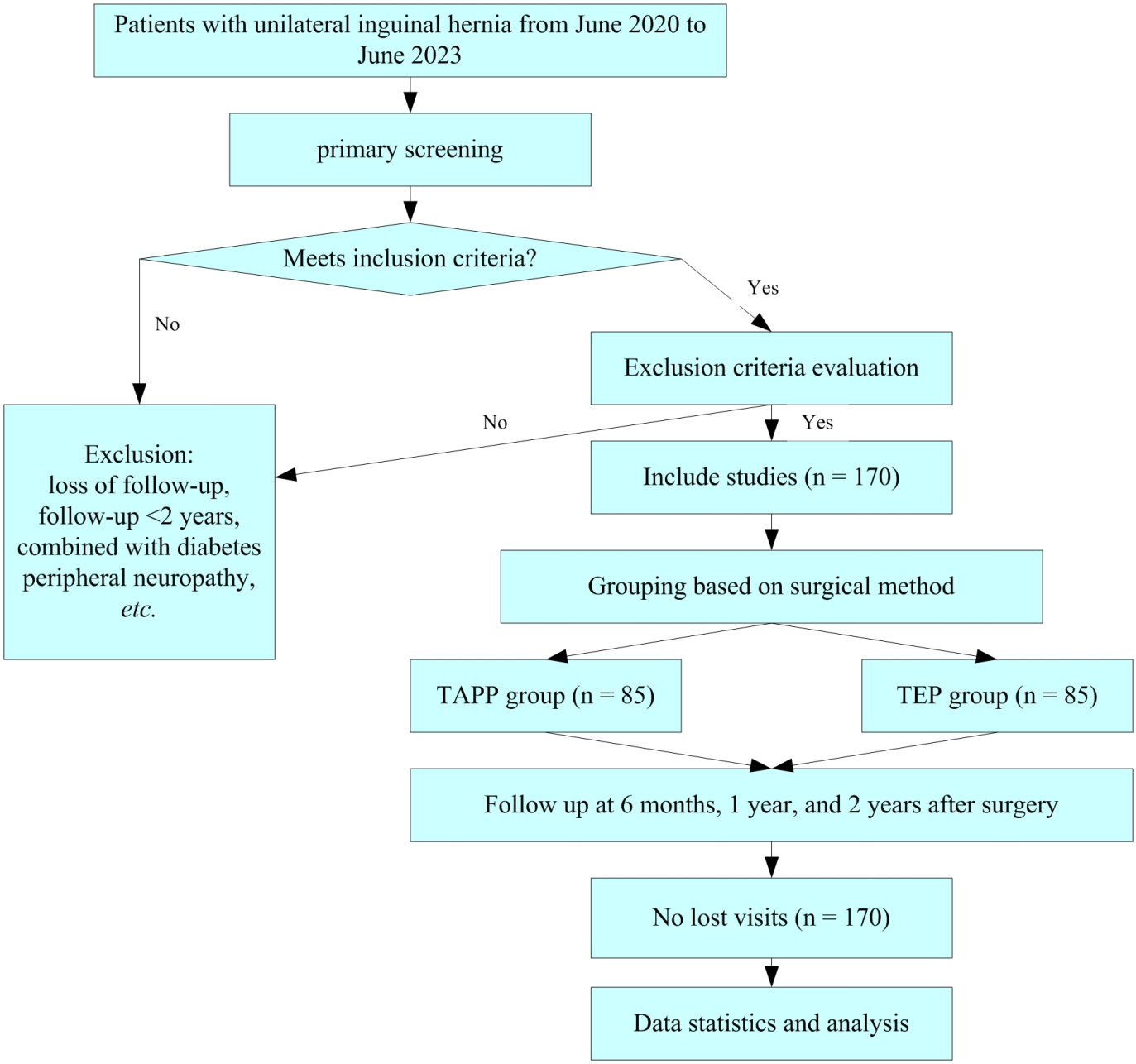

FIGURE 1. Patient enrollment and grouping process. TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair.

ring, avoiding unnecessary extension along the abdominal wall. The same mesh model and size used in TAPP were employed to ensure uniformity in prosthesis placement. Since the peritoneal cavity was not entered in TEP, peritoneal closure was unnecessary. After mesh deployment, the abdominal wall was closed with absorbable sutures, and the wound surface was disinfected to complete the procedure.

2.3 Observation indicators and data collection

Preoperative clinical data were collected at baseline (T0). All patients underwent standardized follow-up evaluations at 6 months (T1), 1 year (T2), and 2 years (T3) after surgery, conducted either through outpatient visits or structured telephone interviews. Outpatient assessments included physical examination—specifically palpation of the inguinal region and testing of the cremasteric reflex—as well as completion of the IIEF-5 questionnaire. Telephone follow-ups were used to document subjective symptoms when in-person evaluation was not possible. Patients were classified as lost to follow-up if they failed to respond to two consecutive follow-up attempts and could not be reached through alternative contact methods.

The following indicators were analyzed and compared between the TAPP and TEP groups: (1) baseline variables such as age, body mass index (BMI), hernia type (indirect or direct hernia), and hernia ring size (<1.5 cm, 1.5–3 cm, >3 cm); (2) surgical indicators, comprising operation time, intraoperative blood loss, postoperative hospital stay, surgical cost, and postoperative time to ambulation, defined as the interval from the completion of surgery to the patient's ability to independently transfer from bed to chair; (3) pelvic floor nerve and erectile

function parameters, including neuropathic pain assessed using the (Douleur Neuropathique 4) DN4 questionnaire, with a score of 4 or higher indicating neuropathic pain [15], cremasteric reflex attenuation or disappearance rate, and erectile function evaluated by the IIEF-5, where a score of 21 or lower was diagnostic of ED; (4) spermatic vein parameters, including spermatic vein diameter and blood flow velocity; (5) testicular parameters, including testicular resistance index (RI), testicular volume, and testicular artery diameter; and (6) postoperative complications, including seroma formation, infection, and chronic pain.

All clinical assessments, including DN4 scoring, cremasteric reflex testing, and IIEF-5 evaluation, were independently performed by two trained clinicians who were blinded to the surgical approach. Inter-rater reliability was verified, yielding an intraclass correlation coefficient (ICC) of 0.89 (95% confidence interval (CI): 0.82–0.94) for DN4 and 0.91 (95% CI: 0.86–0.95) for IIEF-5, confirming the high consistency and reproducibility of the measurements.

2.4 Statistical analysis

All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables are expressed as mean ± standard deviation ($\bar{x} \pm s$), and comparisons between groups were conducted using the independent-samples *t*-test when data were normally distributed or the Mann-Whitney U test when nonparametric conditions applied. Categorical variables are presented as frequencies and percentages, and intergroup differences were analyzed using the chi-square test or Fisher's exact test, as appropriate.

3. Results

3.1 Comparison of baseline data

There were no statistically significant differences between the TAPP and TEP groups regarding patient age, BMI, hernia type distribution, or hernia ring size categories (all $p > 0.05$), indicating that the baseline characteristics of the two groups were comparable, thereby ensuring the reliability of subsequent intergroup analyses (Table 1).

3.2 Comparison of surgical indicators

The mean operative time in the TAPP group was significantly longer than that in the TEP group ($p < 0.001$). There were no statistically significant differences between the two groups in terms of intraoperative blood loss, postoperative hospital stay, or postoperative time to ambulation (all $p > 0.05$). However, the surgical cost in the TEP group was notably higher than that in the TAPP group ($p < 0.001$) (Table 2).

3.3 Assessment of pelvic floor nerve function

At 6 months (T1) and 1 year (T2) after surgery, the proportion of patients with DN4 scores ≥4, indicative of neuropathic pain, was significantly higher in the TAPP group than in the TEP group ($p < 0.05$). However, by 2 years postoperatively (T3), this difference was no longer statistically significant ($p > 0.05$). Similarly, at 6 months after surgery, the incidence of attenuation or disappearance of the cremasteric reflex in the TAPP group was significantly higher than that observed in the TEP group ($p < 0.05$), and this difference gradually decreased at 1 year and disappeared by 2 years after surgery, at which time no significant intergroup difference was detected ($p > 0.05$) (Table 3).

3.4 Erectile function

Preoperatively, there was no significant difference in IIEF-5 scores between the two groups ($p > 0.05$). At 6 months (T1) and 1 year (T2) after surgery, the IIEF-5 scores in the TAPP group were significantly lower than those in the TEP group ($p < 0.05$). By 2 years postoperatively (T3), there was no statistically significant difference in IIEF-5 scores between the two groups ($p > 0.05$). At 6 months (T1) and 1 year (T2) postoperatively, the incidence of ED in the TAPP group was significantly higher than that in the TEP group ($p < 0.05$). By 2 years postoperatively (T3), there was no statistically significant difference in the incidence of ED between the two groups ($p > 0.05$) (Table 4, Fig. 2).

TABLE 1. Comparison of baseline data between the TAPP and TEP groups ($\bar{x} \pm s$, n (%)).

Index	TAPP group (n = 85)	TEP group (n = 85)	t/χ^2	p
Age (yr)	53.02 ± 8.10	52.73 ± 7.47	0.246	0.806
BMI (kg/m^2)	23.41 ± 2.72	24.24 ± 3.03	1.900	0.059
Hernia type				
Indirect hernia	63 (74.12)	65 (76.47)	0.126	0.722
Direct hernia	22 (25.88)	20 (23.53)		
Hernia ring size				
<1.5 cm	28 (32.94)	25 (29.41)		
1.5–3 cm	45 (52.94)	49 (57.65)	0.384	0.826
>3 cm	12 (14.12)	11 (12.94)		

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair; BMI: body mass index.

TABLE 2. Comparison of perioperative indicators between the TAPP and TEP group ($\bar{x} \pm s$).

Index	TAPP group (n = 85)	TEP group (n = 85)	t	p
Operation time (min)	68.72 ± 10.66	58.62 ± 11.84	5.848	<0.001
Intraoperative blood loss (mL)	14.66 ± 3.00	15.20 ± 2.99	1.179	0.240
Postoperative hospitalization days (d)	4.59 ± 1.75	4.51 ± 1.60	0.320	0.750
Surgical cost (×10,000 yuan)	2.40 ± 0.49	2.68 ± 0.48	3.714	<0.001
Postoperative time to ambulation (h)	12.53 ± 3.22	11.82 ± 2.91	1.424	0.158

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair.

TABLE 3. Comparison of postoperative pelvic floor nerve function indicators between the TAPP and TEP groups (n (%)).

Index	Time	TAPP group (n = 85)	TEP group (n = 85)	χ^2	p
DN4 score ≥4 (neuropathic pain)					
	T1	13 (15.29)	5 (5.88)	3.977	0.046
	T2	9 (10.59)	2 (2.35)	4.763	0.029
	T3	5 (5.88)	2 (2.35)	1.341	0.247
Cremasteric reflex weakened/disappeared					
	T1	16 (18.82)	6 (7.06)	5.221	0.022
	T2	10 (11.76)	4 (4.71)	2.802	0.094
	T3	5 (5.88)	2 (2.35)	1.341	0.247

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair; DN4: Douleur Neuropathique 4.

TABLE 4. Comparison of postoperative erectile function indicators between the two groups (($\bar{x} \pm s$), n (%)).

Index	Time	TAPP group (n = 85)	TEP group (n = 85)	t/χ^2	p
IIEF-5 score					
	T0	23.46 ± 1.10	23.33 ± 1.11	0.766	0.445
	T1	21.65 ± 2.96	22.46 ± 2.14	2.049	0.042
	T2	22.42 ± 2.41	23.21 ± 1.95	2.345	0.020
	T3	23.21 ± 2.10	23.39 ± 1.36	0.649	0.517
Incidence of erectile dysfunction (IIEF-5 ≤21)					
	T1	23 (27.06)	8 (9.41)	8.877	0.003
	T2	12 (14.12)	4 (4.71)	4.416	0.036
	T3	6 (7.06)	3 (3.53)	1.056	0.304

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair; IIEF-5: the International Index of Erectile Function-5.

3.5 Spermatic vein parameters

Before surgery, there were no significant differences between the two groups in spermatic vein diameter or blood flow velocity ($p > 0.05$). Scrotal color Doppler ultrasound performed at 6 months after surgery showed that, compared with preoperative values, both groups exhibited significantly increased spermatic vein diameters ($p < 0.05$) and significantly decreased spermatic vein blood flow velocities ($p < 0.05$). Six months after surgery, compared with the TEP group, patients in the TAPP group had a wider spermatic vein diameter ($p < 0.05$) and lower spermatic vein blood flow velocity ($p < 0.05$) (Table 5).

3.6 Testicular parameters

At 6 months after surgery, there were no statistically significant differences between the TAPP and TEP groups in testicular resistance index (RI), testicular volume, or testicular artery diameter ($p > 0.05$) (Table 6).

3.7 Postoperative complications

There were no statistically significant differences between the TAPP and TEP groups in the incidence of postoperative seroma, incisional infection, or chronic inguinal pain persisting

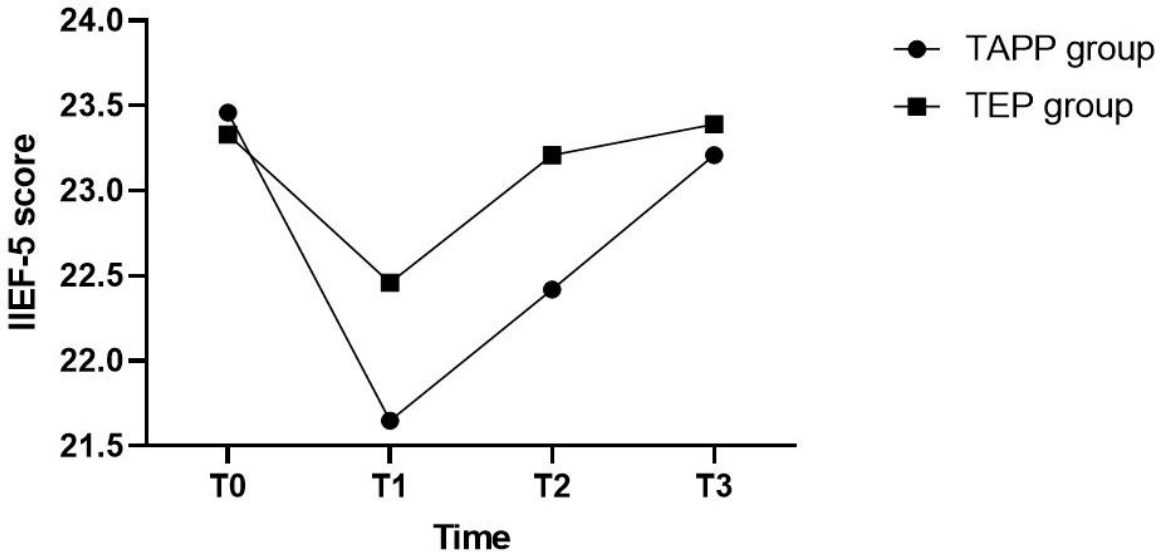

FIGURE 2. Dynamic changes in IIEF-5 scores in the two groups of patients. TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair; IIEF-5: the International Index of Erectile Function-5.

TABLE 5. Comparison of spermatic vein ultrasound indicators between the two groups at 6 months postoperatively ($\bar{x} \pm s$).

Variables	Diameter of spermatic vein (mm)				Blood flow velocity of spermatic vein (cm/s)			
	T0	T1	*t*	*p*	T0	T1	*t*	*p*
TAPP group (n = 85)	1.97 ± 0.13	2.13 ± 0.24	5.455	<0.001	1.95 ± 0.06	1.70 ± 0.12	17.067	<0.001
TEP group (n = 85)	1.96 ± 0.11	2.01 ± 0.15	2.482	0.014	1.94 ± 0.07	1.88 ± 0.09	4.937	<0.001
t	0.225	3.715			0.29	11.354		
p	0.822	<0.001			0.772	<0.001		

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair.

TABLE 6. Comparison of testicular ultrasound indicators between the two groups at 6 months postoperatively ($\bar{x} \pm s$).

Index	TAPP group (n = 85)	TEP group (n = 85)	*t*	*p*
Testicular resistance index (RI)	0.63 ± 0.06	0.62 ± 0.06	0.632	0.528
Testicular volume (mL)	16.86 ± 2.78	17.27 ± 2.83	0.961	0.338
Diameter of testicular artery (mm)	0.47 ± 0.08	0.46 ± 0.09	1.327	0.186

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair.

for more than three months ($p > 0.05$). No cases of hernia recurrence were recorded in either group during the two-year follow-up period (Table 7).

3.8 Multivariate logistic regression analysis of erectile dysfunction

Using ED (IIEF-5 ≤21) at 6 months postoperatively (T1) as the dependent variable, multivariate logistic regression analysis was performed with age, BMI, surgical approach, hernia ring size, operation time, intraoperative blood loss, and postoperative hospital stay as independent variables. The results showed that undergoing TEP (OR = 0.308, 95% CI: 0.114–0.829, p = 0.020) was the only independent protective factor for ED at 6 months postoperatively (Table 8).

4. Discussion

This study is the first to demonstrate in a clinical cohort that the incidence of ED was significantly higher in patients undergoing TAPP compared with those treated with TEP during the early postoperative period at 6 months and 1 year (27.06% *vs.* 9.41% and 14.12% *vs.* 4.71%, respectively). Multivariate logistic regression analysis further identified TEP as an independent protective factor against postoperative ED (OR = 0.308, p = 0.020). The spermatic vein serves as the principal route for testicular venous drainage, and dilatation accompanied by reduced blood flow velocity may lead to testicular congestion [16]. The testis is highly sensitive to temperature fluctuations, and venous stasis elevates local temperature, thereby suppressing spermatogenic cell activity and damaging Leydig cells, which are responsible for

TABLE 7. Comparison of postoperative complications between the TAPP and TEP groups (n (%)).

Complication	TAPP group (n = 85)	TEP group (n = 85)	χ^2/Fisher	*p*
Seroma	8 (9.41)	6 (7.06)	0.311	0.577
Incision infection	2 (2.35)	1 (1.18)	0.339	0.560
Chronic pain (>3 mon)	10 (11.76)	5 (5.88)	1.828	0.176
Recurrence (within 2 yr)	0	0	-	-

TAPP: laparoscopic transabdominal preperitoneal hernia repair; TEP: totally extraperitoneal hernia repair.

TABLE 8. Multivariate logistic regression analysis of erectile dysfunction.

Index	b	SE	Wald χ^2 value	*p* value	OR	95% CI
Operation method	−1.178	0.506	5.428	0.020	0.308	0.114–0.829
Age	−0.043	0.028	2.353	0.125	0.958	0.907–1.012
BMI	−0.014	0.076	0.035	0.852	0.986	0.850–1.144
Hernia type	0.953	0.592	2.591	0.108	2.594	0.813–8.281
Hernia ring size	−0.108	0.334	0.105	0.746	0.897	0.466–1.728
Operation time	0.018	0.020	0.820	0.365	1.018	0.980–1.058
Intraoperative bleeding volume	−0.013	0.071	0.032	0.858	0.987	0.860–1.134
Postoperative hospitalization days	−0.098	0.123	0.635	0.426	0.907	0.713–1.154

BMI: body mass index; b: Regression Coefficient; SE: Standard Error; OR: Odds Ratio; CI: Confidence Interval.

testosterone production [17]. In the present study, the TAPP group exhibited more significant abnormalities in spermatic vein hemodynamics, possibly due to the extensive "walling" dissection of the spermatic cord inherent to this approach. Excessive dissection disrupts the architecture of the pampiniform venous plexus, increases venous return resistance, and impairs physiological circulation. Conversely, TEP requires only limited dissection confined to the area surrounding the hernia ring, resulting in minimal interference with the venous plexus and better preservation of normal hemodynamics [18].

Erectile function depends on the integrity of the neurovascular axis, in which parasympathetic fibers originating from the pelvic nerves mediate penile cavernosal vasodilation, while sympathetic fibers from the hypogastric nerves regulate ejaculation [19]. The higher rate of abnormal cremasteric reflex observed in the TAPP group suggests potential injury to the genital branch of the genitofemoral nerve, which innervates the cremaster muscle. Given the close anatomical proximity of this branch to the pelvic parasympathetic plexus, its injury may extend to parasympathetic fibers and consequently weaken erectile responses [20]. By two years after surgery, differences in IIEF-5 scores and ED incidence between the two groups were no longer significant, which may be attributed to several mechanisms: (a) compensatory remodeling of the spermatic vein, such as venous wall thickening and collateral circulation formation, improving local hemodynamics [21]; (b) nerve regeneration through axonal sprouting and partial recovery of neural conduction in mildly injured fibers [22]; and (c) psychological adaptation, in which reduced anxiety and greater tolerance to postoperative discomfort improve the subjective components of erectile function scores [23]. However, serum testosterone levels were not assessed in this study, precluding direct verification of the link between altered hemodynamics and endocrine function. Future research should incorporate hormonal measurements to confirm the mechanistic relationship between vascular and endocrine changes.

Pelvic floor nerve injury is the core pathological basis of chronic pain and dysfunction after inguinal hernia surgery. This study, through DN4 score and cremasteric reflex assessment, revealed early differences in nerve protection between TAPP and TEP. The inguinal region has a dense nerve plexus, mainly including the genitofemoral nerve (innervating the cremaster muscle), the ilioinguinal nerve (responsible for skin sensation), and the iliohypogastric nerve (involved in transversus abdominis muscle movement) [24, 25]. TAPP surgery requires incising the peritoneum and extensive dissection of the spermatic cord ("parietalization" ≥6 cm), which can easily stretch or compress these nerves, leading to axonal injury or edema [26, 27]. Furthermore, after peritoneal closure, fibrosis and adhesion may occur between the mesh and the peritoneum, causing chronic nerve compression [28]. In contrast, the TEP procedure is performed in the preperitoneal space with minimal spermatic cord dissection and no need for peritoneal suture, thereby reducing the risk of nerve exposure and adhesion [29]. This study showed that at 6 months postoperatively, the incidence of neuropathic pain (5.88%) and the abnormal cremasteric reflex rate (7.06%) in the TEP group were significantly lower than those in the TAPP group (15.29%, 18.82%), consistent with the report by Trehan M *et al.* [30]. The differences between the two groups disappeared at 2 years postoperatively ($p > 0.05$), suggesting that early nerve injury is mostly reversible, potentially related to nerve self-repair and tissue remodeling [31]. However, some patients may still progress to chronic neuropathic pain, requiring long-term

follow-up [32].

In terms of postoperative infection risk, this study found no significant difference in the incidence of incision infection between the two groups, indicating that both surgical approaches offer comparable safety with respect to infection control. From a technical surgical perspective, TAPP involves incision of the peritoneum to access the abdominal cavity, which theoretically carries a potential risk of intra-abdominal infection and mesh-related infection. In contrast, TEP is performed entirely within the extraperitoneal space, avoiding entry into the abdominal cavity and thereby theoretically reducing the likelihood of intra-abdominal infection. However, the actual results of this study revealed no statistically significant difference in infection rates between the two groups, which may be explained by several factors. First, all procedures in this study were conducted under strict aseptic conditions, and lightweight large-pore meshes of unified brands (Bard 3DMax® or Covidien Parietex™) were used, both of which are designed to minimize bacterial adhesion due to their structural properties. Second, patients in both groups received standardized perioperative antibiotic prophylaxis, which, although not explicitly stated in the methods, reflects routine clinical practice that helps reduce baseline infection risk. Third, infection is a relatively rare event; hence, intergroup differences may not have reached statistical significance due to the limited sample size. In clinical settings, regardless of whether TAPP or TEP is performed, it remains essential to strictly adhere to aseptic principles, use antibiotics judiciously, and select mesh materials with high biocompatibility to further reduce postoperative infection risk. Regarding surgical parameters, the operative time in the TAPP group was significantly longer than that in the TEP group (68.72 ± 10.66 min *vs.* 58.62 ± 11.84 min, $p < 0.001$), likely because TAPP requires additional peritoneal incision and suturing procedures [33]. The higher surgical cost observed in the TEP group may be associated with the need for specialized instruments such as balloon dilators, consistent with the findings of Aslam *et al.* [34], who also reported that TEP entails a higher average procedural cost. Despite these differences, there were no significant intergroup variations in intraoperative blood loss, postoperative hospital stay, or postoperative complications, including seroma, infection, and chronic pain, indicating that both procedures possess comparable overall safety profiles. Given the demonstrated early advantage of TEP in preserving nerve integrity and erectile function, this approach may represent a more suitable option for young male patients who are particularly concerned about reproductive function, such as those of childbearing age or with high baseline erectile function. Nevertheless, TAPP remains a valid alternative for patients with less stringent time constraints or limited financial resources, particularly because of its wider technical adoption and relatively gentler learning curve [35].

In this single-center retrospective study, we systematically compared the long-term effects of TAPP and TEP on pelvic floor nerve function and erectile outcomes in male patients with inguinal hernia. Importantly, all patients who met the inclusion criteria during the study period were enrolled, which effectively reduces the likelihood of selection bias and enhances the overall representativeness of the findings. The key results of this study can be summarized as follows: TEP demonstrated superior protection of pelvic floor nerve function and erectile function during the early postoperative period (6 months and 1 year), but the differences between the two surgical approaches gradually diminished over time, indicating that the early advantages of TEP tend to narrow with long-term follow-up. In addition, hemodynamic changes in the spermatic vein may serve as a potential mechanism influencing postoperative erectile function, providing a physiological basis for the observed outcomes. Therefore, when selecting the surgical approach, it is essential to comprehensively consider multiple factors, including operation time, economic cost, and the patient's functional protection needs, in order to achieve a more balanced and individualized treatment strategy.

This study has several limitations: (a) The single-center retrospective design may introduce selection bias, such as the non-random allocation of surgical approaches; (b) The small sample size (85 cases per group) may reduce the statistical power for some secondary indicators, such as testicular volume; (c) The follow-up duration was limited to two years, which does not allow assessment of long-term outcomes, such as five-year changes in nerve function and erectile function; (d) Serum testosterone and other hormone levels were not measured, preventing direct validation of the causal relationship between spermatic blood flow and erectile function; (e) All surgeries were performed by the same experienced team ($\geq$100 laparoscopic hernia repairs), which minimized technical variability but may limit generalizability to centers with less experienced surgeons, since TEP requires proficiency in extraperitoneal space dissection. Future studies should involve multicenter, large-sample prospective designs and integrate hormone testing and neuroelectrophysiological indicators to further clarify the long-term functional impacts and mechanisms of the two approaches.

5. Conclusions

The TEP approach demonstrates superior early postoperative protection of pelvic floor nerve function and erectile function compared with TAPP, which may be attributed to its smaller extent of spermatic cord dissection and reduced hemodynamic interference. However, the long-term functional differences between the two approaches gradually diminish over time, and both exhibit comparable safety profiles. Clinically, TEP is recommended for young male patients, such as reproductive-aged individuals with baseline normal erectile function, because of its early protective effects on nerve and erectile function. In contrast, TAPP may be more appropriate for patients with complex hernias, such as those accompanied by abdominal adhesions, or for patients with limited economic resources, considering its shorter learning curve and lower equipment costs.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

GFY, YW, HBD—designed the study and carried them out; prepared the manuscript for publication and reviewed the draft of the manuscript. GFY, YW, HBD, JMJ, WX, YSY, LH—supervised the data collection. GFY, YW, HBD, JMJ, WX, YSY, LH, YSY, LH—analyzed the data. GFY, YW, HBD, JMJ, YSY, LH—interpreted the data. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Suzhou Hospital of Integrated Traditional Chinese and Western Medicine (Approval no. 2025029). Written informed consent was obtained from a legally authorized representatives for anonymized patient information to be published in this article.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This work was supported by Institutional Project of Suzhou Hospital of Integrated Traditional Chinese and Western Medicine, Jiangsu Province (Grant No. Yj2014018).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Abebe MS, Tareke AA, Alem A, Debebe W, Beyene A. Worldwide magnitude of inguinal hernia: systematic review and meta-analysis of population-based studies. SAGE Open Medicine. 2022; 10: 20503121221139150.

[2] Haladu N, Alabi A, Brazzelli M, Imamura M, Ahmed I, Ramsay G, *et al*. Open versus laparoscopic repair of inguinal hernia: an overview of systematic reviews of randomised controlled trials. Surgical Endoscopy. 2022; 36: 4685–4700.

[3] McBee PJ, Walters RW, Fitzgibbons RJ. Current status of inguinal hernia management: a review. International Journal of Abdominal Wall and Hernia Surgery. 2022; 5: 159–164.

[4] Andresen K, Rosenberg J. Transabdominal pre-peritoneal (TAPP) versus totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair. Cochrane Database of Systematic Reviews. 2024; 7: CD004703.

[5] Shenoy KG. Enhanced view totally extraperitoneal approach: a better alternative to transabdominal preperitoneal approach for irreducible inguinoscrotal and giant inguinal hernias! Journal of Minimal Access Surgery. 2025; 21: 97–99.

[6] Mubark M, Mohammed HA, Mohamed MA, A MY. Transabdominal pre-peritoneal (TAPP) versus totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair. SVU-International Journal of Medical Sciences. 2023; 6: 676–683.

[7] Aykanat IC, Er S, Senel C, Comcali B, Aslan Y, Balci M, *et al*. Comparison of the impact of open and laparoscopic inguinal hernia operations on male sexual function and pain during sexual activity. Andrologia. 2022; 54: e14254.

[8] Cantay H, Ezer M, Binnetoglu K, Uslu M, Anuk T, Bayram H. What is the effect of inguinal hernia operations on sexual functions? Cureus. 2022; 14: e24137.

[9] Supsamutchai C, Wattanapreechanon P, Saengsri S, Wilasrusmee C, Poprom N. Sexual dysfunction between laparoscopic and open inguinal hernia repair: a systematic review and meta-analysis. Langenbeck's Archives of Surgery. 2023; 408: 277.

[10] Nethaji K, Kumari R, Jaiswal P, Jha PK, Ranjan R, Akela A. Comparison of extended total extraperitoneal (E-TEP) repair and trans-abdominal pre-peritoneal (TAPP) mesh repair in inguinal hernia repair. Cureus. 2023; 15: e39420.

[11] Raza A, Fayyaz MU, Malik MN. Comparison of total extra peritoneal and transabdominal pre-peritoneal inguinal hernia repair. Indus Journal of Bioscience Research. 2025; 3: 177–180.

[12] Şenol Z, Güleç B, Gülşen T, Kızıltoprak N. Our experiences and comparison of total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) techniques in laparoscopic inguinal herni repair. Journal of Cukurova Anesthesia and Surgical Sciences. 2022; 5: 433–436.

[13] Stabilini C, van Veenendaal N, Aasvang E, Agresta F, Aufenacker T, Berrevoet F, *et al*. Update of the international HerniaSurge guidelines for groin hernia management. BJS Open. 2023; 7: zrad080.

[14] Vallejo-Medina P, Saffon JP, Álvarez-Muelas A. Colombian clinical validation of the international index of erectile function (IIEF-5). Sexual Medicine. 2022; 10: 100461.

[15] Hardt S, Bergau S, Jacques A, Tampin B. Short- and long-term test-retest reliability of the English version of the 7-item DN4 questionnaire—a screening tool for neuropathic pain. Scandinavian Journal of Pain. 2023; 23: 494–500.

[16] Lucy AT, Mustian MN. Minimally invasive inguinal hernia repair: TAPP, TEP, and eTEP approaches. Illustrative Handbook of General Surgery. 2024; 36: 409–421.

[17] Jayalal J, Raj SEK, Baghavath P, Venkatesh K. Transabdominal preperitoneal repair *vs* total extraperitoneal repair for inguinal hernia: a meta-analysis. European Journal of Cardiovascular Medicine. 2024; 14: 570–576.

[18] Dokania MK, Ankur A, Agarwal N, Jain A, Anshu A, Singh RAK. Comparison of perioperative complication rates of total extraperitoneal and transabdominal preperitoneal repairs in primary inguinal hernia. Journal of West African College of Surgeons. 2024; 14: 69–75.

[19] Damous SHB, Damous LL, Borges VA, Fontella AK, Miranda JDS, Koike MK, *et al*. Bilateral inguinal hernia repair and male fertility: a randomized clinical trial comparing Lichtenstein versus laparoscopic transabdominal preperitoneal (TAPP) technique. Surgical Endoscopy. 2023; 37: 9263–9274.

[20] Hu Y, Zhang Z, Wang F, Qiu X. Comparison of modified tumescent and conventional laparoscopic transabdominal preperitoneal inguinal hernia repair: a retrospective clinical study. Journal of International Medical Research. 2024; 52: 03000605231220789.

[21] Kshirsagar V, Bendre M, Chavan S, Pande B. Inguinal hernia repair: comparative study between TEP versus extended totally extraperitoneal. Annals of African Medicine. 2025; 24: 57–60.

[22] Ortenzi M, Rapoport Ferman J, Antolin A, Bar O, Zohar M, Perry O, *et al*. A novel high accuracy model for automatic surgical workflow recognition using artificial intelligence in laparoscopic totally extraperitoneal inguinal hernia repair (TEP). Surgical Endoscopy. 2023; 37: 8818–8828.

[23] Kolli VS, Kumar K, Hajibandeh S, Hajibandeh S. Balloon dissection versus telescopic dissection during laparoscopic totally extraperitoneal (TEP) inguinal hernia repair: a systematic review, meta-analysis, and trial sequential analysis. Hernia. 2023; 27: 527–539.

[24] Vuckovic Z, Bojovic M. Neuropathic causes of groin pain in athletes: understanding nerve involvement. International Orthopaedics. 2025; 49: 845–852.

[25] Manolakos K, Zygogiannis K, Manolakos O, Mousa C, Papadimitriou G, Fotoniatas I. Anatomical variations of ilioinguinal nerve: a systematic review of the literature. Surgical Neurology International. 2024; 15: 225.

[26] Trad KS, Thiru SS, Stirrat TP, Marino PJ, Prevou ER, Greer ME, *et al*. Balloon dissection for robotic totally extraperitoneal (rTEP) inguinal herniorrhaphy: description of a modified technique and report on 97 consecutive patients. Hernia. 2025; 29: 115.

[27] Ozel Y, Ergenc M, Emir S, Kara YB. A retrospective analysis of laparoscopic totally extraperitoneal (TEP) and transabdominal preperitoneal

(TAPP) techniques in the treatment of unilateral inguinal hernias. Annali Italiani di Chirurgia. 2025; 96: 703–712.

[28] Iqbal T, Bakar MQA, ul Malook MS, Arbi FM, Jatt AU. Comparison of laparoscopic total extraperitoneal (TEP) repair and transabdominal peritoneal (TAPP) repair of inguinal hernia. Journal of Islamabad Medical & Dental College. 2024; 13: 596–603.

[29] Jaiswal RK, Pandey NK, Tolat A, Kalwaniya DS, Gupta AK, Naga Rohith V, *et al*. A prospective comparative study of laparoscopic totally extraperitoneal (TEP) and laparoscopic transabdominal preperitoneal (TAPP) inguinal hernial repair. Cureus. 2023; 15: e42209.

[30] Trehan M, Garg S, Singh J, Singla S, Garg R, Rakesh D, *et al*. Laparoscopic inguinal hernia repair—transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) approach: a comparative analysis. Medical Journal of Dr. DY Patil Vidyapeeth. 2023; 16: S5–S9.

[31] Paparao S, Reddy KH. A study of laparoscopic totally extraperitoneal mesh repair of inguinal hernia and trans abdominal pre-peritoneal mesh repair of inguinal hernia. Research Journal of Medical Sciences. 2025; 19: 210–213.

[32] Adhikari D, Bhattarai A, Parajuli B, Mehta AK, Yadav DK, Poudel S. Transabdominal pre-peritoneal versus totally extraperitoneal laparoscopic techniques for inguinal hernia repair in Eastern Nepal. Journal of Nobel Medical College. 2023; 12: 60–65.

[33] Posthuma JJ, Sandkuyl R, Sloothaak DA, Ottenhof A, van der Bilt JDW, Gooszen JAH, *et al*. Transinguinal preperitoneal (TIPP) *vs* endoscopic total extraperitoneal (TEP) procedure in unilateral inguinal hernia repair: a randomized controlled trial. Hernia. 2023; 27: 119–125.

[34] Aslam M, Alam J, Singh M, Kujur M. Totally extraperitoneal versus transabdominal preperitoneal approach. Saudi Journal of Laparoscopy. 2022; 7: 12–17.

[35] Iossa A, Traumueller Tamagnini G, De Angelis F, Micalizzi A, Lelli G, Cavallaro G. TEP or TAPP: who, when, and how? Frontiers in Surgery. 2024; 11: 1352196.

How to cite this article: Guofeng Yu, Yan Wang, Haibo Deng, Jianming Ju, Wei Xu, Yousheng Yang, Lei Huang. Comparative effects of laparoscopic TAPP and TEP hernia repair on pelvic floor nerve and erectile function in male patients: a retrospective study. Journal of Men's Health. 2026; 22(1): 115-124. doi: 10.22514/jomh.2026.010.