

## Original Research Article

# Early and late outcomes of TEP and Lichtenstein repair for recurrent inguinal hernia repair in men: a comparative study

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## ABSTRACT

**Background:** Repair operation for recurrent inguinal hernia is a more exigent than the primary inguinal hernia. Open hernia repair associated with lower recurrence and fewer complications while the Laparoscopic repair associated with less pain postoperatively, early recovery time with subsequent earlier return to activity and better results regarding the wound.

**Methods:** From November 2015 to March 2019, a total of 86 patients were randomized. 42 patients were recruited to total extra-peritoneal repair (TEP) group and 44 patients for Lichtenstein group. Overall, 86 were operated in general surgery department, Menoufia University hospitals.

**Results:** The mean age of patients was  $41.3 \pm 14.4$ , range from (25-55 years). One conversion occurred in the TEP group to Lichtenstein. Operative time was significantly low in TEP group (82.7 min) compared to Lichtenstein group (108 min). Hospital stay was significantly less in TEP group (1 day) compared to Lichtenstein group (1.8 days). Patients undergoing Lichtenstein repair have significant earlier oral intake than TEP group (3.7 vs. 6.6 hours). 12 cases developed seroma in Lichtenstein group with significant p value (0.001). This study showed less immediate and early VAS score in TEP group (2.3) versus high VAS score in Lichtenstein group (5.9) with highly significant p value (0.0001).

**Conclusions:** TEP offer excellent results than LR for treatment of unilateral or bilateral recurrent inguinal hernia with lower morbidity and less incidence of post-operative pain with subsequent earlier return to normal activities.

**Keywords:** Laparoscopy, Lichtenstein repair, Recurrent hernia

## INTRODUCTION

Inguinal hernias are common, and its surgical repair remains one of the most common procedures in surgery. In 1889, Bassini has described the original hernia repair; later on, numerous refinements for hernia repair developed with the main idea to decrease the recurrence rate.<sup>1</sup>

The gold standard technique for inguinal hernia repair is Lichtenstein repair since its description in 1984, being a pure prosthetic, tension free repair, which achieved consistently low recurrence rates in long term outcomes analysis.<sup>1</sup>

After that when the laparoscopic approach began to show its advantages, it started to be used in the resolution of inguinal hernias, especially in bilateral ones.<sup>2</sup> European nationwide registers report 15% recurrence rate occurred in all operations for inguinal hernia repair.<sup>3</sup>

Repair operation for recurrent inguinal hernia is a more exigent than the primary inguinal hernia as the surgeon has to deal with scarred and fibrotic tissue and a possible change in the anatomical position of the structures in the groin. Now a days, the consensus to use prosthetic meshes for the repair of recurrent inguinal hernia is widespread. Nevertheless, as in primary hernia repair, the

technique, e.g. endoscopic versus open repair is still under discussion.<sup>4</sup>

Laparoscopic techniques have become more and more popular over the last twenty years for primary as well as for recurrent hernia. Total extra-peritoneal (TEP) and trans-abdominal pre-peritoneal inguinal hernia repair (TAPP) are nowadays the standard endoscopic techniques. These operative methods seem to be advantageous in the setting of recurrent inguinal hernia repair especially if the primary intervention was performed in an open so-called ventrally approach.<sup>5</sup>

TAPP and TEP are safe, feasible and can be performed in recurrent inguinal hernia with a lower incidence of postoperative complications.<sup>6</sup> The aim of the study was to compare early and late outcomes after TEP repair versus Lichtenstein repair (LR) for recurrent inguinal hernia in men.

## METHODS

This was a prospective randomized and purposive study included 86 patients of recurrent non-complicated inguinal hernia. From November 2015 to March 2019, a total of 86 patients were randomized. 42 patients were recruited to TEP group and 44 patients for Lichtenstein group. Overall, 86 patients underwent operation in general surgery department, Menoufia university hospitals. One conversion occurred in the TEP group to Lichtenstein.

### Inclusion criteria

Male patients with recurrent inguinal hernia either with or without mesh repair were included.

### Exclusion criteria

Female patients, patients have complicated inguinal hernia and patients with chronic diseases proved to be unfit for surgery were excluded.

### Pre-operatively

Complete history was taken, and complete clinical examination was performed. Evaluation of recurrence was unilateral, bilateral or unilateral with a new developed hernia.

Informed consent was taken from all patients with consent for orchiectomy when needed. 1 gram amoxicillin, clavulanic acid was given preoperatively.

### Operative procedures

All of the patients were advised to empty their urinary bladder just before surgery. A standard three-port TEP repair was done with all the ports in the midline. Authors did not use any balloon dissector and created the pre-

peritoneal space by blunt dissection with telescope only. Lichtenstein repair was done in the standard fashion.

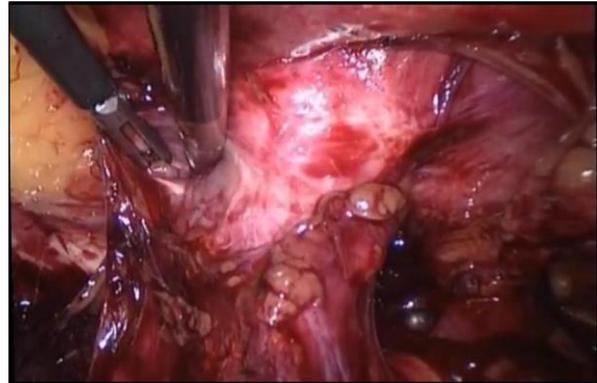


Figure 1: Dissection of the spermatic cord.

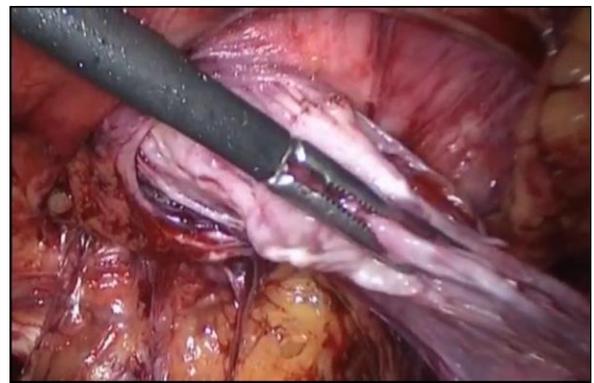


Figure 2: Dissection of the sac.



Figure 3: Identification of the hernia defect.

### Postoperatively

Paracetamol 1 gm. vial every 6 hours at the 1st day post operatively and NSAID (diclophenac sodium) 75 mg IM for 2 days then orally 50 mg for 4 days.

Amoxicillin, clavulanic acid 1 gm were given orally for 5 days. Proton pump inhibitors were given for 5 days.

**Follow-up**

Patients were followed up at 1 week, 6 weeks, 3 months, 6 months, and then yearly after discharge.

Various parameters such as operative time, complications (cord edema, seroma, or hematoma), postoperative pain, hospital stay, time to return to daily activities, and recurrence rates were evaluated.



**Figure 4: Insertion of the mesh.**

For Lichtenstein repair, the operative time was defined as the time taken from incising the skin to the time of suturing/stapling of skin, whereas for TEP, it was defined as the time taken from insertion of ports up to the closure of skin defects.

Postoperative pain was measured by visual analog scale (VAS). The pain scores were obtained at 1, 2, 4, 6, 8, 12, and 24 h postoperatively. Wound was inspected for any signs of infection. The cosmetic effects were determined by measuring the total scar size at 60 days postoperatively.

**Statistical analysis**

All data were statistically analyzed using Statistical Package of Social Science (SPSS). Quantitative data were expressed as a mean±standard deviation (SD) while

qualitative data were expressed as frequency and percentages. Qualitative variables were compared using a chi-square test while Quantitative continuous data were compared using the Mann-Whitney test. The area under the ROC curve for each scale was used to compare the accuracy of the studied models.

A p value less than 0.05 was considered statistically significant. A uni-variant analysis with non-linear correlation (cubic spline functions) was used to evaluate the shape of the relationship between the continuous variables and outcome. We use Chi-square test for categorical variable, while one-way ANOVA test for quantitative variables.

**RESULTS**

The mean age of patients was 41.3±14.4, range from (25-55 years) with no significant difference between two groups. Majority of cases were unilateral hernia 88.30% and indirect hernia 79.1% with no significant correlation between groups regarding type and site of hernia (p value 0.34, 0.35 respectively) (Table 1). Presence of Co-morbidities as DM, HTN, COPD did not differ between two groups as authors undergo group to group matching to decline the variability between groups and minimize allocation and confounding bias (Table 1).

Regarding hospital outcomes; the mean operative time was significantly low in TEP group (82.7 min) compared to Lichtenstein group (108 min) with significant p value (0.001). The mean hospital stay was less in TEP group (1 day) compared to Lichtenstein group (1.8 days) with significant p value (0.0001) (Table 2).

Interestingly, neither spermatic cord injury nor orchiectomy was noted in TEP group compared to Lichtenstein group (6 cases with spermatic cord injury and 1 case undergo orchiectomy) with significant p value (0.015). Postoperative urine retention was in-significantly low in TEP group than Lichtenstein group (2 patients vs. 6 patients) with p value 0.14 (Table 2).

**Table 1: Socio-demographic data and comorbidities of both groups.**

Characters	All participants		TEP repair		Lichtenstein repair		X <sup>2</sup> test	P value
	Number	%	Number	%	Number	%		
Age (years)	41.3±14.4		42.1±14.7		40.5±14.2			0.617
Site							0.56	0.34
Unilateral	76	88.30	36	85.70	40	90.90		
Bilateral	10	11.70	6	14.30	4	9.10		
Type							0.411	0.35
Direct hernia	18	20.90	10	23.80	8	18		
Indirect hernia	68	79.10	32	76.20	36	82		
DM	11	12.70	5	11.90	6	13.60	0.29	0.53
HTN	7	8.00	3	7	4	9	0.1	0.53
COPD	3	3.40	1	2.30	2	4.50	0.31	0.518

**Table 2: Hospital outcome and complication in both groups.**

Characters	All participants		TEP repair		Lichtenstein repair		X <sup>2</sup> test	P value
	Number	%	Number	%	Number	%		
Operative time (mins)	95.6±25.6		82.7±18.4		108±25.6			0.0001
Conversion to open	1	1	1	2.30	0	0	1	0.48
Spermatic cord injury	6	6.90	0	0	6	13.60	6.1	0.015
Orchidectomy	1	1.15	0	0	1	2.3	2.9	0.12
Cardiac arrhythmia	1	1	1	2.30	0	0	1	0.48
Start oral intake (hours)	5.1± 2.4		6.6± 2.4		3.7± 1.4			0.0001
Ileus	3	3.40	2	4.70	1	2.20	0.39	0.48
Hospital stay (days)	1.4± .67		1± .36		1.8± .64			0.0001
Urine retention	8	9.30	2	4.70	6	13.60	2	0.14

**Table 3: Results of early follow up in both groups.**

Characters	All participants		TEP repair		Lichtenstein repair		X <sup>2</sup> test	P value
	Number	%	Number	%	Number	%		
Wound ecchymosis	17	19.70	7	16.60	10	22.70	0.49	0.33
Seroma	13	15	1	2.30	12	27.20	10.3	0.01
Wound infection	4	4.60	1	2.30	3	6.80	0.95	0.32
Scrotal edema	13	15	1	2.30	12	27.20	10.3	0.01
Immediate VAS score	4.5±2.2		2.6±1.2		6.3±1.2			0.0001
Early VAS	4.1±2.1		2.3±1.2		5.9±1.2			0.0001

**Table 4: Results of late follow up in both groups.**

Characters	All participants		TEP		Lichtenstein		X <sup>2</sup> test	P value
	Number	%	Number	%	Number	%		
Mild chronic pain	5	5.80	1	2.30	4	9	1.7	0.19
Moderate chronic pain	3	3.40	1	2.30	2	4.50	0.29	0.51
Sever chronic pain	0	0	0	0	0	0		
Hypothesia	16	18.60	1	2.30	15	34	14.2	0.001
Recurrence	7	8	5	11.90	2	4.50	1.5	0.19
Return to daily activities (days)	2.8± 1.6		1.3± .6		4.2± .6			0.0001
Patient satisfaction	7.9± 1.1		7.2± 1.2		8.5± .7			0.0001

Regarding postoperative complication, seroma and scrotal edema were significantly less in TEP group (1 case with seroma and scrotal edema) versus 12 cases developed seroma in Lichtenstein group with significant p value (0.001) (Table 3).

This study showed less immediate and early VAS score in TEP group (2.3) versus high VAS score in Lichtenstein group (5.9) with highly significant p value (0.0001). (Table 3).

Authors classified postoperative chronic pain into three categories; mild, moderate and severe. No significant difference between two groups in postoperative chronic pain, while hypoesthesia was significantly high in Lichtenstein group than TEP group (Table 4).

At a median of 1.5(0.9-2.1) years after operation, 86/86 (100%) patients completed the follow-up.

The cumulative recurrence rate at 2 years was 11.9% (n=5) in the TEP group and 4.9% (n=2) in the Lichtenstein group (p=0.19) (Table 4).

Patients undergo TEP repair returns to work earlier than open repair with high patient satisfaction in TEP group with significant p value (0.0001).

## DISCUSSION

The ideal method of hernia repair should be simple to perform, easy to learn, have a low rate of complications and recurrence, cause minimal discomfort to the patient during the postoperative period and require a short period of convalescence.<sup>7</sup>

The proportion of laparoscopic surgery of inguinal hernia has been increasing for the past years. The length of hospital stay and the rate of combined bowel resection have decreased.<sup>8</sup>

As the spectrum of laparoscopic procedures started to expand after the first laparoscopic cholecystectomy, the inclusion of laparoscopic hernia repair was not very far. The use of laparoscopic techniques for the repair of groin hernias incited a heated debate. The proponents of this technique emphasize the benefits of excellent visualization, minimal pain, less postoperative analgesia, rapid return to work, improved cosmesis, decreased wound infections, and potential cost savings secondary to decreased work loss.<sup>9</sup>

TEP repair has a potential advantage over TAPP in that the peritoneal cavity is not breached.<sup>10</sup>

In this study, the mean age of patients was 41.3±14.4, range from (25-55 years). The mean operative time was significantly low in TEP group (82.7 min) compared to Lichtenstein group (108 min) with significant p value (0.001).

This is similar to Krishna et al mean operating time for repair of unilateral inguinal hernia was 54.8±14 minutes, and, for bilateral hernia repair, it was 77.9±26.2 minutes.<sup>10</sup>

This is not similar to Gass et al Operative time was shorter in the open group (54.2 vs. 62.9 min) and much faster compared to TAPP as well as TEP group. An explanation might be the learning curve.<sup>11</sup>

This study showed less immediate and early VAS score in TEP group (2.3) versus high VAS score in Lichtenstein group (5.9) with highly significant p value (0.0001).

Authors classified postoperative chronic pain into three categories; mild, moderate and severe. No significant difference between two groups in postoperative chronic pain, while hypoesthesia was significantly high in Lichtenstein group than TEP group.

Lau et al showed that, pain scores following laparoscopic repair are much less compared with open repair, with VAS scores of <2 on follow-up. The incidence of chronic groin pain in this study was 1.4%.<sup>12</sup>

This is similar to Krishna et al particularly chronic groin pain, is one of the least appreciated but most common complications of inguinal hernia repair. Laparoscopic repair has the advantage of lower pain scores and earlier return to activity when compared with open repair.<sup>10</sup>

TEP has an advantage over Lichtenstein regarding the postoperative pain, because TEP is a posterior hernioplasty, the surgeon is unlikely to dissect regional sensory nerves. As a note, surgeons must be careful of the pain triangle during TEP. Also, staplers and sutures applied for mesh fixation in TEP can barely incorporate the nerves. Furthermore, because no primary repair to the hernia defect is applied through muscles and tendons, the incidence of somatic pain also decreases. All these factors also decrease the rate of early postoperative pain.<sup>13</sup> However, authors could not find a statistically significant difference between postoperative chronic pain with open and laparoscopic inguinal hernioplasty.

Recurrence is a challenging aspect of inguinal hernia repair and it remains an unsolved problem, despite technical and socio-economic improvements. The recurrence rate for inguinal hernia ranges from 1% to 10% depending on surgical procedure, hernia type, surgeons' experience, and follow-up period.<sup>14</sup>

In this study, at a median of 1.5 (0.9-2.1) years after operation, 86/86 (100%) patients completed the follow-up. The cumulative recurrence rate at 2 years was 11.9% (n=5) in the TEP group and 4.9% (n=2) in the Lichtenstein group (p=0.19). There was a wide variability in the incidence of recurrences between different surgeons and hospitals for the TEP method.

To date, identified risk factors for recurrent inguinal hernia include controllable factors such as technical surgical methods, methods for anesthesia, mesh-fixation techniques, surgeon experience, and non-controllable patient-related risk factors such as sex, hernia type, connective tissue composition and family disposition.<sup>14</sup>

In 2012, an updated European Hernia Society (EHS) meta-analysis of 27 randomized controlled trials reported significantly higher recurrence rate for TEP as compared to Lichtenstein.<sup>15</sup>

However, an updated version of the guidelines published in 2014, excluded one randomized controlled trial (which had shown an erroneously high recurrence rate for TEP [33%]) from the 2012 meta-analysis and found no difference in the recurrence rates.<sup>14</sup>

The reported incidence of recurrence in TEP has been around 1% to 2% and, for TAPP, around 0% to 3%. Recent comparative studies have reported a recurrence rate of 0.5% to 0.7% for TAPP and 0.3% to 0.4% for TEP.<sup>16</sup>

In this study interestingly, neither Spermatic cord injury nor orchiectomy were noted in TEP group compared to Lichtenstein group (6 cases with spermatic cord injury and 1 case undergo orchiectomy) with significant p value (0.015).

Postoperative urine retention was in-significantly low in TEP group than Lichtenstein group (2 patients vs. 6 patients) with p value 0.14. Regarding Postoperative complication, Seroma and scrotal edema were significantly less in TEP group (1 case with seroma and scrotal edema) versus 12 cases developed seroma Lichtenstein group with significant p value (0.001)

TEP provides all the benefits of minimal access surgery. Although the overall intraoperative or postoperative complication rates were similar in both the groups, some complications were unique to each group.

As expected, peritoneal breach and surgical emphysema were only encountered in the TEP group, whereas wound infection, testicular swelling, and urinary retention were only seen in the Lichtenstein group.<sup>17</sup>

Pisanu et al show, fewer patients with ischemic orchitis with TEP compared to the LR (0 vs. 3%), also the operative time for TEP was lower than LR and these results agreed with this study.<sup>6</sup>

## CONCLUSION

TEP is an excellent laparoscopic repair of recurrent inguinal hernia with acceptable complications over long-term. TEP is superior to Lichtenstein and should be preferred as it results in less postoperative pain, better cosmesis, early resumption of routine activities, and less wound infection. The recurrence rates are similar in both procedures.

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