

## Original Research Article

# Comparative study between laparoscopic trans-abdominal preperitoneal and open mesh hernioplasty in repair of non-complicated inguinal hernia

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**Received:** 04 November 2019

**Revised:** 15 December 2019

**Accepted:** 16 December 2019

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### ABSTRACT

**Background:** Inguinal mesh hernioplasty is one of the common procedures performed all over the world. It can be done either through open or laparoscopic techniques. The aim of this study was to compare the outcomes of Lichtenstein tension free hernioplasty versus laparoscopic transabdominal pre-peritoneal (TAPP) mesh repair considering, duration of the surgery, hospital stay, and duration to resume normal activity, degree of postoperative pain, wound infection, recurrence and complications.

**Methods:** Adult patients presented to the general surgical OPD, with the diagnosis of inguinal hernia underwent either Lichtenstein repair or laparoscopic repair by TAPP.

**Results:** Patients in Group A (open-repair) had significantly greater level of local pain during rest and during routine activities than those within Group B (laparoscopic group) during the postoperative period assessed on the visual-analogue scale. Mean operative time for open hernia repair was 43.7 minutes and for laparoscopic hernia repair was 59.03 minutes and the difference were statistically significant ( $p=0.0001$ ). The mean duration of hospital stay for open hernia repair was 2.16 days and that for laparoscopic hernia repair was 1.08 days with a ( $p=0.00001$ ) which was statistically significant. The time to resume routine activities was much shorter among Group B patients than patients in Group A. Only one recurrence (3.3%) was seen in Group B after 6 months follow up.

**Conclusions:** It is concluded that laparoscopic TAPP repair of inguinal hernia in adults is safe and preferred operation as compared to open inguinal hernia repair.

**Keywords:** Laparoscopic transabdominal pre-peritoneal approach hernioplasty, Lichtenstein repair, Polypropylene mesh

### INTRODUCTION

Hernias of the abdominal wall comprise an important health problem and often constitute a surgical dilemma even for the most skilled surgeons. Inguinal hernia affects both men and women but it is much more common in men who constitute over 90% of operated patients.<sup>1</sup> Considering both operated and non-operated inguinal hernias, the lifetime prevalence rate is 47% for men up to

and including the age of 75.<sup>2</sup> The lifetime risk of undergoing such a repair is 27% for men and 3% for women.<sup>3</sup> High incidence of the disease makes inguinal hernia repair the most frequent procedure in general surgery, accounting for 10-15% of all operations.<sup>4,5</sup> Laparoscopic inguinal hernia repair is a minimal access surgical procedure. Laparoscopic repair is usually undertaken by two methods one is transabdominal preperitoneal (TAPP) and other one is TEP repair, the main

variation between these two techniques is the sequence of gaining access to peritoneal space. Laparoscopic repair is also associated with an approximately 0.3% risk of visceral or vascular injury.<sup>6</sup>

Arregui and Doin described the trans-abdominal preperitoneal (TAPP) hernioplasty. In this method peritoneum is cut to enter into the avascular preperitoneal space which is dissected enough to place a large mesh over the hernial orifices. After mesh is fixed, the peritoneum is either sutured back or stapled. TAPP approach has the advantage of identifying other missed hernias like additional direct or femoral hernia as well as identifying any hernia in the contralateral groin. Studies have reported around 15% recurrence rate in pre-mesh era. Also pain in postoperative period and disability was frequent.<sup>7-11</sup> Although since the introduction of tension-free surgical repair with the use of polypropylene mesh, recurrence rate was reported to be about <5%.<sup>2,3</sup>

Since the introduction of laparoscopic approach to mesh repair, different studies have reported much lower recurrence rates. Laparoscopic technique is also associated with substantially less and earlier return to activities than the open-repair technique.<sup>10,12,13</sup> The laparoscopic technique does require general anesthesia, and is sometimes associated with serious intraoperative complications than is open repair.<sup>14-16</sup>

The objective of this study was to compare open and laparoscopic hernia repair in terms of safety, operative time, complications, recurrence, post-operative pain and hospital stay.

## **METHODS**

This was a prospective comparative study. Total of 60 patients were enrolled in this study which was conducted in the department of general surgery, Tanta university Hospital, during the period of Mars 2018 to May 2019.

Of them 30 patients were subjected to open Lichtenstein repair of hernia (Group A) and the other 30 patients were subjected to laparoscopic TAPP repair of hernia (Group B). In Group A, out of 30 patients 24 unilateral hernia and 6 bilateral hernia repaired with open Lichtenstein approach and in Group B, out of 30 patients 22 unilateral hernia and 8 bilateral hernia repaired with laparoscopic TAPP approach. Post-operatively patients were observed for any complications and were followed up in OPD after discharge. Thorough examination was done on follow-up for 6 months to detect any complication. Visual analogue scale was used for assessment of severity of pain.

### ***Inclusion criteria***

Patients admitted to Hospital, diagnosed with inguinal hernia and undergoing open Lichtenstein repair and laparoscopic TAPP repair as an elective surgery were included in this study.

### ***Exclusion criteria***

Emergency surgery for complicated hernias, those with psychological problems, patients with history of major abdominal surgery, pregnant and those who are not candidate for general anesthesia were excluded in this study.

In Group A, 30 patients were operated under spinal anesthesia and in Group B, 30 patients were operated under general anesthesia. All the patients in group B, those operated under laparoscopic TAPP hernia repair were catheterized prior to surgery.

### ***Steps of surgery for open hernia repair***

IV antibiotic (1-gram ceftriaxone) was given to all patients before incision, which was continued postoperatively. An inguinal incision was used in all cases, which extend from the mid inguinal point to the ipsilateral pubic tubercle above the inguinal ligament and one finger breadth below the internal inguinal ring. Dissection was continued through the subcutaneous tissues and Scarpa's fascia. The external oblique fascia and aponeurosis were incised through the superficial inguinal ring to expose the inguinal canal. The spermatic cord was mobilized at the pubic tubercle by a combination of blunt and sharp dissection. The cremasteric muscle of the mobilized spermatic cord was separated parallel to its fibers from the underlying cord structures. In case of indirect hernia; the sac was separated from adjacent cord structures and dissected to the level of the internal inguinal ring. The sac was opened and examined for visceral contents. The sac was then transfixed at the base with vicryl 2-0 RB. Remaining sac was incised and displaced into the peritoneal cavity. In case of direct hernia; sac was not opened and reduced into peritoneal cavity. polypropylene mesh was placed in the space below the external oblique aponeurosis and internal oblique muscle. Mesh was fixed with prolene 3-0 RB with inguinal ligament inferiorly, lacunar ligament superiorly and posteriorly with the internal oblique muscle. External oblique aponeurosis was sutured with vicryl 2-0 RB and wound was closed in layers. Skin is sutured with prolene 2-0 RC.

### ***Steps of surgery for laparoscopic inguinal hernia repair***

IV antibiotic (1-gram ceftriaxone) was given to all patients before incision, which was continued postoperatively. Painting and draping were done. Pneumo peritoneum was created using Veress needle inserted at Palmers point and intra- abdominal pressure was adjusted to 13 mmHg. One 11 mm port was inserted in the supra umbilical region in the mid line for the 30-degree scope. Other two ports (one 11 mm and one 5 mm port) were placed at the same transverse plane of the supra umbilical port 5-7 cm away. Abdominal exploration and diagnostic laparoscopy was done first then a transverse peritoneal incision was done 2 cm above the internal ring to create a

peritoneal flap, starting at the inner edge of the anterior superior iliac spine to the outer edge of the homo-lateral medial umbilical ligament. Dissection continued medially to the symphysis pubis to visualize the space of Retzius identifying the shiny white Cooper's ligament. The hernial sac was dissected from the spermatic cord structures. A 15 x 11 cm of polypropylene mesh was rolled and introduced into the abdominal cavity through the 11 mm right trocar. The mesh was unrolled to cover the entire myopectineal orifice (Hesselbach's triangle, the indirect space, and the femoral ring areas). An endoscopic multifire hernia tucker was used to fix the mesh in place. Finally closure of peritoneal flap by tucker and port site closure.

After operation in both groups patients were carefully monitored postoperatively. On day 1, in the evening Foley's catheter removed in the patients who had undergone TAPP repair. 1 gm ceftriaxone continued till the patient discharge. The analgesic used was paracetamol 1gm tablet 12 hourly and pain was recorded on visual analogue score on consecutive postoperative days. The patients were motivated to move in the early postoperative period and to take liquid diet on the evening of day of surgery. Sutures were removed between 8-12 days postoperative. Patients were evaluated on day 1, at the time of discharge, day 14, 1 month, 3 months and 6 months' post-operative for the presence of any superficial wound infection, recurrence, post-operative pain, Seroma formation, swelling, and signs of recurrence. The scars were checked at each follow-up and compared between the two groups during and after surgeries.

**Statistical analysis**

The data was entered using SPSS 20 software. Statistical analysis was done using SPSS version 20 software. Results were presented in tables, graphs and diagrams. Chi square test was done. Significance was defined as a p<0.05.

**RESULTS**

The present study was conducted in the department of surgery, Tanta university Hospital, during the period of Mars 2018 to May 2019. Of them 30 patients were subjected to open Lichtenstein repair of hernia (Group A) and the other 30 patients subjected to laparoscopic TAPP repair of hernia (Group B).

Data obtained was tabulated and expressed as statistics and percentages. A probability value of (p value) of less than 0.05 was considered as statistically significant. The youngest patient in the study was a 20 years old male and oldest patient in the study was 65 years old male with a mean of 52.2 years in Group A and 47.8 years in Group B. Each group included 29 (96.7%) male and only one (3.3%) female. Group A comprised 24 patients (80%) with unilateral hernias and 6 (20%) patients had bilateral

hernias while in Group B, 22 cases (73.3%) had unilateral hernias and 8 cases (26.7%) had bilateral hernias. In Group A, 9 cases (30%) were direct and 18 cases (60%) were indirect and in Group B, 12 cases (40%) were direct and 15 cases (50%) were indirect. Each group contained 3 (10%) cases of pantaloon hernia. Mean operative time for open hernia repair was 43.7 minutes and for laparoscopic hernia repair was 59.03 minutes. Thus, the mean time taken to complete a laparoscopic hernia repair was significantly higher and the difference was statistically significant (p = 0.0001) (Table 2).

**Table 1: Demographic data.**

Variables	Category	Open repair (Group A)	TAPP repair (Group B)
		n=30	n=30
		N (%)	N (%)
Age (in years)	Mean	52.2	47.8
	Sex		
Sex	Male	29 (96.7)	29 (96.7)
	Female	1 (3.3)	1 (3.3)
Side	Unilateral	24 (80)	22 (73.3)
	Bilateral	6 (20)	8 (26.7)
Type of hernia	Direct	9 (30)	12 (40)
	Indirect	18 (60)	15 (50)
	Pantaloon	3 (10)	3 (10)

**Table 2: Duration of operation.**

Mean operative time (minutes)	Open hernioplasty	TAPP	P value
	43.7 mins	59.03 mins	0.0001

**Table 3: Post-operative pain visual analogue score of patients operated by Lichtenstein (open) method and laparoscopic method.**

Visual analogue score	Open hernioplasty N (%)	TAPP N (%)
1-2	15 (50%)	29 (96.7%)
3-4	14 (46.7%)	1 (3.3%)
5-6	1 (3.3%)	0 (0%)
7-8	0 (0%)	0 (0%)
9-10	0 (0%)	0 (0%)

**Table 4: Post-operative complications.**

Post-operative complications	Group A N (%)	Group B N (%)
Seroma	2 (6.6)	0 (0)
Hematoma	2 (6.6)	0 (0)
Wound infection	1 (3.3)	0 (0)
Pain in groin and thigh	10 (33.3)	6 (20)
Pain in scrotum	5 (16.6)	0 (0)
Testicular atrophy	0 (0)	0 (0)
Urine retention	0 (0)	0 (0)
Recurrence	0 (0)	1 (3.3)
Orchitis	1 (3.3)	2 (6.6)

**Table 5: Hospital stay and time to return to normal activities.**

Variable	Group A	Group B	P value
<b>Duration of hospital stay (mean)</b>	2.16 days	1.08 days	0.00001
<b>Return to normal activity (mean)</b>	9.32 days	8.64 days	0.00025

There was a marked reduction in postoperative pain in laparoscopic hernia repair compared to open inguinal mesh hernioplasty (Table 3) especially in early postoperative period then pain gradually fades away and was reduced in intensity although in both groups pain was tolerable and of mild intensity till completely disappeared. Seroma, hematoma and superficial wound infection was found only in open inguinal hernia repair group and not in laparoscopic (TAPP) hernia repair. Only one recurrence (3.3%) was recorded in Group B. Two cases (6.6%) suffered orchitis in Group B and only one case (3.3%) in Group A. Neither urine retention nor testicular atrophy had occurred in either of the two groups (Table 4). The mean duration of hospital stay for open hernia repair was 2.16 days and that for laparoscopic hernia repair was 1.08 days with a ( $p=0.00001$ ) which was statistically significant. Thus, time to return to normal activity was significantly lower in laparoscopic hernia repair than open hernia repair, 8.64 days and 9.32 days respectively with a ( $p=0.00025$ ) which was statistically significant also (Table 5).

## DISCUSSION

There are numerous inguinal hernia repair techniques. It can be performed conventionally (open surgery) or through a minimally invasive way. Worldwide studies showed that laparoscopic procedures are associated with less postoperative pain, with less analgesia consumption by the patient.<sup>17-21</sup> Our study confirms these results: patients after laparoscopic TAPP repair had lower postoperative pain scores, required fewer analgesics, and the duration of the pain was shorter compared with open surgery.

Laparoscopic hernia repair is also associated with shorter hospital stay, faster recovery, earlier return to normal activities.<sup>22</sup> Better cosmetic results, possibilities to detect a contralateral inguinal defect and repair it through the same incision at the same time are the advantages of laparoscopic surgery too.<sup>20,22</sup> The disadvantages of laparoscopic surgery include requirement of general anesthesia, longer operative time and learning curve and more expensive equipment.<sup>22-26</sup>

The youngest patient in the present study was a 20 years old male and the oldest patient was 65 years old male with a mean of 52.2 years in group A and 47.8 years in group B. Each group included 29 (96.7%) male and only one (3.3%) female. Faisal et al, reported a mean age of

38.17 years within the range of 19-57 years they were all males.<sup>26</sup> Also, the study of Singh et al, reported that mean age was 36.81 years and all patients were male.<sup>27</sup> Whereas Koshariya et al reported that the youngest patient in his study was a 32-year-old male and oldest patient was 79-year-old male with a mean age 57.12 in laparoscopic hernia repair and 57.00 in open inguinal hernia repair and with a very high incidence of inguinal hernia in males (94%).<sup>28</sup> Gupta et al reported an incidence of 96% males while Charles et al, reported 93.2% of all the cases to be males.<sup>29,30</sup> Helmy et al reported in his study that group A who underwent open surgery the mean for age was 44.52 while Group B patients that were subjected to laparoscopic treatment, the mean of age was 44.80.<sup>31</sup>

In our study group A comprised 24 patients (80%) with unilateral hernias and 6 (20%) patients had bilateral hernias while in Group B 22 cases (73.3%) had unilateral hernias and 8 cases (26.7%) had bilateral hernias. In Group A 9 cases (30%) were direct and 18 cases (60%) were indirect and in Group B 12 cases (40%) were direct and 15 cases (50%) were indirect. Each group contained 3 (10%) cases of pantaloon hernia.

Faisal et al reported similar results that unilateral inguinal hernia was in 26 (72.2%) patients and bilateral inguinal hernia was in 10 (27.8%) patients.<sup>26</sup> 20 (55.6%) patients were presented with indirect inguinal hernia and rest 16 (44.4%) patients had direct inguinal hernia. While Garg et al, reported that in laparoscopic group unilateral hernia was 68.6% and in 31.4% it was bilateral while in open hernioplasty group 80% of patients had unilateral hernias and 20% had bilateral hernias also he reported that in laparoscopic group 71.4% of patients had direct hernias and 28.6% of patients had indirect hernias, while in Lichtenstein group 57.1% of his patients had direct hernia and 42.9% had indirect hernia.<sup>32</sup>

Koju et al in his study, reported that in 1.96% of his cases hernia was bilateral and in 98.04% it was unilateral in open hernioplasty group and in TAPP group 13.73% of the cases had bilateral hernia and 86.27% of them had unilateral hernias, of these patients, 19.6% direct and 80.4% indirect hernias in open group while in TAPP group 21.57% direct and 78.43% indirect.<sup>33</sup>

In the present study mean operative time for open hernia repair was 43.7 minutes and for laparoscopic hernia repair was 59.03 minutes. Thus, the mean time taken to complete a laparoscopic hernia repair was significantly higher and the difference was statistically significant ( $p=0.0001$ ). While Grag et al reported that in laparoscopic group the mean time was 131.86 minutes and in open group it was 80.29 minutes with a significant difference ( $p=0.001$ ).<sup>32</sup> Also Koju et al reported a mean operative time of 42.55 minutes and 96.08 minutes for both open and laparoscopic groups consecutively with a  $p$  value of  $<0.001$ .<sup>33</sup> While Helmy et al reported that the mean operative time was 55.8 minutes in Group A (open)

while in Group B (laparoscopic) it was 47.3 minutes.<sup>31</sup> Which is opposite of the previous results mentioned before. Faisal et al reported that the mean operative time was 55.30 minutes and 76.07 minutes for both open and laparoscopic groups consecutively with a p value of <0.001.<sup>26</sup> whereas Shah et al reported that the mean operative time was 84.25 minutes and 71.50 minutes for both laparoscopic and open groups consecutively with a p<0.016.<sup>34</sup>

In the present study there was a marked and significant reduction in postoperative pain in laparoscopic hernia repair compared to open inguinal mesh hernioplasty (Table 3) especially in early post-operative period, then pain gradually fades away and was reduced in intensity although in both groups pain was of mild intensity and tolerable till completely disappeared within 2 weeks. Helmy et al reported that in patients with bilateral hernia managed laparoscopically less analgesia required (mean of VAS score 4.29) while in open procedure they needed more analgesia (mean of VAS score 6.74), it did not differ between both groups as regard unilateral hernias.<sup>31</sup> While Koju et al reported a significant difference in pain score with low pain score in TAPP group was seen to be (2.00±0.63 versus 3.90±0.73, p<0.001).<sup>33</sup> Also Garg et al reported that at 0, 12, 24 and 72 hours postoperatively, LH patients described significantly less pain than the open group (p<0.05).<sup>32</sup> Although the visual analogue scale (VAS) pain scores of the LH group were also lower than the OH group on postoperative day 14, these differences were not statistically significant.

In the present study regarding post-operative complications such as seroma, hematoma and superficial wound infection was found only in open inguinal hernia repair group and not in laparoscopic (TAPP) hernia repair and all were managed conservatively. Only one recurrence (3.3%) was recorded in Group B. Two cases (6.6%) suffered orchitis in Group B and only one case (3.3%) in Group A. Neither urine retention nor testicular atrophy had occurred in either of the two groups.

Our results are compatible with those of Koshariya et al who reported that superficial wound infection was found to be more in open inguinal hernia repair group than laparoscopic hernia repair group also recurrence rate in laparoscopic hernia repair is 4% but that is 0 in open hernia repair.<sup>28</sup> This result is also compatible with the study of Jaykar, in which recurrence rate was the same in both group of hernia repair that was 4%.<sup>35</sup> Also, our results are compatible with those of Shah et al, who reported that the postoperative complications like hematoma/seroma and wound infection, urinary retention were comparatively lower in the laparoscopic hernia repair group 0%, 5%, 5% compared to that of the hernioplasty group 6.67%, 13.33% and 10% respectively.<sup>34</sup>

Our results differ from those of Faisal et al who reported that seroma/hematoma formation was in 4 (22.2%)

patients of open mesh repair whereas 5 (27.8%) patients of laparoscopic mesh repair.<sup>26</sup> Urinary retention was only in 3 (16.7%) patient of open mesh repair Testicular vessels were injured in six (16.7%) patients. There was no complication regarding injury to vas deferens, bowel injury or urinary bladder injury. Also Our results differ from those of Koju et al who reported that there were two wound infections and one seroma formation in conventional group whereas in TAPP group there were three recurrence (one after 3 months, one after 2 weeks and one after one year of surgery) and one conversion due to adhesion.<sup>33</sup> Also Garg et al reported that 2 patients in open group had seroma formation but none in laparoscopic group.<sup>32</sup> LH group had 1 conversion to open due to difficult anatomy. There was no recurrence in either group during a follow up of 6 months.

The present study showed that the mean duration of hospital stay for open hernia repair was 2.16 days and that for laparoscopic hernia repair was 1.08 days with a (p=0.00001) which was statistically significant. Thus, time to return to normal activity was significantly lower in laparoscopic hernia repair than open hernia repair, 8.64 days and 9.32 days respectively with a (p=0.00025) which was statistically significant also.

Koshariya et al reported similar results and said that the duration of hospital stay for open hernia repair and laparoscopic hernia repair are 4.64 days and 3.08 days.<sup>28</sup> Thus postoperative hospital stay was significantly lower in laparoscopic hernia repair than open hernia repair (p=0.00001). He also reported that time to return to normal work for open hernia repair and laparoscopic hernia repair were 8.24 days and 7.24 days. Thus time to return to normal work was significantly lower in laparoscopic hernia repair than open hernia repair (p=0.000253). Whereas Shah et al found in his study, that the mean period of hospitalization was slightly higher 3.5 days in case of laparoscopic hernia repair with 3.23 days in cases of hernioplasty but not statistically significant.<sup>34</sup> The post-operative days spent in the hospital were almost comparable in both groups. And this was the same results obtained by Cochrane review that also stated that the length of hospital stay did not differ between open and laparoscopy groups (WMD-0.04 days, 95% CI-0.08 to 0.00; p=0.05).<sup>36</sup>

Faisal et al reported that 15 (83.3%) patients of laparoscopic mesh repair had two days or less hospital stay whereas 8 (44.4%) patients of open mesh repair had more than two days hospital stays and (66.7%) patients of laparoscopic mesh repair had return to work within 10 days whereas only 6 (33.3%) patients of open mesh repair returned to work within 10 days post-operatively.<sup>26</sup> 16 (88.9%) patients of laparoscopic mesh repair had return to work within two weeks of surgery whereas only 10 (55.6%) patients of open mesh repair had return to work during same period of time. Helmy et al found that there was great difference between mean of time needed to

regain activity between both groups, it was 26.3 in Group A (open) while in Group B (TAPP) was 5.73.<sup>31</sup>

Koju et al found that the average hospital stay in TAPP and Lichtenstein's group was 2.33±0.62 and 2.96±0.20; p<0.001, respectively also, there was early return to normal work in TAPP group than in Lichtenstein's group (13.39±0.60 versus 17.88±0.87 days, p<0.001).<sup>33</sup>

## CONCLUSION

Laparoscopic trans abdominal preperitoneal (TAPP) approach to inguinal hernia repair is considered safe and effective as excellent alternative to conventional open repair. It is associated with less postoperative pain, postoperative hospital stay, postoperative complications, and earlier return to normal activities, although it has its own disadvantages in terms of recurrence rate, operative time, cost effectiveness, violation of the peritoneal cavity and occurrence of several complications, e.g., intestinal obstruction subsequent to entry of the peritoneal cavity.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** El Sherpiny WY. Comparative study between laparoscopic trans-abdominal preperitoneal and open mesh hernioplasty in repair of non-complicated inguinal hernia. *Int Surg J* 2020;7:24-30.