

# Postoperative Outcomes in Patients undergoing Transabdominal Preperitoneal Repair versus Lichtenstein's Repair for Inguinal Hernia: A Prospective Cohort Study

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## ABSTRACT

**Introduction:** Transabdominal Preperitoneal (TAPP) and Lichtenstein tension-free repair are well-established methods for inguinal hernia treatment. There is a need to establish the short-term outcomes of both procedures.

**Aim:** To determine the short-term outcomes of Lichtenstein and TAPP hernia surgery.

**Materials and Methods:** A prospective cohort study was conducted in the Department of Surgery at Father Muller Hospital, Mangaluru, Karnataka, India from November 2020 to May 2022. A total of 30 male patients underwent TAPP and 30 male patients underwent Lichtenstein repair. Polypropylene mesh (Trulene macropore, Healthium Medtech, India) was used in both groups. Postoperative pain, early ambulation, number of days stayed in the hospital postoperatively, time taken to return to work, cost-analysis, and operating time were assessed between the groups using mean, percentage, Student's t-test for continuous data, and Pearson Chi-square test for categorical variables.

**Results:** The mean age of patients was 60.83±13.84 years in the TAPP group and 56.67±13.99 years in the Lichtenstein group, respectively. The Visual Analogue Scale (VAS) score at 24 hours was higher in the Lichtenstein group (p-value <0.001). Ambulation occurred on Postoperative Day 1 (POD1) in the TAPP group whereas it was on POD2/3 in the Lichtenstein group (p-value <0.001). The Length of Stay (LOS) in the hospital was higher in the Lichtenstein group (p-value 0.063). A total of 50% of the patients in the TAPP group returned to work by POD5, whereas 33.3% and 43.3% of patients in the Lichtenstein group returned to work by POD10 and POD11, respectively, with a p-value of 0.016. The cost was in the range of 30,000-45,000 rupees for the TAPP group (86.7% of patients) and 15,000-30,000 rupees for the Lichtenstein group (63.3% of patients) respectively, with a p-value <0.001.

**Conclusion:** Laparoscopic surgery (TAPP) is superior to Lichtenstein repair despite higher fixation device costs because it is associated with shorter hospital stays, less pain, and earlier return to regular activities.

**Keywords:** Ambulation, Hospital stay, Inguinal hernia, Visual analogue score

## INTRODUCTION

An inguinal hernia is a prevalent condition affecting between 5-10% of the population. Up to 50% of people with inguinal hernias are aware of their condition, while 30% are asymptomatic, and 3% of patients have an incarcerated inguinal hernia. Indirect hernias account for more than 70% of cases in adults. Recurrence rates following surgery range from 3-8% [1]. In 1986, Dr. Irving Lichtenstein, along with Dr. Alex Schulman and Dr. Parviz Amid at the Lichtenstein Hernia Institute in Los Angeles, described the Lichtenstein tension-free repair. However, the best surgical strategy remains a subject of debate [2,3]. There are multiple techniques to manage inguinal hernias, ranging from open inguinal hernia repair to minimally invasive methods. Less invasive techniques are increasingly popular for inguinal hernia management. There is ongoing debate about which hernia repair technique, open or laparoscopic, is superior. According to the National Institute for Health and Care Excellence guidelines, an open surgical approach should be preferred for primary inguinal hernias. However, many doctors favour laparoscopic surgery [4]. Proponents of laparoscopic surgery point to its advantages, such as less scarring, less pain, reduced recovery time, and fewer complications, particularly for bilateral and recurrent hernias. Advocates for open surgery argue that it can be done under local anaesthesia as day surgery without entering the abdomen and is less expensive [2]. However, laparoscopic hernia repair has not been universally adopted by the surgical community because it demands more refined techniques

and involves a steeper learning curve. The laparoscopic approach also carries potential complications during surgery, although the risk of visceral or vascular injury is not as high as with open approaches [2]. This study was conducted to compare the short-term outcomes of TAPP and Lichtenstein hernia surgery in terms of operative time, postoperative pain, early ambulation, length of hospital stay, return to work, and cost-effectiveness.

## MATERIALS AND METHODS

A prospective cohort study was conducted in the Department of Surgery, Father Muller Hospital, Mangaluru, Karnataka, India from November 2020 to May 2022. The approval from the Institutional Ethics Committee (FMIC/CCM/132/2021) was obtained. Written informed consent was obtained from all patients.

**Inclusion criteria:** Patients with a Nyhus classification I-III inguinal hernia [5] and aged ≥18 years were included in the study.

**Exclusion criteria:** Patients with complicated hernias, obstructive airway disease, obstructive uropathy, or constipation were excluded from the study.

**Sample size calculation:** The prevalence of inguinal hernia in male patients was 25% [5]. The precision of the estimate was required to be within five percentage points as assessed by the 95% confidence interval for the population prevalence-that is, a 95% confidence interval of 20% to 30%. The initial required sample size was determined to be 50. To account for a potential dropout/withdrawal

rate of 20%, the sample size was increased to 60, with 30 patients in each group [5]. A total of 60 patients scheduled for TAPP repair or Lichtenstein's repair were recruited for the study. The patients were selected randomly through a computer-generated sequence. The TAPP group included 30 patients, and the Lichtenstein group also included 30 patients. Polypropylene mesh (Trulene macropore, Healthium Medtech, India) was used in both groups.

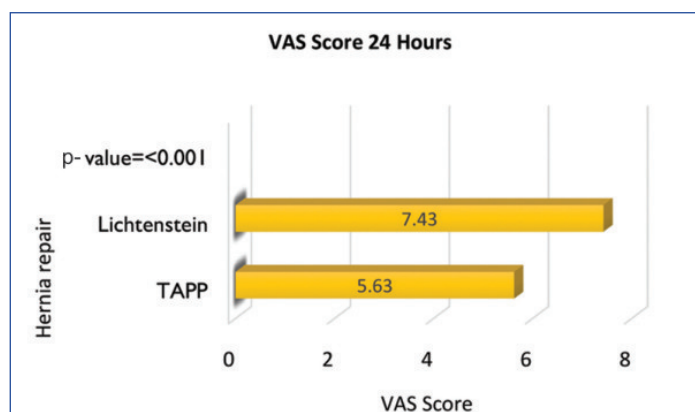
**Outcomes assessed:** Postoperative pain, early ambulation, the number of days stayed in the hospital postoperatively, the time taken to return to work, cost analysis, and operating time. The operating time was calculated by the investigator, starting from the induction of anaesthesia (including the time required to set-up the laparoscopy in the TAPP group) until the dressing was applied. The pain scores were evaluated at the 24<sup>th</sup> hour postoperatively by the investigator using VAS. Postoperative pain was measured qualitatively with VAS and was graded as follows: no pain, no discomfort during daily life activities (VAS=0); mild pain, occasional discomfort but not affecting the quality of life (VAS=1-3); moderate pain, pain hampering the patient's quality of life including the inability to participate in sports (VAS=4-7); and severe pain, the presence of constant or intermittent pain debilitating the patient or interfering with activities of daily living (VAS=8-10). The number of days stayed in the hospital was calculated from the first postoperative day until the patients were discharged. The number of days required for the patient to return to work was also calculated. The cost analysis included Operating Theatre (OT) charges and hospital charges (cost of hospital stay excluding OT charges) for the patients at discharge who underwent TAPP and Lichtenstein repairs.

**STATISTICAL ANALYSIS**

The statistical analysis of the data was conducted using Excel and SPSS software version 21.0. The Student's t-test was used to compare continuous data between the two groups, and the Pearson Chi-square test was applied for the comparison of categorical variables. A p-value <0.05 was considered statistically significant at the 95% confidence interval.

**RESULTS**

The mean age was 60.83±13.84 years in the TAPP group and 56.67±13.99 years in the Lichtenstein group, respectively. Postoperative pain scores were evaluated at the 24<sup>th</sup>-hour postoperatively using the VAS score. The VAS score at 24 hours was higher in the Lichtenstein group, with a p-value of <0.001 [Table/Fig-1].



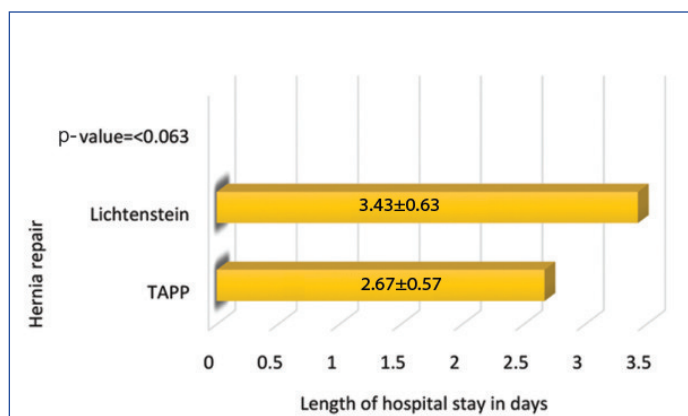
**[Table/Fig-1]:** Postoperative pain in TAPP and Lichtenstein groups. Student t-test was done and a p-value <0.05\* was considered statistically significant

All patients who underwent TAPP repair were ambulated on POD1, compared to those who had Lichtenstein surgery, who were mobilised on POD2/3. This difference was statistically significant with a p-value of <0.001 [Table/Fig-2].

Ambulation		Group		Total
		TAPP	Lichtenstein	
POD1	Count	30	0	30
	% within group	100.0	0	50.0
POD2	Count	0	29	29
	% within group	0	96.7	48.3
POD3	Count	0	1	1
	% within group	0	3.3	1.7
Total	Count	30	30	60
	% within group	100.0	100.0	100.0
Value		df	p-value	
Pearson Chi-square		60	2	<0.001*

**[Table/Fig-2]:** Early ambulation in TAPP and Lichtenstein groups. Chi-square tests were done and a p-value <0.05\* was considered statistically significant

The Length of Stay (LOS) was higher in the Lichtenstein group, with a p-value of 0.063 [Table/Fig-3]. The operating time was longer in the TAPP group (2.35±0.84 hours), but this was not statistically significant (t-value of 0.079) with a p-value of 0.937, compared to the Lichtenstein repair group (2.33±0.78 hours).



**[Table/Fig-3]:** Length of hospital (LOS) stay in TAPP and Lichtenstein groups. Student t-test was used and a p-value <0.05\* was considered statistically significant

Regarding return to work, 50.0% of patients in the TAPP group returned by POD5, whereas 76.6% of patients in the Lichtenstein group returned by POD10 and POD11 (33.3% and 43.3%, respectively), with a statistically significant p-value of 0.016 [Table/Fig-4].

Time taken to return to work		Group		Total
		TAPP	Lichtenstein	
POD5	Count	15	7	22
	% within group	50.0	23.3	36.7
POD10	Count	2	10	12
	% within group	6.7	33.3	20.0
POD15	Count	13	13	26
	% within group	43.3	43.3	43.3
Total	Count	30	30	60
	% within group	100.0	100.0	100.0
Value		df	p-value	
Pearson Chi-square		8.242	2	0.016

**[Table/Fig-4]:** Time taken to return to work in TAPP and Lichtenstein groups. Chi-square tests were done and a p-value <0.05\* was considered statistically significant df: Degree of freedom

In the cost analysis, patients were divided into two ranges. It was found that 86.7% of patients who underwent TAPP fell into the cost range of Rs 30,000-45,000, whereas 63.3% of those who underwent Lichtenstein repair were in the range of Rs 15,000-30,000, with a statistically significant p-value of <0.001, indicating that laparoscopic surgery is more expensive. However, when analysing hospital charges (excluding OT charges), 80.0% of TAPP

patients incurred costs in the range of Rs 5,000-10,000, whereas 70.0% of Lichtenstein patients paid between Rs 10,000-15,000, with a p-value of <0.001, which was statistically significant. This increase in cost for the Lichtenstein group was likely due to the longer hospital stay and increased postoperative complications.

OT charges		Group		Total
		TAPP	Lichtenstein	
Rupees 30,000 – 45,000	Count	26	11	37
	% within group	86.7	36.7	61.7
Rupees 15,000 – 30,000	Count	4	19	23
	% within group	13.3	63.3	38.3
Total	Count	30	30	60
	% within group	100.0	100.0	100.0
	Value	df	p-value	
Pearson Chi-square	15.864	1	<0.001*	

**[Table/Fig-5]:** Cost-analysis in TAPP and Lichtenstein groups. Chi-square tests were done and a p-value <0.05\* was considered statistically significant. df: Degree of freedom; OT: Operation theatre

## DISCUSSION

Even though numerous researchers have examined the comparative benefits and potential risks of minimal access surgery for the repair of inguinal hernias, most of these studies have been too small to conclusively demonstrate the superiority of one method over another [6-8]. When comparing laparoscopic and open surgery for inguinal hernias, postoperative pain is a critical outcome to consider. Four clinical trials reported quantitative assessments of immediate and long-term postoperative pain using VAS. Three studies assessed pain within 12 hours after surgery, with results favouring the TAPP method [9-11]. Present study's p-value for postoperative pain was <0.001, which was statistically significant and indicates that patients undergoing laparoscopic hernioplasty experienced less postoperative pain than those receiving open hernioplasty.

In a study by Shakya VC et al., involving 50 patients with laparoscopic hernia surgeries, the average time taken for full ambulation was 2.05±1.39 days, ranging from 1-10 days [12]. Another study by Kubiliute E et al., on 33 male patients assessed mobility, strength, and stability of the hip and leg after inguinal hernia surgery and found that recovery was earlier in minimally invasive inguinal hernia repairs, allowing for early mobilisation [13]. In present study, 100% of patients in the TAPP repair group were ambulated on POD1 compared to open surgery, where mobilisation occurred on POD2/3.

A comparative study conducted by Dumitrescu V et al., on 235 patients evaluated that the mean duration of postoperative hospital stay was 1 to 2 days for patients who underwent the TAPP procedure [14]. Similarly, a study by Takayama Y et al., on 107 patients stated that the postoperative hospital stay was longer in the open group, with 26% staying longer than three days [15]. Present study showed similar results, with LOS being higher in the open hernioplasty group. A randomised study conducted on 50 patients by Ilyas M et al., showed that the return to regular work was earlier in the laparoscopic mesh repair group compared to the open repair with mesh group, with a p-value of 0.011 [16]. Present study yielded similar results, with 50.0% of patients who underwent TAPP returning to work by POD-5, in contrast to the open group, which took almost twice as long. A study by Sofi J et al., on 60 patients revealed that the mean cost of laparoscopic repair per patient was higher than that of open repair [17]. Present study corroborated these findings, showing that the core cost of surgery was higher in the TAPP repair group compared to the open repair group, likely due to the higher cost of laparoscopic mesh and general anaesthesia.

The mean operating time in present study for laparoscopic surgery was 2.35±0.84 hours, compared to 2.33±0.78 hours for the Lichtenstein repair. Thus, the overall mean operative time for the Lichtenstein repair was notably less, which aligns with findings from other studies [4,5]. Most research indicates that open repair typically requires less time to complete.

Laparoscopic TAPP can be considered feasible and superior to Lichtenstein repair in terms of short-term outcomes, with the exception of cost. However, it is important to note that these findings from present study are not universally generalisable.

## Limitation(s)

In present study, long-term follow-up measures to determine recurrence rates and to assess patient pain one year postsurgery were not included.

## CONCLUSION(S)

Laparoscopic surgery is demonstrated to be superior to open repair despite the higher costs associated with fixation devices. This was due to a shorter period of hospital stay, reduced pain, and an earlier return to regular activities for patients. Therefore, laparoscopic hernioplasty should be considered the first-line treatment for all cases of uncomplicated inguinal hernias.

## Acknowledgement

All authors have made significant contributions to the conception and design, as well as the analysis and interpretation of data.

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**PLAGIARISM CHECKING METHODS:** [Jain H et al.]

- Plagiarism X-checker: Aug 08, 2023
- Manual Googling: Nov 16, 2023
- iThenticate Software: Dec 22, 2023 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Aug 08, 2023**Date of Peer Review: **Nov 06, 2023**Date of Acceptance: **Dec 26, 2023**Date of Publishing: **Feb 01, 2024**