

# A Comparison of outcome between Transabdominal Preperitoneal (TAPP) and Lichtenstein operation for primary inguinal hernia repair – An institutional study

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## Abstract

**Introduction:** Inguinal hernia repairs are one of the most common operations in general surgery. Apart from the classical open repairs, minimally invasive approaches are increasingly preferred to manage groin hernia repair. However, the optimal surgical approach still remains controversial.

**Methods:** This is a prospective observational study done in Shree Birendra Hospital, a 750-bedded tertiary care military hospital located in Kathmandu from July 2021 to December 2021. A total of 120 patients operated for inguinal hernia by either open Lichtenstein repair or Transabdominal Preperitoneal (TAPP) in the department of surgery were included in this study.

**Results:** The mean age of patients between open Lichtenstein repair and TAPP was 59.3 (22-79) and 63.4 (27-70) years respectively. The majority of patients were male among both the groups constituting of more than 95%. The mean intraoperative duration among the two groups was 44.12±7.23 minutes and 77.43±8.77 minutes, respectively (p=0.021). The mean postoperative pain was less in TAPP procedure compared to open procedure (p=0.037). The mean duration of the postoperative hospital stay was 2±1.12 and 1±0.79 respectively. At the three-month evaluation, there were four cases of recurrence of which one of them underwent open procedure while three underwent TAPP procedure.

**Conclusion:** Both the open Lichtenstein repair and the TAPP procedures are safe and effective in the repair of primary inguinal hernia. In a view of postoperative pain, seroma formation and length of hospital stay TAPP procedure has been found superior to open procedure in our study.

**Keywords:** Inguinal hernia; Lichtenstein repair; Mesh; TAPP.

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## Introduction

Surgical repair of inguinal hernias is a common procedure in adult population. The standard method for hernia repair has changed little over a hundred years. Introduction of synthetic mesh has changed the scenario in the past few decades. These synthetic meshes can be placed either by open or laparoscopic techniques. Laparoscopic hernia repair was first reported by Ger and colleagues in 1990.<sup>1</sup> The advent of laparoscopy has revolutionized abdominal surgery and a large body of evidence has been amassed to compare laparoscopic and open techniques in the repair of primary inguinal hernias.<sup>2,3</sup> Lichtenstein's open technique is the most commonly performed anterior surgical approach technique worldwide.<sup>4</sup>

However, with the advent of minimal invasive surgery (MIS), hernia repair underwent radical evolution, and two major laparoscopic surgeries as posterior surgical approach exists- the transabdominal preperitoneal (TAPP) procedure and the totally extraperitoneal (TEP) procedure.<sup>5,6</sup> Various studies comparing different open techniques to laparoscopic techniques have found that laparoscopic repair techniques are superior to open mesh repair techniques in terms of postoperative pain, need for analgesia, and time to return to day-to-day activity.<sup>7-10</sup> Advantages of laparoscopic procedures may include a reduction in postoperative pain and hospital stay, and the ability to undertake a simultaneous repair of symptomatic incipient contralateral herniation.<sup>11-13</sup>

This study aims to compare the postoperative outcomes between laparoscopic hernia repair (transabdominal preperitoneal technique) and Open Lichtenstein tension-free repair.

## Methods

This was a prospective observational study done in Shree Birendra Hospital, a 750- bedded tertiary care military hospital located in Kathmandu. The data was collected over the period of six months from July 2021 to December 2021. A total of 120 patients operated for inguinal hernia by either open Lichtenstein repair or TAPP in the department of surgery were included in this study. The allocation of patients into either group was non-random and based on patient's choice and feasibility of general anaesthesia. Inclusion criteria included all the patients aged >18 years with inguinal hernia undergoing TAPP or Lichtenstein repair in department of surgery, Shree Birendra Hospital. Exclusion criteria were: previous history of lower abdominal surgical procedures, complex inguinal hernia disease (irreducibility, strangulation, hydrocele of the cord, obstruction, and recurrent inguinal hernia), bilateral inguinal hernia, ASA more than 3, age less than 18 years, coagulopathy and patients who have undergone totally extra peritoneal (TEP) repair. A detailed clinical history and thorough clinical examination were done and recorded in a predesigned proforma. An informed written consent was taken from each patient after explaining about the study prior to enrolment. Routine investigations were

done for all patients, including complete blood picture, coagulation profile, liver function and kidney function tests, fasting blood sugar, urine analysis, ECG and chest radiography. Management of comorbidities like smoking, chest disease, diabetes mellitus, cardiac disease, hepatic disease, and chronic constipation was properly carried out so that all patients were properly prepared for the surgery. All patients for transabdominal preperitoneal (TAPP) repair were fit for general anaesthesia (GA). Previous intra-abdominal operation was not a contraindication for TAPP repair. Intra- and postoperative complications were recorded if a complication occurred. Seroma was defined as some amount of fluid collection in the inguinal region requiring puncture. Chronic pain was defined as the presence of pain six months after surgery. All patients were followed up as outpatients within two weeks postoperatively to assess groin pain, medication requests, and any complications. Postoperative complications such as seroma, bleeding, chronic pain, and recurrence were evaluated for three months. Statistical analysis was performed by using the IBM SPSS ver. 24.0. Quantitative data were presented as mean and SD. Qualitative data were presented as number and percentage. P value less than 0.05 was considered significant. The study was approved by the Ethics Committee, Institutional review Board (IRB) of Nepal Army Institute of Health Sciences (NAIHS).

## Results

A total of 120 primary inguinal hernia patients who underwent surgical procedure during the study period were included in the study. Among them 73(60.83%) cases underwent open Lichtenstein repair (Group A) while 47 (39.16%) patients underwent laparoscopic TAPP procedure (Group B). Clinical characteristics of the patients are summarized in **Table 1**. The median age among the patient undergoing Open and TAPP was 59.3 (22-79) and 63.4 (27-70) respectively. Among them a total of 111(92.5%) were male while 09(7.5%) were females. The rates of comorbidities such as hypertension, diabetes mellitus, Benign Prostatic Enlargement (BPE), cardiac disease and COPD in Group A were significantly higher than in the patient undergoing TAPP repair. Majority of patient with Benign prostatic Enlargement (BPE) belonged to Open Lichtenstein group (17) which was statistically significant (p value= 0.04). Primary indirect inguinal hernia 73(60.83%) was the most common type of inguinal hernia among patient who underwent surgical repair followed by direct inguinal hernia 47(39.16%) respectively.

Surgical outcomes of intraoperative and postoperative complications are summarized in **Table 2** and **Table 3** respectively. Mean time taken for open inguinal hernia repair (Group A) was 44.12±7.23 minutes which was less compared to (Group B) undergoing TAPP repair (77.43±8.77 minutes). The difference between two procedures was found to be significant (p=0.021). In the TAPP group, the operation time was significantly longer, however, the estimated blood loss was significantly less (20 ± 5 vs 10±5 mL).

**Table 1. Demographic profile, Risk factors and Types of Inguinal hernia among the patients undergoing hernia repair**

S. no	Particulars	Group-A Open Lichtenstein Repair (N= 73)		Group -B TAPP (N = 47)	
		Number	%	Number	%
1.	Age (mean range)	59.3 (22-79)	-	63.4 (27-70)	-
2.	Sex				
	Male	67	91.78	44	93.61
	Female	06	8.21	03	6.38
3.	BMI (Kg/m <sup>2</sup> )	23.6 (17.8-28.4)	-	22.1 (16.6-29.2)	-
4.	Comorbidities				
	Hypertension	13	19.4	07	14.89
	Diabetes Mellitus	23	34.32	12	25.53
	BPE*	17	25.37	11	23.40
	COPD**	25	37.31	01	21.2
	Cardiac disease	11	16.41	05	10.63
5.	Type of hernia				
	a) Primary indirect inguinal hernia	56	76.71	17	36.17
	b) Primary direct inguinal hernia	17	23.28	30	63.82

\* BPE- Benign Prostatic Enlargement

\*\*COPD- Chronic Obstructive Pulmonary Disease

**Table 2. Intraoperative complications during hernia repair**

S. no	Complications	Open Lischetein Repair n (%)	TAPP n(%)	P value
1.	Mean Operative time	44.12 ± 7.23	77.43 ± 8.77	0.021
2.	Bleeding ml (mean range)	20 ± 5	10±5	0.45
3.	Injury to the bowel/ bladder	0	0	

No intraoperative complications (bowel and bladder injury) were observed in either group.

Postoperative outcomes between two groups are presented in **Table 3**. Postoperative pain score (VAS score) was much less in TAPP procedure as compared to open procedure (3.12±1.33 vs2.17±1.02) which was statistically significant with p value <0.037 (**Table 3**).

**Table 3. Post- operative pain compared with VAS score among patients who underwent hernia repair**

S. no	Post-operative pain	Total VAS score	6-12 hrs.	12-24 hrs.	24-48 hrs.	P value (for 24-48hrs)
1.	Open Lichtenstein Repair	10	7 ±2.17	5.17 ±2.11	3.12 ±1.33	0.037
2.	TAPP	10	5.4 ±1.1	4.44 ±1.2	2.17 ±1.02	

Six cases of seroma were found in open repair group A whereas two in the laparoscopic hernioplasty group B cases. Seroma was however found to be significant difference between the two groups with increased incidence in open group (p value=0.021) (**Table 4**). No urinary retention was noted in Group B as urinary catheters were placed during the operative procedure. Chronic pain was noticed among 03 cases in Group A compared to 01 cases undergone TAPP procedure. A total 04 cases of recurrence were reported during the study of which 01(2.5%) had undergone open repair while 03(7.5%) patients had undergone TAPP procedure. The mean post-operative stay between the two groups was found to be (2±1.12 vs1±0.79) which was statistically insignificant.

**Table 4. Post- operative complications during hernia repair**

S. no	Complications	Total	Open Lischetein Repair (N=73), n(%)	TAPP (N=47), n(%)	P value
1.	Seroma	11	06 (8.2)	02 (4.2)	0.021
2.	Hematoma	01	02 (2.7)	0	0.761
3.	Wound infection	03	03 (4.1)	0	0.063
4.	Chronic pain	04	03 (4.1)	01 (2.1)	0.612
5.	Recurrence	04	01 (2.5)	03 (7.5)	0.711
6.	Mean Post-operative hospital stay		2± 1.12	1±0.79	0.517

## Discussion

Inguinal hernia repair is the most frequently performed operation in general surgery. The standard method for inguinal hernia repair had changed little over a hundred years until the introduction of synthetic mesh which can be placed by either using an open or a laparoscopic approach.<sup>5-9</sup> The cause of groin hernia is probably multifactorial, with one or more factors applying in any particular case.<sup>2-4</sup> With the introduction of minimal access surgery (MIS) in past few decades hernia repair underwent radical evolution and two major laparoscopic surgeries as posterior surgical approach exists- the transabdominal preperitoneal (TAPP) procedure and the totally extra peritoneal (TEP) procedure. In this study, we compared the outcomes between laparoscopic inguinal hernioplasty (TAPP procedure) and open inguinal hernioplasty.

In the present study 73 cases underwent Lichtenstein repair while 47 cases underwent laparoscopic (TAPP) procedure. The procedure was chosen based on patient's choice and feasibility for general anesthesia. Majority of cases who underwent the hernia repair belonged to age group between (22- 79 years) were male constituting of 91.6% compared to females. Different studies have shown that groin hernias are predominantly observed in male which was also evident in our study. In a study done by Wright et al, 93.4% were male<sup>14</sup> and Heikkinen et al<sup>15</sup> (96.4% male). The large size of inguinal canal in males that provides passage for testicles and accommodates the spermatic cord contents, could be the reason why inguinal hernias are 25 times more common in male.<sup>16</sup> Furthermore, Shree Birendra hospital being an Army Hospital with male beneficiaries outnumbering female beneficiaries could be another factor for male dominance in this study. Our study showed that a vast majority of patients had indirect inguinal hernia with a percentage reaching up to 60.83%. Few other studies have shown similar results with increased predominance of indirect hernia among the adult populations. A study conducted by Heikkinen et al<sup>15</sup> found indirect hernia in 63.9%. Another study done by Winslow et al<sup>17</sup> found indirect hernias in 62% of cases and direct in 38%. The ratio of indirect to direct hernia was found to be 2:1 in a study conducted by Fitzgibbons et al.<sup>18</sup>

Mean operative time taken for open inguinal hernia repair was shorter (44.12±7.23 minutes) compared to the patients undergoing laparoscopic TAPP repair (77.43±8.77 minutes). The difference between the two procedures was found to be significant (p=0.021). These findings were similar to other studies which showed the increased time duration required among patients undergoing laparoscopic inguinal hernia repair. In the TAPP group, the operation time was significantly longer, however, the estimated blood loss was significantly less (20 ± 5 vs 10±5 mL). No intraoperative complications (bowel and bladder injury) were observed in either group in our study. In a prospective randomized multicenter trial by Pokorny et al<sup>19</sup> among 365 patients found that the intraoperative complications were evenly distributed (p value= 0.15) in both open and laparoscopic method of inguinal hernia repair. Similarly, in a meta-analysis of 614 patients (333 in laparoscopic and 312 in Lichtenstein) done by Podda et al<sup>20</sup> found that there was no significant difference (p value >0.05) between intraoperative complication following laparoscopic and open method of inguinal hernia repair which is not similar to our study.

Postoperative pain remains the major issue among the patients who have undergone either of the repair. Advantageous part of laparoscopic to open inguinal hernia repair is reduced postoperative pain.<sup>14</sup> Our study showed that, patients undergoing TAPP had experienced less pain in early postoperative period as compared to Lichtenstein method of inguinal hernia repair (VAS score of 7± 2.17, 5.17±2.11, 3.12±1.33 in 12, 12- 24 and 24- 48hrs postoperatively for open inguinal hernia repair and 5.4±1.1, 4.44±1.2, 2.17±1.02 for TAPP repair).

These findings have similarities to few other international studies. In a randomized control trial done by Umme Salma et al<sup>21</sup> the range of postoperative pain experienced following TAPP was moderate intensity (63.34%, n= 19, total cases 30) versus severe intensity of pain following Lichtenstein inguinal hernia repair (53.33%, n=30), which was similar to our study. Similarly, a randomized multicenter study done by Eklund et al, after 5 years following surgery, 1.5% reported moderate to severe pain following laparoscopic method of inguinal hernia repair versus 3.5% patient in open group.<sup>22</sup> A large meta-analysis and veteran trials stated that laparoscopic method of inguinal repair has less postoperative pain, shorter convalescence and early return to work as compared to open method. The incidence of other postoperative complications like seroma (Lichtenstein: 8.2%, TAPP: 4.22%, p value=0.021), hematoma (Lichtenstein: 6%, TAPP: 0%, p value=1.761), and wound infection (Lichtenstein =4.41, TAPP :0, p value=0.063), though being more in Lichtenstein group than in TAPP group, however they were statistically insignificant. In a systemic review and meta-analysis of 896 patients (425 cases of TAPP and 411 of Lichtenstein repair) done by Kargar et al<sup>23</sup> found that postoperative seroma (p value= 0.72), hematoma (p value= 0.76), SSI ( p value = 0.41) were more in Lichtenstein group, however they were statistically insignificant<sup>23</sup> which is similar to our study. Similarly, a randomized control trial done by Zare et al.<sup>24</sup> found that TAPP group had lower incidence of hematoma (TAPP, 6.6% vs. Lichtenstein 13.3%; P=0.67), seroma (TAPP 10% vs. Lichtenstein 13.3%; p=1.00), and infection (TAPP 0 vs. Lichtenstein 1.6%; p=0.67) though was not statistically significant. Though urinary retention was more in Lichtenstein group as patient undergoing TAPP procedure were catheterized during the procedure, however it was statistically insignificant. Our study showed that 03(4.1%) of patient undergoing open mesh repair complained of chronic pain compared to 01(2.1%) of patient undergoing laparoscopic TAPP procedure. A study done by Podda et al<sup>20</sup> found that patients who underwent laparoscopic repair experienced significantly less chronic pain (9.2 % vs. 21.5 %, p = 0.003). Another meta-analysis by Scheurman et al<sup>25</sup> in 2017 reported that patients of the laparoscopic group (0.78). Study conducted by Wright et al<sup>14</sup> observed chronic pain occurred more in open group than in laparoscopic group (5.3% vs 1.4%). There were four cases of recurrence (01 among open repair group, and 03 among TAPP group) following inguinal hernia repair during follow up period of six months. These findings were however insignificant. In a randomized control study done by Pawanindra et al<sup>26</sup> for laparoscopic and open Lichtenstein inguinal hernia repair in a follow up period of 9-13 months there was no recurrence in either group. Study done by Pokorny et al<sup>19</sup> reported that cumulative 3-year recurrence rate was 3.4% in the Bassini group, 4.7% in the Shouldice group, 0% in the Lichtenstein group, 4.7% in the TAPP group, and 5.9% in the TEP group (p = 0.48).<sup>19</sup> There are various studies that supports postoperative hospital stay is shorter in TAPP as compared to Lichtenstein method of inguinal hernia repair. These findings had the conformity



to our study with least postoperative hospital stay among the patient who have undergone laparoscopic TAPP repair compared to open repair which was statistically insignificant ( $p$  value=0.517). However, some study has shown that postoperative hospital stay in both groups is comparable. In a randomized control trial of 120 patients (60 each in TAPP and Lichtenstein group) done to compare postoperative short-term complications following TAPP and Lichtenstein method of inguinal hernia repair by Kargar et al<sup>23</sup> found that mean hospital stay in TAPP was significantly less than Lichtenstein group (TAPP,  $8.13 \pm 2.19$  days vs. Lichtenstein,  $13.15 \pm 1.5$  days;  $p < 0.001$ ). In a RCT done to compare TAPP and Lichtenstein method of inguinal hernia repair in 176 (88 patients in each group) by Akhtar et al<sup>27</sup> found that mean hospital stay in TAPP was significantly less as compared to Lichtenstein group of inguinal hernia repair ( $1.45 \pm 0.72$  days in TAPP group compared to  $2.61 \pm 0.71$  days in Lichtenstein group,  $P < 0.001$ ).

The present study has few limitations. The main limitation includes the calculation of sample size prior to the study, as sample size was not calculated, so power of the study was not known. Furthermore, Simple convenience Non-random distribution of cases was done which may have further created selection bias as patients with comorbidities are

more likely to end in open Lichtenstein group. However, these results are helpful in terms of processing prospective randomized clinical trials in future study. In conclusion, Laparoscopic inguinal hernia repair (TAPP) can effectively and safely be performed by general surgeons with consistent results in terms of low rates of complications, provided that the surgeons have the prior experience of laparoscopic surgery and follow the standard technique of repair.

## Conclusion

The Lichtenstein tension-free hernioplasty is the gold standard of primary groin hernia repair owing to the simplicity of the technique, the short learning curve, the low incidence of recurrence and post-operative complications. However, our study shows that transabdominal preperitoneal (TAPP) repair has other advantages such as high aesthetics, short hospital stay, reduced pain after surgery, and fewer postoperative complications and can be considered among adult with primary inguinal hernia.

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