Original Research Article

Comparison between lichtenstein and laparoscopic transabdominal preperitoneal repair of adult inguinal hernias – A randomized controlled study

Shruti Devendra[1], Om Kumar Sharma[2*], Sharad Seth[3]

[1]3rd Year Post Graduate, Department of General Surgery, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India

[2]Associate Professor, Department of General Surgery, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India

[3]Professor & Head of the Department, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India

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Abstract

Background: Lichtenstein tension free repair is the gold-standard technique amongst the open procedures performed for inguinal hernia repair. Advanced laparoscopic techniques are also now being widely used one of which is the transabdominal preperitoneal (TAPP) inguinal hernia repair. In this study Lichtenstein was compared with TAPP for adult inguinal hernia repair. **Objective:** To compare the two procedures in terms of operative time taken, intra-operative complications, post-operative complications, duration of hospital stay and recurrences. **Material and Methods:** A randomized controlled study was carried out in the Department of surgery, RMCH, Bareilly, Uttar Pradesh from 01 Nov 2019 to 31 Oct 2020. Hundred and twelve adult inguinal hernia patients were included and randomly allotted to Lichtenstein and TAPP repair. All data was statistically assessed using SPSS version 23. **Results:** Operative time of Lichtenstein and TAPP was 42.05±10.03 and 67.25±6.05 minutes respectively. Visual analogue score (VAS) for pain at 24 hours in Lichtenstein and TAPP group was 4.35±1.1 & 2.28±0.94 respectively and at 72 hours was 3.41±1.09 and 1.37±0.72 respectively. Wound infection was present in 4 (7.14%) patients of the Lichtenstein group no infection was observed in the TAPP group. There was no significant difference found in the groups when compared for post-operative hematoma, seroma and neuralgia. Post-operative hospital stay was significantly lower in the TAPP group (mean ± SD: 2.71 ± 0.52 days) as compared to Lichtenstein group (mean ± SD: 6.14 ±1.2 days). One patient in Lichtenstein group had recurrence on three months of follow-up.

Key words: Lichtenstein tension-free repair, Transabdominal preperitoneal (TAPP) repair, inguinal hernia

Introduction

Inguinal hernia account for 75% of all hernias and are the commonest variety of groin hernias. Males have a 27 % lifetime risk, whereas females have a 3 % lifetime risk[1]. The percentage of inguinal hernia repair performed in males is 90% as compared to 10% in females[2]. The Lichtenstein technique (61.67 %), followed by herniotomy (18.33 %), and subsequently modified Bassini's herniorrhaphy (13.33 %), are commonly performed open procedures in India[3].

Irving Lichtenstein in 1964 started performing the repair under local anesthesia and promoted its tension-free nature, so much so that the anterior tension-free mesh repair is now known as the "Lichtenstein tension-free repair" or TFR. This approach was superior to the others as it was not only tension-free, but it could also restore the transversalis fascia's strength[4]. The use of mesh has reduced the recurrence rate from 10 to 35% to less than 0.5%[5]. This is the reason for the widespread popularity of the tension-free Lichtenstein mesh repair. For this reason, it is considered the gold standard open procedure for inguinal hernia repair.

Laparoscopic inguinal hernia is a more recent technique that has been in practice for over a decade. Ger's first description of laparoscopic hernia procedure has evolved since then[6]. There are two popular approaches to introduce the mesh laparoscopically. The transabdominal preperitoneal hernia repair (TAPP) is more commonly practiced (61.9%) as compared to totally extraperitoneal repair (TEP) (38.1%)[7]. Several clinical studies comparing the Lichtenstein and TAPP procedures have been done. Each approach has its own set of benefits and drawbacks. Till date the superiority of one technique over the other has not been conclusively established, thus the need for this study.

Aims and Objectives

The aim of this study was to compare the open tension-free Lichtenstein versus laparoscopic transabdominal preperitoneal inguinal hernia repair for adults. The objectives were to compare the two procedures in terms of operative time taken in each procedure, intra-operative complications, post-operative pain, post-operative complications, duration of hospital stay and recurrences in the duration of the study.

Material and Methods

The present study was a double blinded randomized controlled study carried out from 01 November 2019 to 31 October 2020 in the Department of General Surgery, Rohilkhand Medical College and Hospital, Bareilly. All adult patients of inguinal hernia in the age group of 18 to 65 years who underwent elective Lichtenstein and TAPP repair were included in this study. **Sample size:** The study was conducted on 112 patients randomly assigned to Lichtenstein and TAPP group with 56 participants in each group. **Ethical clearance:** Data were collected after taking clearance from the Institutional ethical committee. All participants were explained about the objective of the study and informed and written consent was taken. History taking, physical examination, essential radiological examinations, blood investigations were done. Patients were explained about the

*Correspondence
Dr. Om Kumar Sharma
Associate Professor, Department of General Surgery, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India
E-mail: dr.omsharmagsvm@gmail.com

purpose, risk and benefit of the operations. **Inclusion criteria:** Patients admitted and diagnosed clinically as a case of unilateral or bilateral inguinal hernias between the age group of 18 to 65 years were enrolled in the study. **Exclusion criteria:** Patients with gross ascites, respiratory distress, with a BMI > 40, recurrent inguinal hernia and patients who were deemed unfit for surgery were excluded. **Technique: Lichtenstein:** The procedure was done under spinal anaesthesia. A 6 cm incision superior and parallel to the inguinal ligament was given and external oblique was incised from superficial to deep ring and superior and inferior flaps were made. Spermatic cord was lifted from the medial end and cremasteric fibers were dissected. The sac was identified and separated from the cord structures. The indirect sac was ligated and cut. Direct sac was simply pushed back and the defect in the transversalis fascia was repaired above it with 2-0 vicryl suture. Ten by fifteen cm size polyproplylene mesh was trimmed and stitched to the inguinal ligament by continuous 2-0 prolene sutures till the deep ring. New deep ring was created by giving a slit over at upper 2/3 and lower 1/3 of the mesh. The two tails of the mesh were over-lapped and stitched around the cord. Upper edge was stitched to the internal conjoint muscle with the interrupted sutures. Closure was done in layers. **Fig 1**. **TAPP:** The procedure was done under general anesthesia. Pneumoperitoneum was created by the Veress needle. One 10 mm port at the umbilicus and two 5 mm ports were inserted slightly below and lateral to the edge of the rectus sheath. Peritoneum was incised using scissors approximately 5 cm above the superior edge of the hernia defect, and the space between the peritoneum and the transversalis fascia was entered. Cord structures were isolated from the peritoneum. The sac and preperitoneal fat were reduced by gentle traction from the hernia orifice separating the peritoneal sac from the thinned-out transversalis fascia. The inferior flap was mobilized to a distance past the bifurcation of the vas deferens and the internal spermatic vessels. A polypropylene mesh of 10 x 15 cm was placed over the myopectineal orifice so that it completely covered the direct, indirect, femoral and obturator spaces. Tacks used for securing the mesh were helical, 5mm titanium tacks. A total of 6 to 7 tacks were used on each side. At the end the prosthesis was covered by the peritoneum with the tacks. Similar procedure was repeated on the other side for bilateral hernias. In the end closure of the ports was done. **Fig 2.**

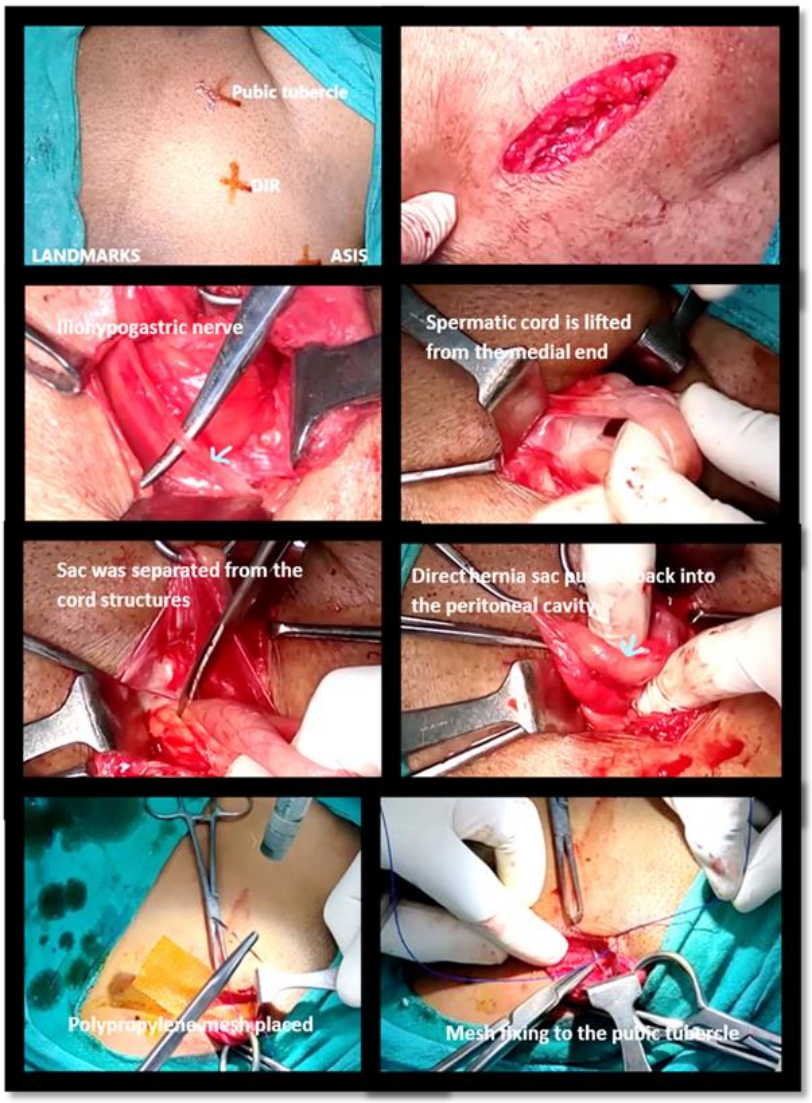

Fig 1: Lichtenstein procedure

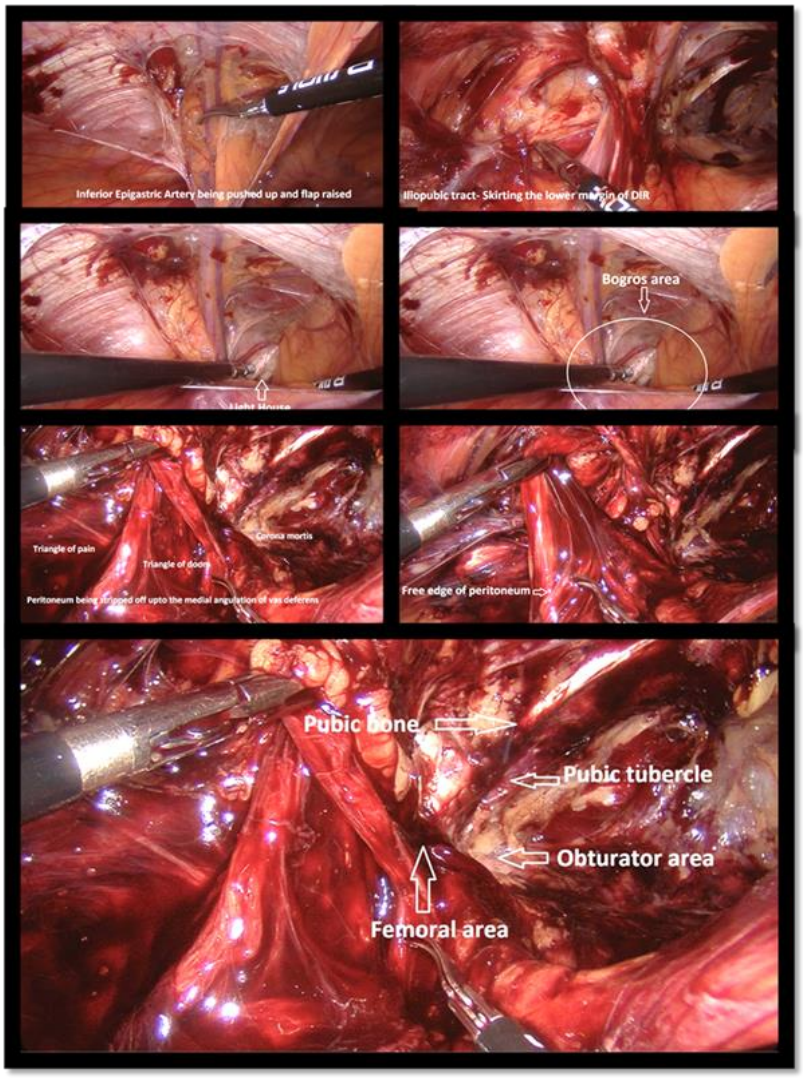

Fig 1: TAPP procedure

Results

The participant's flowchart **(Figure 1)** shows the total number of patients assessed. The mean age of patients of Lichtenstein and TAPP group was 38.25 ± 9.49 and 40.92 ± 8.72 years, respectively (table 1). All the participants were male. The characteristics of the patients and hernia are shown in the **Table 1**. The duration of surgery was significantly less (p-value <0.001*) in the Lichtenstein group (42.05 ± 10.03 minutes) as compared to TAPP group (67.25±6.05 minutes) **(Table 2).** There were 3 (5%) incidents of peritoneal buttonhole injury during TAPP hernia repair **(Table 2).** Post-operative visual analogue pain score from 1 to 10 at 24 hours was significantly lower (p <0.001*) in the TAPP group (2.28 ± 0.94) as compared to the Lichtenstein group (4.25 ± 1.1). Post-operative pain score at 72 hours was significantly lower (p <0.001*) in the TAPP group (1.3 ± 0.72) as compared to Lichtenstein group (3.4 ± 1.09). Post-operative hematoma detected on ultrasonography (USG) in the Lichtenstein and TAPP group were 2 (3.57%) and 1 (1.79%) respectively. Wound infection was present in 4 (7.14%) patients of the TFR group and was absent in the TAPP group. Seroma formation detected on USG was present in 1 (1.79%) of Lichtenstein and 4 (7.14%) patients of the TAPP group. Neuralgia was present in 3 (5.36%) patients of Lichtenstein group and was absent in the TAPP group **(Table 3).** Chronic pain was present in 4 (7.14%) patients of the Lichtenstein group and in 1 (1.79%) patient of the TAPP group **(Table 4).** Post-operative hospital stay was significantly (p value <0.001*) lower in the TAPP group (2.71 ± 0.52 days) as compared to the Lichtenstein group (6.14 ±1.2 days). One (1.79%) patient had recurrence in the Lichtenstein group and there was no recurrence observed in the TAPP group on 3 months follow-up **(Table 4)**. As per the modified Hollander score cosmetic satisfaction in the TAPP group was significantly higher than the Lichtenstein group (p value <0.001*). The modified Hollander score was 1.98 ± 0.94 and 1.32 ± 0.66 in the Lichtenstein and TAPP group respectively **(Figure 2). Figure 3** shows comparison of post-operative complications between the groups. The Lichtenstein procedure was associated with increased odds of hematoma, wound infection, neuralgia, chronic pain and recurrence whereas the TAPP procedure was associated with increased odds of seroma post-operatively. Comorbidities like diabetes mellitus type 2, Obesity, type of hernia and prolonged hospital stay were associated with increased risk of early post-operative complications **(Figure 4)**. Late post-operative complications and prolonged hospital stay (>5 days) were also found in association with diabetes, obesity, hypertension and type of surgery, **(Figure 5).**

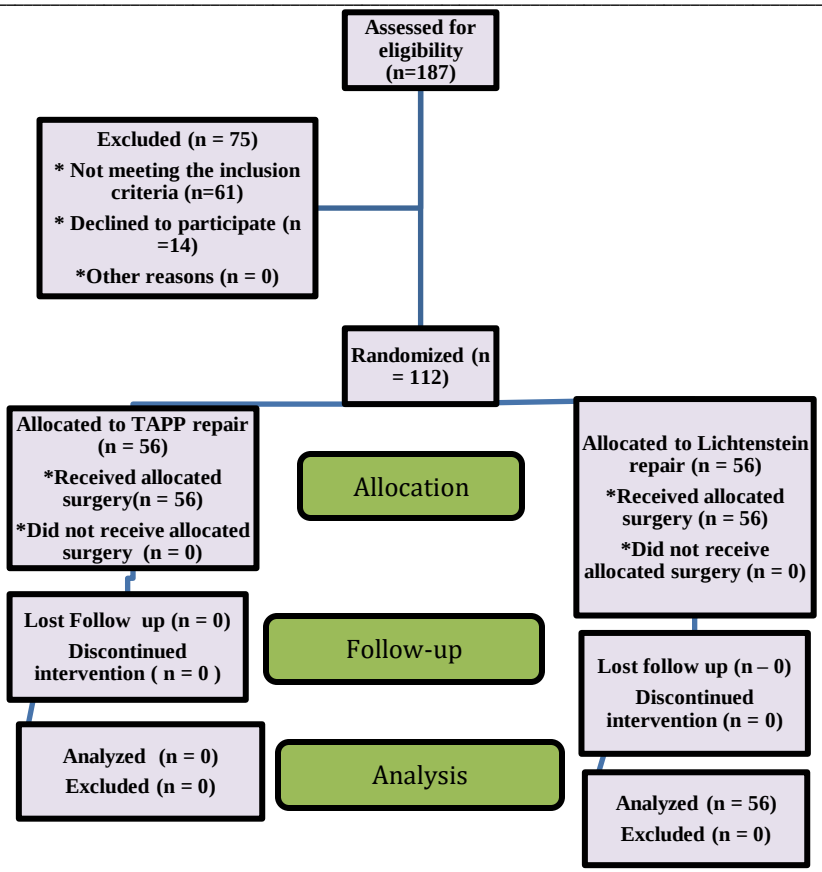

Figure 1: Participant's flowchart

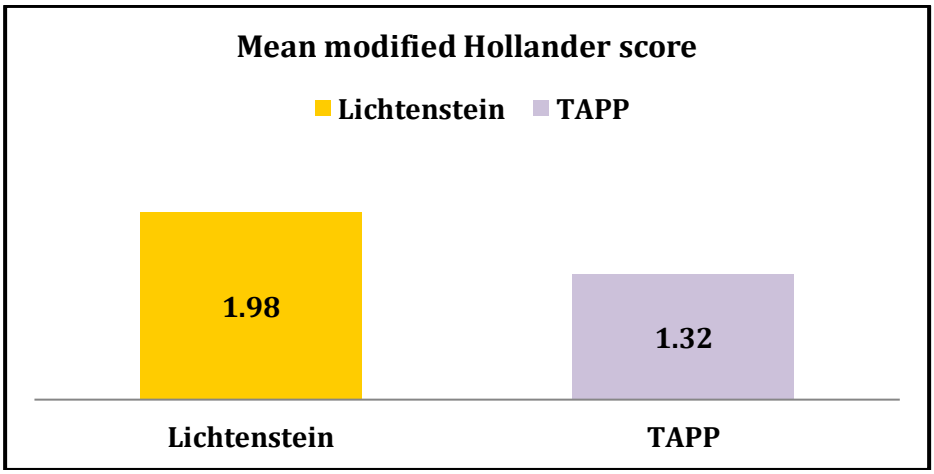

Figure 2: Mean modified Hollander score comparing Lichtenstein and TAPP groups

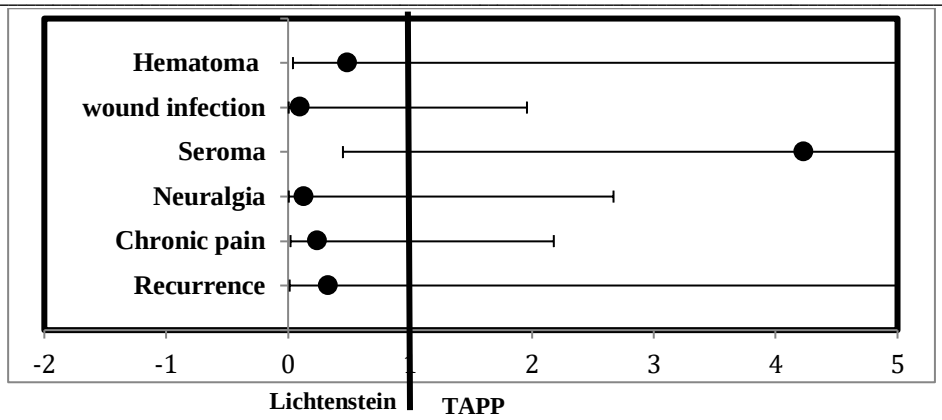

Figure 3: Forest graph showing odds ratio of the post-operative complications

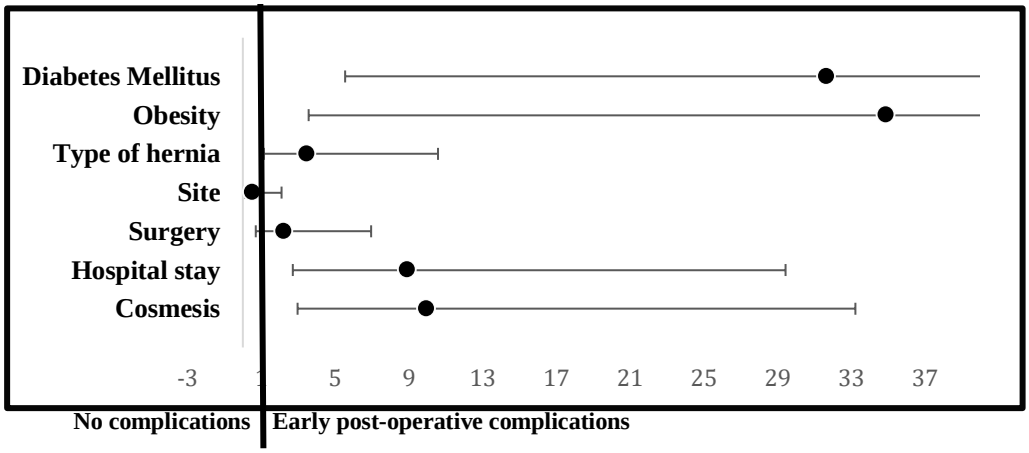

Figure 4: Forest graph showing different factors compared with early post-operative complications

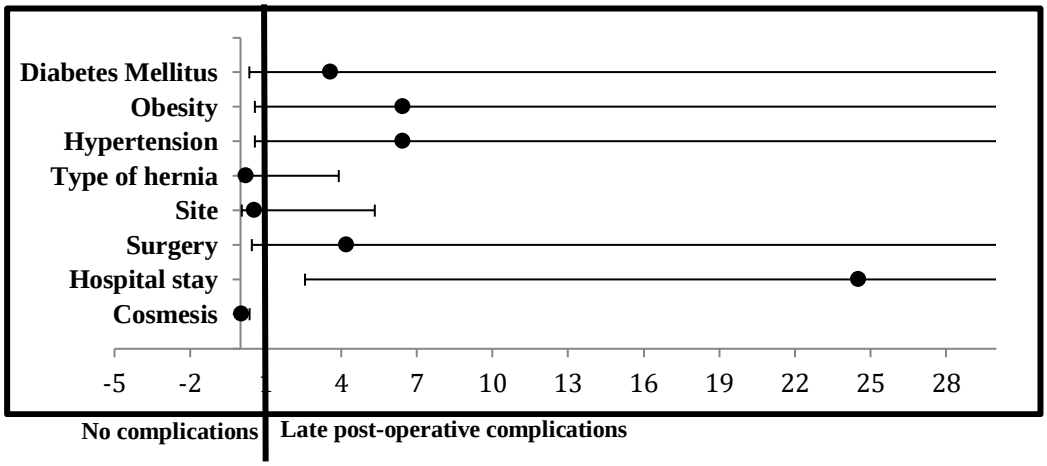

Figure 5: Forest graph showing different factors compared with late post-operative complications

Table 1: Characteristics of patients and hernia

Characteristics of patients and hernia		Lichtenstein repair (n=56)		TAPP repair (n=56)	
		no.	%	no.	%
Gender	Male	56	100	56	100
	Female	0	0	0	0

Age	**Age in years (mean ± 9.49)**	38.25 ± 9.49		40.92 ± 8.72	
DM type 2	**Diabetic**	2	3.57	6	10.71
	Non-diabetic	54	96.43	50	89.29
Obesity	**Obese**	1	1.79	4	7.14
	Non-obese	55	98.21	52	92.86
Hypertension	**Hypertensive**	3	5.36	2	3.57
	Non-hypertensive	53	94.64	54	96.43
Hernia type	**Direct**	18	32.14	14	25
	Indirect	38	67.86	42	75
Site	**Right**	45	80.35	41	73.21
	Left	5	8.92	7	12.5
	Bilateral	6	10.71	8	14.28
Hernia sac content	**Bowel**	53	94.64	52	92.85
	Omentum	3	5.3	4	7.1

Table 2: Operative data

Operative data		**Lichtenstein repair (n=56)**		**TAPP repair (n=56)**		**Chi-sq test/t-test p value**
		no.	**%**	**no.**	**%**	
Operative time	**Mean**	42.05		67.25		<0.001*
	Stand. Deviation	10.03		6.05		
Intra-operative complications						
Intra-op peritoneal buttonhole injury	**Present**	0	0	3	5	0.13
	Absent	56	100	53	95	

Table 3: Early post-operative complications

Early post-operative complications		**Lichtenstein repair (n=56)**		**TAPP repair (n=56)**		**Chi-sq test/t-test p value**
		no.	**%**	**no.**	**%**	
Pain Score (VAS)	**At 24 hours (mean ± SD)**	4.35 ± 1.1		2.28 ± 0.94		<0.001*
	At 72 hours (mean ± SD)	3.41 ± 1.09		1.3 ± 0.72		<0.001*
Hematoma	**Present**	2	3.57	1	1.79	0.56
	Absent	54	96.43	55	98.21	
Seroma	**Present**	1	1.79	4	7.14	0.17
	Absent	55	98.21	52	92.86	
Wound infection	**Present**	4	7.14	0	0	0.04*
	Absent	52	92.86	56	100	
Neuralgia	**Present**	3	5.36	0	0	0.12
	Absent	53	94.64	56	100	

Table 4: Late post-operative complications

Summary table: late post-operative complications		**Lichtenstein repair (n=56)**		**TAPP repair (n=56)**		**Chi-sq test/t-test*p value**
		no.	**%**	**no.**	**%**	
Chronic pain	**Present**	4	7.14	1	1.79	0.17
	Absent	52	92.86	55	98.21	
Recurrence	**Present**	1	1.79	0	0	0.32
	Absent	55	98.21	56	100	

Discussion

This study was conducted on 112 patients at Rohilkhand Medical College and Hospital Bareilly, Uttar Pradesh. All the participants were male patients of inguinal hernia and were randomly assigned to undergo Lichtenstein and TAPP hernia surgery. Each group had 56 patients. The factors studied were demographics, comorbidities,

clinical presentation, type and site of inguinal hernia. Operative time, intra-operative complications like bleeding, peritoneal buttonhole injury; early and late post-operative complications like post-operative pain, hematoma, seroma, wound infection, genital swelling, neuralgia, chronic pain and recurrence were compared. The mean age of patients in Lichtenstein group was 38.25±9.49 years and TAPP hernia repair group was 40.92±8.72 years. A study in year 2021 by Karim et al. had a similar age distribution[8]. The operative time of the Lichtenstein group 42.05±10.03 minutes was significantly less as compared to the TAPP group 67.25±6.05 minutes which are similar to the observations in a metanalysis conducted by Yunxiao Lyu et al. in the year 2020[9]. Intra-operative bleeding was not significant in any of the groups. Peritoneal buttonhole injury occurred in 3 (5%) patients of TAPP group which was safely overlapped and tacked. Post-operative VAS score for pain from 0 to 10 was monitored at 24 hours and at 72 hours. At 24 hours the mean VAS score was 4.35 ± 1.1 in the Lichtenstein group and 2.28 ± 0.94 in the TAPP group after giving injection diclofenac 75 mg 12 hourly to each group. VAS score at 72 hours with the same post-operative analgesics was 3.41 ± 1.09 and 1.3 ± 0.72 in Lichtenstein and TAPP group respectively. A study by Bin Yang et al. in year 2018 had similar observations[10]. Post-operative hematoma occurred in 2 (3.57%) patients of Lichtenstein group and 1 (1.79%) patient of TAPP group. Wound infection was seen in 4 (7.14%) patients of Lichtenstein group and was not seen in the TAPP group patients. Seroma was observed in 1 (1.79%) patient of Lichtenstein group and 4 (7.14%) patients of TAPP group. Post-operative surgical site infection although minor and superficial was significantly higher in the Lichtenstein group patients whereas seroma formation and hematoma between the Lichtenstein and TAPP group was statistically non-significant. Meta-analysis by Yunxiao Lyu et al. showed that there was no significant difference in the occurrence of post-operative hematoma and seroma formation between TEP, TAPP and Lichtenstein groups. TAPP however was associated with maximum number of hematoma formation and TEP was associated with highest number of seroma cases. Wound infection was higher in the Lichtenstein group compared to the TEP but there was no statistical difference among the three groups in the surgical site wound infections[9]. Sudarshan et al (2017) observed post-operative neuralgia in 2 patients out of 30 in open mesh repair group but in none of the patients of laparoscopic hernia repair group. Similar observations were seen in our study, the post-operative neuralgia was observed in 3 (5.36%) patients of Lichtenstein group and 0 (0.00%) patients of the TAPP group. Mean hospital stay of Lichtenstein group was 6.14 ± 1.2 days and of TAPP group was 2.71 ± 0.52 days[11]. Sudarshan et al (2017) observed a mean hospital stay of 7.8 days in the Lichtenstein group whereas 3.07 days in the TAPP group. The observations are similar in both the studies[11]. Persistent pain post-operatively (for more than 3 months) was seen in 4 (7.14%) patients of the Lichtenstein group and in 1 (1.79%) patient of TAPP hernia group. A meta-analysis by Fortes TB et al. published in year 2020 showed similar results of persistent post-operative pain higher in the Lichtenstein group[12]. The recurrence rate of 1.7% in the Lichtenstein group and 0% in the TAPP group was observed on 3 months follow-up. A study by Yang B et al. in 2018had a similar recurrence rate[11]. Cosmetic satisfaction was significantly higher in the TAPP group 53 (95%) than the TFR group 41 (73%). A study by Elmessiry et al. (2020) found similar observations of cosmetic satisfaction between the groups[13].

Conflict of Interest: Nil Source of support: Nil

Limitation of the study

Recurrence was followed for a period of 3 months but needs to be followed for 1 to 2 years for a proper evaluation of the efficacy of the procedures.

Conclusion

A comparison between the Lichtenstein and TAPP procedure for inguinal hernia showed that the Lichtenstein procedure has a shorter duration of surgery, but a post-operative infection was significantly higher. TAPP procedure proved to have better cosmetic outcome, minimal pain, shorter duration of hospital stay and less risk of post-operative wound infection. There was no significant advantage of one procedure over the other.

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