Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 9s, https://carcinogenesis.com/

Comparison of outcome of total extra-peritoneal repair versus open hernia repair in inguinal hernia

Zeeshan Ishaque[1], Saad Bin Abdul Qudus[2], Mustansar Iqbal[3], Muhammad Hassan[4], Muhammad Ahmad Yusuf[5], Mohibba Azam[6]

1MBBS, THQ Hospital Ferozwala, Sheikhupura

Zshanisaq@gmail.com

2MBBS, FCPS(General surgery), MRCS(ENG), Mayo Hospital, Lahore

Saadqudus6@gmail.com

3MBBS, DHQ Hospital , Sheikhupura

Mustansarmughal47@gmail.com

4MBBS, FCPS(Surgery), Assistant Professor General Surgery, Sharif Medical & Dental College, Lahore

drmay26@gmail.com

5MBBS, BSc ,MD, General Physician & Surgeon Life Support Certification: ACLS, ATLS, BLS, PALS, CPR

Drmohibbaazam9@hotmail.com

6MBBS, Omar Hospital and Cardiac Centre, Lahore

Corresponding Author:

Zeeshan Ishaque

ABSTRACT

Introduction: Most patients with an inguinal hernia are symptomatic and the treatment of choice is surgical repair with mesh using open or laparoscopic approach. Laparoscopic inguinal hernia repair can be done by total extra peritoneal (TEP) approach. The choice of approach to the laparoscopic repair of inguinal hernia is controversial because of scarcity of data comparing the two approaches and some questions remain unanswered about their relative merits and risks.

Objectives: To compare the outcome of total extra-peritoneal repair versus open hernia repair in inguinal hernia.

Study Design: Randomized Controlled Trial

Study Duration: 1st June 2021 to 30th November 2021.

Settings: Department of General Surgery, Services Hospital, Lahore.

Materials & Methods: A total of 60 patients aged 20-70 years presenting with inguinal hernia undergoing surgery under general anesthesia were included. Patients with ASA III or IV, redo surgery or recurrent hernia (on medical record), liver disease (ALT & AST >40IU, hepatitis B or C), renal dysfunction (creatinine>2mg/dl or on hemodialysis), anemia (HB<10g/dl) and BMI >35 kg/m2, incarcerated or massive scrotal hernias were excluded. In group A, patient were undergone surgery by TEP. In group B, patient were undergone open surgery. All surgeries were done by a single surgical team with assistance of researcher under general anesthesia. Doing surgery, operative time was noted. Postoperatively patients were shifted in post-surgical wards and were discharged and total hospital stay was noted.

Results: Mean operative time in Group A (total extra-peritoneal repair) was 64.40 ± 7.66 minutes while in Group B (open hernia) was 87.30 ± 5.86 minutes (p-value = 0.0001). Mean post-operative pain in Group A (total extra-peritoneal repair) was 1.63 ± 1.07 while in Group B (open repair) was 3.23 ± 1.38 (p-value = 0.0001).

Wound infection occurred in 3.33% cases in open method while did not occur in any case in TEP group. Also urinary retention occurred in 6.67% cases in open method group while nil in TEP group (p>0.05).

Conclusion: This study concluded that total extra-peritoneal repair results in less operative pain and hospital stay as compared to open repair of inguinal hernia.

Keywords: *Inguinal Hernia, Total Extra-Peritoneal Repair, Hospital Stay*

How to Cite: Zeeshan Ishaque, Saad Bin Abdul Qudus, Mustansar Iqbal, Muhammad Hassan, Muhammad Ahmad Yusuf, Mohibba Azam, (2025) Comparison of outcome of total extra-peritoneal repair versus open hernia repair in inguinal hernia, *Journal of Carcinogenesis*, *Vol.24, No.9s*, 650-661

1. INTRODUCTION

Inguinal hernia can be repaired through numerous approaches either by conventional open or laparoscopic technique. Few factors are contributing to the increasing popularity of laparoscopic approach: firstly the several studies that showed the benefits and advantages of the technique then, the widest application of laparoscopic techniques in all fields of surgery including advanced procedures, making the, once defined "difficult to learn", laparoscopic hernia repair easier and lastly.1 Risk factors for the development of a hernia include: smoking, chronic

obstructive pulmonary disease, obesity, pregnancy, peritoneal dialysis, collagen vascular disease, and previous open appendectomy, among others.2 Hernias are partly genetic and occur more often in certain families. It is unclear if inguinal hernias are associated with heavy lifting. Hernias can often be diagnosed based on signs and symptoms. Occasionally medical imaging is used to confirm the diagnosis or rule out other possible causes.2

Most patients with an inguinal hernia are symptomatic and the treatment of choice is surgical repair with mesh using open or laparoscopic approach. The use of mesh varies worldwide from 0 to 5% in low-resource countries to 95% in high-resource countries.2 Laparoscopic inguinal hernia repair can be done by total extra peritoneal (TEP) approach. The choice of approach to the laparoscopic repair of inguinal hernia is controversial because of scarcity of data comparing the two approaches and some questions remain unanswered about their relative merits and risks.3

This single general surgeon experience supports total extra peritoneal inguinal hernia repair without mesh fixation as a safe, effective procedure with low morbidity and no evidence of recurrence.4 One trial reported that the TEP procedure was faster than open method (40.8±8.3 min vs 46.3±7.1 min) ($P<0.001$), Hospital stay was significantly shorter in the TEP group (1.2±1.2 days vs 3.9±1.3 days in the open method group). Wound infection occurred in 1.8% cases in open method while did not occur in any case in TEP group also urinary retention occurred in 4.5% cases in open method group while nil in TEP group ($p>0.05$).5 But another trial found that mean operative time was 58.6±18.1 vs. 57.2±17.8, urinary retention was 6.3% vs. 1.7% and wound infection was 0.9% vs. 1.3% ($p>0.05$), respectively in TEP versus open repair method.6

While other studies concluded that TEP and open mesh repair are equivalent in most of the analyzed outcomes.7 TEP was associated with more operative complications, and higher operative costs; however, total costs were comparable for the two procedures. Chronic pain and impairment of inguinal sensibility were more frequent after Lichtenstein repair.8

Rationale of this study was to compare the outcome of total extra-peritoneal repair versus open hernia repair in inguinal hernia. Literature has reported conflicting results regarding the outcomes of TEP and open repair method for inguinal hernia. This created a dispute whether to rely on TEP or open method is reliable as it is done in routine. Moreover, no local literature found in this regard. So we want to conduct this study to get local evidence that can be implemented in local setting in future and more appropriate and reliable method can be applied in future for inguinal hernia repair. Patient satisfaction was also significantly higher after TEP. Therefore, TEP should be recommended in experienced hands.

Periprocedural care:
Preprocedural Planning:
For better hemostasis, sharp dissection is preferred to blunt dissection. This is one operation in which, as the saying goes, every red blood cell must be caught.

If a lipoma is present in the spermatic cord, as is often the case, it should be excised to reduce the bulk of the cord; cord structures, however, must be protected. Some surgeons excise the cremaster muscle fibers in the cord; others prefer not to.

With a direct hernia, the sac is not dissected and opened, as is done with an indirect inguinal hernia. Rather, it is inverted (pushed back) into the extraperitoneal space, sometimes with plication of the transversalis fascia.

Bilateral hernias can be repaired in a single procedure, especially with a Lichtenstein tension-free mesh hernioplasty. Some surgeons, however, prefer to repair only one hernia at a time, deferring repair of the other for about 4-6 weeks; this avoids the risk of bilateral infection and the higher risk of penile and scrotal edema after bilateral inguinal hernia repair.

If the hernia is irreducible or obstructed, the sac should be opened first at its fundus, before it is dissected up to its neck, to allow evacuation of toxic fluid and inspection of the bowel for ischemia. If the conventional technique, in which the sac is first completely dissected up to its neck, is followed, the ischemic bowel may slip back into the peritoneal cavity before the sac is opened at its fundus and may then be difficult to retrieve for inspection.

Ischemic bowel is blue-black and thick-walled, lacks luster, feels firm to the touch, and has no peristalsis. The bowel must be wrapped in moist warm packs, and 100% oxygen should be delivered for a few minutes. The bowel is then reassessed for viability. Any nonviable bowel will have to be resected.

Equipment
No special equipment is required for inguinal hernia repair. Standard operating room anesthesia equipment, outfitted for possible conversion to general anesthesia and endotracheal intubation, is required. For high-risk patients with comorbid conditions, a cardiac monitor and a pulse oximeter should be available.

A standard open surgical tray should be available. Instruments and materials on hand may include the following:

- Syringe
- 25-Gauge needle
- Surgical knife with blade
- Mosquito forceps
- Dissecting scissors
- Polypropylene (Prolene) or polyester mesh
- Langenbeck retractors
- Adson thumb forceps
- Needle holder
- Sutures (absorbable or nonabsorbable)
- Penrose drain or umbilical tape
- Noncrushing intestinal clamps (in case bowel resection is required, in a strangulated hernia)

A self-retaining (e.g. Adson) retractor, though not essential, may eliminate the need for an assistant. The umbilical tape or Penrose drain may be used to retract the mobilized spermatic cord, but a hernia ring forceps can also be used. If the neck of the hernia sac is particularly tight, the use of a grooved probe or dissector may help minimize injury to the contents.

The mesh must be a permanent material large enough to produce a wide overlap beyond the defect's edges (e.g. 5 × 10 cm to 7.5 × 15 cm). Many manufacturers have now shifted toward lighter, more porous constructions that maintain the strength of the repair but putatively reduce the inflammatory response.62-65 These meshes may decrease long-term discomfort, but possibly at the cost of increased recurrence rates (e.g. from inadequate fixation or overlap).

The question of absorbable versus permanent sutures to secure the mesh is based on surgeon preference; to date, there has been no evidence conclusively favoring one type over the other. Sutures made of polyglactin (Vicryl) or polypropylene are commonly used, with undyed polyglactin often preferred for subcutaneous tissue. A theoretical advantage of absorbable suture is that if nerve impingement is inadvertently caused, the suture material disappears with time. The authors prefer to use absorbable (2-0 polyglactin) sutures for mesh fixation.

Patient Preparation:
Anesthesia:
Inguinal hernia repair can be performed with the following types of anesthesia:
- General
- Regional (spinal epidural)
- Local (infiltration field block)

The choice of anesthesia technique may be influenced by patient preferences and the medical history. The current trend toward increasing utilization of ambulatory surgery tends to favor local anesthesia, which allows quick recovery time and thus is safe for early discharge. For older patients or those with high American Society of Anesthesiologists (ASA) scores (indicating underlying cardiovascular or pulmonary disease), local anesthesia causes much less hemodynamic compromise and is far better tolerated than general anesthesia.

For Lichtenstein hernioplasty, local anesthesia is safe and generally preferable. By permitting immediate postoperative mobilization and discharge of the patient on a day-care basis, it helps minimize the length of the hospital stay, the incidence of complications, and the cost of treatment. In addition, a patient under local anesthesia can be asked to cough during the procedure to help the surgeon identify any additional hernias that may be present and to confirm the adequacy of the prosthetic repair.

Large randomized control trials have found overall anesthesia time, urinary retention, and postoperative pain to be less after local anesthesia than after regional or general anesthesia.66,67 Although a follow-up study of recurrence by Nordin et al reported an increase in reoperation for recurrence in the local anesthesia group, the investigators suggested that this increase may be negated with increasing use of the Lichtenstein mesh technique and concluded that further follow-up is warranted.68

When hernia repair is performed under local anesthesia, patients still feel the discomforts of pressure and traction; such discomforts can be minimized by administering anxiolytic agents. Additionally, the patient must always give consent for the possibility of conversion to general anesthesia should he or she experience difficulty in tolerating the procedure because of anxiety or discomfort.

Commonly used local anesthetics include the following69:
- 0.5-1% lidocaine with epinephrine
- 0.25% bupivacaine
- A combination of these 2 agents in a 50:50 mixture

A field block is applied by injecting along the site of incision, from superficial to deep, and lateral to the pubic tubercle, to provide anesthesia to the deeper structure. To block the ilioinguinal nerve, an injection is placed just medial to the anterior superior iliac spine.70

Additional amounts of the local agent may be injected throughout the procedure. For example, administration of the agent below the fibers of the external oblique aponeurosis, as described by Lichtenstein's group, anesthetized the three major nerves by flooding the enclosed inguinal canal and served to hydrodissect the underlying ilioinguinal nerve (thus making it less prone to injury when the aponeurosis was incised).71

Other techniques, such as epidural anesthesia, have been widely reported, but results depend largely on local expertise.

Elective inguinal hernia repair is considered a clean procedure and, as such, should carry a surgical site infection rate of less than 2%. The data remain controversial, but one meta- analysis supported the use of antibiotic prophylaxis in the performance of a mesh-based repair.71 Cephalosporins (e.g. cefazolin) are commonly administered by the anesthesiologist in a single dose before the skin incision.72 A properly powered, prospectively randomized study is needed to determine whether such prophylaxis is necessary.

Positioning:
The correct surgical side (left or right) should be confirmed and marked preoperatively in the holding area.

The patient should be placed in the supine position, with the upper extremities comfortably secured. He or she should be at ease, and the position should be comfortable for the surgical team. For large defects, slight Trendelenburg positioning may facilitate exposure by reducing the visceral contents into the abdomen.

The surgical site is prepared and draped in standard surgical fashion, so that the patient's upper abdomen and lower limbs are covered and only the intended operative groin site is exposed. The patient's head is left open to allow conversation with the surgeon. The surgeon stands on the side of the patient where the hernia is located, and the assistant stands on the opposite side.

2. MATERIALS & METHODS

This randomized controlled trial was conducted in the Department of General Surgery, Services Hospital, Lahore, over a period of six months from 1st June 2021 to 30th November 2021. A total of 60 patients were included, with 30 patients allocated to each group, and the sample size was calculated using an 80% power of study and a 95% confidence level, based on the mean hospital stay of 1.2 ± 1.2 days for totally extraperitoneal (TEP) repair and 3.9 ± 1.3 days for open inguinal hernia repair. Non-probability consecutive sampling was employed. Patients aged 20–70 years presenting with

inguinal hernia and undergoing surgery under general anesthesia were included, while those with ASA grade III or IV, recurrent or redo hernia, liver disease (ALT or AST >40 IU/L or hepatitis B/C positive), renal dysfunction (creatinine >2 mg/dL or on hemodialysis), anemia (hemoglobin <10 g/dL), body mass index >35 kg/m², and incarcerated or massive scrotal hernias were excluded from the study.

3. DATA COLLECTION PROCEDURE

After taking approval from hospital ethical committee, 60 patients fulfilling the inclusion criteria were enrolled in the study through wards of Department of Surgery, Services Hospital, Lahore. An informed written consent was obtained. Demographic details like name, age, BMI, duration of symptoms, h/o diabetes (BSR>200mg/dl) were noted. Then patients were randomly divided in two groups by using lottery method. In group A, patient were undergone surgery by TEP. In group B, patient were undergone open surgery. All surgeries were done by a single surgical team with assistance of researcher under general anesthesia. Doing surgery, operative time was noted. Postoperatively patients were shifted in post-surgical wards and were discharged and total hospital stay was noted. All this information was recorded on proforma (attached). All the data was analyzed in SPSS 22.0. Mean and standard deviation were calculated for age, BMI, duration of symptoms, operative time and hospital stay. Frequency and percentage were calculated for gender, h/o diabetes, urinary retention and wound infection. Independent samples t-test was applied to compare mean operative time and hospital stay in both groups. P-value ≤0.05 was considered as significant.

Data was stratified for age, gender, BMI, duration of symptoms and diabetes. Post-stratification, both groups were compared for outcome by using independent t test in each strata. P-value ≤0.05 was considered as significant.

4. RESULTS

Age range in this study was from 20 to 70 years with mean age of 40.87 ± 13.67 years. The mean age of patients in group A was 38.80 ± 13.01 years and in group B was 41.07 ± 13.85 years. Majority of the patients 34 (56.67%) were between 20 to 45 years of age as shown in Table I. Mean duration of disease was 8.31 ± 2.35 months (Table II). Mean BMI was 27.76 ± 2.88 kg/m2 (Table III).

Distribution of patients according to DM & gender is shown in Table IV & V respectively.

Mean operative time in Group A (total extra-peritoneal repair) was 64.40 ± 7.66 minutes while in Group B (open hernia) was 87.30 ± 5.86 minutes as shown in Figure I (p-value = 0.0001). Mean post-operative pain in Group A (total extra- peritoneal repair) was 1.63 ± 1.07 while in Group B (open repair) was 3.23 ± 1.38 (p-value = 0.0001) as shown in Figure II. Wound infection occurred in 3.33% cases in open method while did not occur in any case in TEP group. Also urinary retention occurred in 6.67% cases in open method group while nil in TEP group (p>0.05). Stratification of operative time with respect to age, gender, BMI, duration of symptoms and diabetes is shown in Table VI. Stratification of hospital stay with respect to age, gender, BMI, duration of symptoms and diabetes is shown in Table VII.

Table-I: Age distribution for both groups (n=60).

Age (years)	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
20-45	18	60.0	16	53.33	34	56.67
46-70	12	40.0	14	46.67	26	43.33
Mean ± SD	**38.80 ± 13.01**	**41.07 ± 13.85**	**40.87 ± 13.67**			

Table-II: Distribution of patients according to duration of disease

Duration of disease (in months)	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
≤6 months	07	23.33	05	16.67	12	20.0
>6 months	23	76.67	25	83.33	48	80.0
Mean ± SD	**8.27 ± 2.33**	**8.43 ± 2.34**	**8.31 ± 2.35**			

Table-III: Distribution of Patients according to BMI.

BMI (kg/m^2)	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
≤27	12	40.0	15	50.0	27	45.0
>27	18	60.0	15	50.0	33	55.0
Mean ± SD	28.0 ± 2.96		27.33 ± 2.84		27.76 ± 2.88	

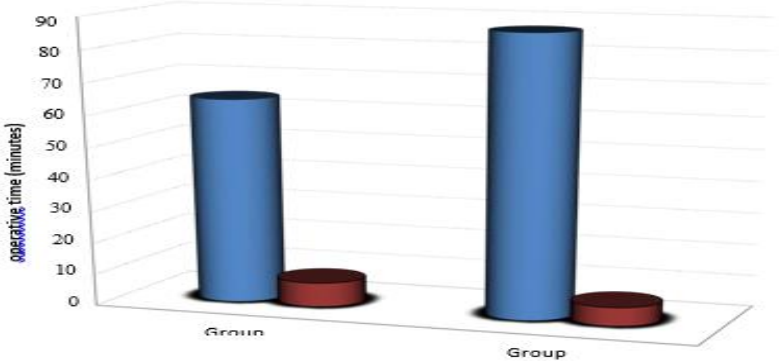
Table-IV: Distribution of patients according to DM

DM	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
Yes	11	36.67	12	40.0	23	38.33
No	19	63.33	18	60.0	37	61.67

Table-V: Distribution of patients according to gender.

Gender	Group A (n=30)		Group B (n=30)		Total (n=60)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
Male	30	100.0	30	100.0	60	100.0
Female	00	0.0	00	0.0	00	0.0

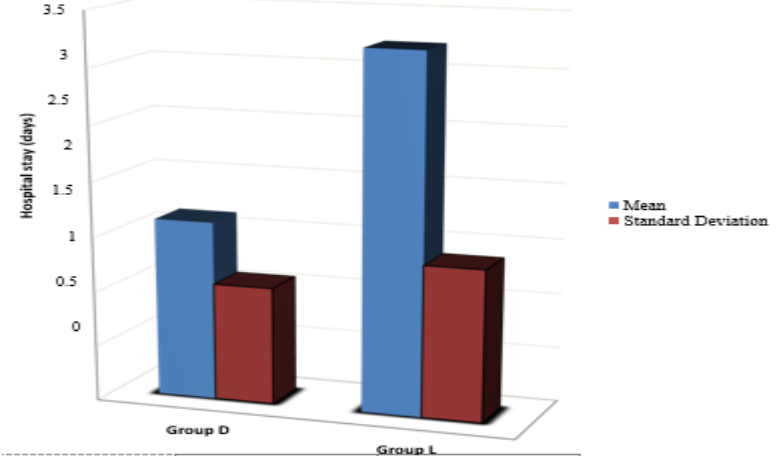
Figure I: Mean operative time in both groups.



	Group D	Group L
Mean	64.4	87.3
Standard Deviation	7.66	5.86

P-value = 0.0001 which is statistically significant

Figure II: Mean hospital stay in both groups.



	Group D	Group L
Mean	1.63	3.23
Standard Deviation	1.07	1.38

P-value = 0.0001 which is statistically significant

Table VI: Stratification of Operative time with respect to age, gender, BMI, duration of symptoms and diabetes.

		Group A (n=30)		Group B (n=30)		P-value
		Operative time (minutes)		Operative time (minutes)		
		Mean	SD	Mean	SD	
Age (years)	**20-45**	65.0	7.57	87.13	6.30	**0.0001**
	46-70	63.50	8.05	87.50	5.53	**0.0001**
Duration (months)	**≤6**	64.43	3.91	85.20	6.38	**0.0001**
	>6	64.39	8.56	87.72	5.79	**0.0001**
BMI (kg/m^2)	**≤27**	59.67	8.12	86.93	5.35	**0.0001**
	>27	67.56	5.59	87.67	6.49	**0.0001**
Gender	**Male**	64.40	7.66	86.30	5.86	**0.0001**
	Female	0.0	0.0	0.0	0.0	**----**
DM	**Yes**	67.45	6.66	87.25	6.06	**0.0001**
	No	62.63	8.58	87.33	5.89	**0.0001**

Table VII: Stratification of hospital stay with respect to age, gender, BMI, duration of symptoms and diabetes.

		Group A (n=30)		Group B (n=30)		P-value
		Hospital stay		Hospital stay		
		Mean	SD	Mean	SD	
Age (years)	**20-45**	1.67	1.19	3.44	1.50	**0.0001**
	46-70	1.58	0.90	3.0	1.24	**0.0001**
Duration (months)	**≤6**	1.71	1.38	2.20	0.45	**0.0001**
	>6	1.61	0.99	3.44	1.42	**0.0001**
BMI (kg/m^2)	**≤27**	2.08	0.99	3.53	1.25	**0.0001**
	>27	1.33	1.03	2.93	1.49	**0.0001**
Gender	**Male**	1.63	1.07	3.23	1.38	**0.0001**
	Female	0.0	0.0	0.0	0.0	**-----**
DM	**Yes**	1.55	0.93	3.25	1.60	**0.0001**
	No	1.68	1.16	3.22	1.26	**0.0001**

5. DISCUSSION

Success of groin hernia repair is measured primarily by the permanence of the operation, fewest complications, minimal costs, and earliest return to normal activities. This success largely depends upon the surgeon's competencies, preoperative patient selection and preparation, knowledge and experience of effective use of surgical techniques and currently available materials for repair.1 Endoscopic hernia surgery has increased significantly with the introduction of new operating techniques during the past decade. Day care open hernia surgery is routinely being performed in selected centers all over the world. Prolonged hospital stay and post operative pain are of more concern for patients immediately after surgery. Surgeons performing laparoscopic hernioplasty claim that there is decreased post operative pain and short postoperative hospital stay as compared to open hernioplasty.78, 79 Anyway controversy persists regarding the most effective inguinal hernia repair.

I have conducted this study to compare the outcome of total extra-peritoneal repair versus open hernia repair in inguinal hernia. Mean operative time in Group A (total extra-peritoneal repair) was 64.40 ± 7.66 minutes while in Group B (open hernia) was 87.30 ± 5.86 minutes (p-value = 0.0001). Mean post-operative pain in Group A (total extra-peritoneal repair) was 1.63 ± 1.07 while in Group B (open repair) was 3.23 ± 1.38 (p-value = 0.0001). Wound infection occurred in 3.33% cases in open method while did not occur in any case in TEP group. Also urinary retention occurred in 6.67% cases in open method group while nil in TEP group ($p>0.05$). One trial reported that the TEP procedure was faster than open method (40.8±8.3 min vs 46.3±7.1 min) ($P<0.001$), Hospital stay was significantly shorter in the TEP group (1.2±1.2 days vs 3.9±1.3 days in the open method group). Wound infection occurred in 1.8% cases in open method while did not occur in any case in TEP group also urinary retention occurred in 4.5% cases in open method group while nil in TEP group ($p>0.05$).5 But another trial found that mean operative time was

58.6±18.1 vs. 57.2±17.8, urinary retention was 6.3% vs. 1.7% and wound infection was 0.9% vs. 1.3% (p>0.05), respectively in TEP versus open repair method. 6

In a local study80, a total 60 patients of direct inguinal hernia were included. The mean age was 61.48±7. The range of postoperative pain experienced was 5.55 as per VAS among all patients. In group-I (open hernioplasty) majority of patients (53.33%, n=16) experience severe type of pain where as in group-II, moderate severity of pain was reported by large number of patients (63.34%, n=19). The mean postoperative pain intensity as per VAS was 6.23 in group-I and 4.43 in group-II patients.80

Regarding postoperative pain, it is reported in literature that the laparoscopic repair is associated with less pain as compared to open herniorrhaphy. The p value for postoperative pain is 0.032 in our study which is quite significant and concludes that the patient who had laparoscopic hernioplasty experienced less pain postoperatively as compared to those having open herniorrhaphy. The same results were also concluded from the review of 41 Cochrane studies,81 TULIP Trial82 and other studies.83 On the contrary, a multicenter trial conducted at Austria concludes no significant difference in complications and recurrence rate between laparoscopic and open hernioplasty.84 Similarly, a meta analysis conducted at Aberdine, UK conclude that the open and laparoscopic hernia repair are equally effective procedures and choice between them should be made on a case to case basis depending on patient preference and other characteristics such as age, work, health status etc.85 Many national and international studies also conclude no significant difference in morbidity and recurrence between both modalities but operating time is more in laparoscopic herniorrhaphy.85,86

In a study87 from 11 hospitals, 1371 men underwent surgery, 665 in the TEP group and 706 in the Lichtenstein group. The median duration of operation was 55 min for both procedures and 91.0 percent of the patients in both groups were discharged on the day of operation. Patients in the TEP group experienced less postoperative pain (P<0.001), consumed fewer analgesics (P<0.001), had a shorter period of sick leave (7 versus 12 days; P<0.001) and a shorter time to resumption of normal physical activity (20 versus 31 days; P<0.001). 87 Sven Bringman et al. showed in their study there was less postoperative pain and shorter time to full recovery in TEP compared to both open methods. Meta-analysis showing that laparoscopic repair had a shorter rehabilitation than open repair.88,89

In another local study90, less postoperative pain and requirement for analgesics were reported by patients who underwent total extraperitoneal laparoscopic repair of inguinal hernia as compared to those who underwent inguinal hernia repair by Lichtenstein tension free mesh hernioplasty. At 12 hours after surgery, the mean pain scores in the TEP group were 3.1 ± 1.8 and in the Lichtenstein group they were 4.2 ± 2.1 (p 0.031). At 24 hours after surgery, the scores were 2.3 ± 1.5 and 3.1 ± 1.9 for the TEP and Lichtenstein groups, respectively (p = 0.026). At 48 hours after surgery, the mean pain scores in the TEP group were 1.5 ± 1.1 while in the Lichtenstein group they were 2.0 ± 1.6 (p = 0.041). At 7 days after surgery, the scores were 0.3 ± 0.5 in the TEP group and 0.4 ± 0.8 in the Lichtenstein group (0.137). The mean number of injection of Diclofenac Sodium required by the TEP and Lichtenstein groups was 3.1 ± 1.6 and 5.8 ± 2 .2, respectively (p = 0.011).90

In a comparative study carried out on 60 patients. In group A, hernias were repaired laparoscopically and in group B Lichtenstein repair was done. In this study it was seen that post-operative pain was less in group A as compared to group B patients and the analgesia dose required in group A patients was much less as compared to group B patients.91 Similar results were seen on study carried out by Dr. Snehal Fegade and Prof. Dr. R.K. Mishra published in current medical journal of India.92 Another study carried out by R.S. Chung and D.Y. Rowland in department of surgery in East Cleveland, USA on 2471 patients showed that the post-operative pain after laparoscopic and tension free mesh repairs showed no significant advan-tage.93

6. CONCLUSION

This study concluded that total extra-peritoneal repair results in less operative pain and hospital stay as compared to open repair of inguinal hernia. So, we recommend that total extra-peritoneal repair should be used routinely for inguinal hernioplasty for reducing the operative pain and hospital stay which will in turn improve their quality of life.

REFERENCES

[1] Lomanto D, Clara ELS. Total extraperitoneal approach in inguinal hernia repair: an update. Ann Lapaosc Endosc Surg 2017;2:119.

[2] Gavriilidis P, Davies R, Wheeler J, de'Angelis N, Di Saverio S. Total extraperitoneal endoscopic hernioplasty (TEP) versus Lichtenstein hernioplasty: a systematic review by updated traditional and cumulative meta-analysis of randomised-controlled trials. Hernia 2019:1-11.

[3] Rambhia SU, Modi R. A comparative study between totally extraperitoneal and transabdominal preperitoneal laparoscopic inguinal hernia repair techniques. International Surgery Journal 2017;4(2):663-70.
[4] AL-Shareef AH, Akin Y, Almouhissen T, Rassweiler J, Alshehri MS, Gözen AS, et al. Effects of previous hernia repair on extraperitoneal robot-assisted radical prostatectomy: a matched-pair analysis study. Journal of endourology 2015;29(10):1143-7.
[5] Feliu X, Torres G, Viñas X, Martínez-Ródenas F, Fernández-Sallent E, Pie J. Preperitoneal repair for recurrent inguinal hernia: laparoscopic and open approach. Hernia 2004;8(2):113-6.
[6] Vidović D, Kirac I, Glavan E, Filipović-Čugura J, Ledinsky M, Bekavac- Bešlin M. Laparoscopic totally extraperitoneal hernia repair versus open Lichtenstein hernia repair: results and complications. Journal of Laparoendoscopic & Advanced Surgical Techniques 2007;17(5):585 -90.
[7] Zhu X, Cao H, Ma Y, Yuan A, Wu X, Miao Y, et al. Totally extraperitoneal laparoscopic hernioplasty versus open extraperitoneal approach for inguinal hernia repair: a meta-analysis of outcomes of our current knowledge. The Surgeon 2014;12(2):94-105.
[8] Eker HH, Langeveld HR, Klitsie PJ, van't Riet M, Stassen LP, Weidema WF, et al. Randomized clinical trial of total extraperitoneal inguinal hernioplasty vs Lichtenstein repair: a long-term follow-up study. Archives of Surgery 2012;147(3):256-60.
[9] Nixon S J, Tulloh B. Abdominal wall, hernia and umbilicus. In: Williams NS, Bulstrode CJK, Connell PRO, (edi). Bailey & Love's Short Practice of Surgery. 26th ed. London: CRC Press 2013: 948-969.
[10] Rosenberg J, Bisgaard T, Kehlet H, Wara P, Asmussen T, Juul P, et al. Danish Hernia Database recommendations for the management of inguinal and femoral hernia in adults. Danish Med Bulletin. 2011;58(2):C4243.
[11] Fitzgibbons RJ, Forse RA. Clinical practice. Groin hernias in adults.". New England J Med. 2015;372(8):756–63.
[12] Domino FJ. The 5-minute clinical consult 2014 (22nd ed. ed.). Philadelphia, Pa.: Wolters Kluwer Health/Lippincott Williams & Wilkins. 2014; p. 562.
[13] GBD 2013 Mortality and Causes of Death, Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. doi:10.1016/S0140-6736(14)61682-2.
[14] Purkayastha S, Chow A, Athanasiou T, Tekkis P, Darzi A, Chow A, et al. "Inguinal hernia". Clin Evid (Online) 2008. PMC 2908002.
[15] Matthews RD, Neumayer L. Inguinal hernia in the 21st century: an evidence-based review. Curr Probl Surg. 2008;45:261-312.
[16] Awad SS, Fagan SP. Current approaches to inguinal hernia repair. Am J Surg. Dec 2004;188(6A Suppl):9S-16S.
[17] Hosgor M, Karaca I, Ozer E, Suzek D, Ulukus C, Ozdamar A. Do alterations in collagen synthesis play an etiologic role in childhood inguinoscrotal pathologies: an immunohistochemical study. J Pediatr Surg. Jul 2004;39(7):1024-9.
[18] Junge K, Klinge U, Prescher A, Giboni P, Niewiera M, Schumpelick V. Elasticity of the anterior abdominal wall and impact for reparation of incisional hernias using mesh implants. Hernia. Sep 2001;5(3):113-8.
[19] Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J, et al. European Hernia Society guidelines on the treatment of inguinal hernia in adult patients. Hernia. Aug 2009;13(4):343-403.
[20] O'Dwyer PJ, Norrie J, Alani A, Walker A, Duffy F, Horgan P. Observation or operation for patients with an asymptomatic inguinal hernia: a randomized clinical trial. Ann Surg. Aug 2006;244(2):167-73.
[21] Fitzgibbons RJ Jr, Giobbie-Hurder A, Gibbs JO, et al. Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: a randomized clinical trial. JAMA. Jan 18 2006;295(3):285-92.
[22] Grosz CR. Iliohypogastric nerve injury. Am J Surg. Nov 1981;142(5):628.
[23] Ruhl CE, Everhart JE. Risk factors for inguinal hernia among adults in the US population. Am J Epidemiol. May 15 2007;165(10):1154-61.
[24] Manthey DE. Abdominal hernia reduction. In: Clinical Procedures in Emergency Medicine. 2003.
[25] Brandt ML. Pediatric hernias. Surg Clin North Am. Feb 2008;88(1):27-43
[26] Katz DA. Evaluation and management of inguinal and umbilical hernias. Pediatr Ann. Dec 2001;30(12):729-35.
[27] Matthews RD, Neumayer L. Inguinal hernia in the 21st century: an evidence-based review. Curr Probl Surg. Apr 2008;45(4):261-312.
[28] Kapur P, Caty MG, Glick PL. Pediatric hernias and hydroceles. Pediatr Clin North Am. Aug 1998;45(4):773-89.
[29] Rutkow IM. Epidemiologic, economic, and sociologic aspects of hernia surgery in the United States in the 1990s. Surg Clin North Am. Dec 1998;78(6):941-51.
[30] Walker SH. The natural history of umbilical hernia. A six-year follow up of 314 Negro children with this defect. Clin Pediatr (Phila). Jan 1967;6(1):29-32.
[31] Scherer LR 3rd, Grosfeld JL. Inguinal hernia and umbilical anomalies. Pediatr Clin North Am. Dec 1993;40(6):1121-31.
[32] Akbulut S, Cakabay B, Sezgin A. A familial tendency for developing inguinal hernias: study of a single family. Hernia. Aug 2010;14(4):431-4.

[33] Mizrahi H, Parker MC. Management of asymptomatic inguinal hernia: a systematic review of the evidence. Arch Surg. Mar 2012;147(3):277-81.
[34] Eubanks S. Hernias. In: Sabiston DC Jr, ed. Textbook of Surgery: The Biological Basis of Modern Surgical Practice. 1997.
[35] London JA, Utter GH, Sena MJ, et al. Lack of insurance is associated with increased risk for hernia complications. Ann Surg. Aug 2009;250(2):331-7.
[36] Abi-Haidar Y, Sanchez V, Itani KM. Risk factors and outcomes of acute versus elective groin hernia surgery. J Am Coll Surg. Sep 2011;213(3):363-9.
[37] Smith S. Inguinal hernia reduction. In: King C, Henretig FM, eds. Textbook of Pediatric Emergency Procedures. 2nd ed. Philadelphia, PA: Lippincott Williams and Wilkins; 2008:840-847/87
[38] Awad SS, Fagan SP. Current approaches to inguinal hernia repair. Am J Surg. Dec 2004;188(6A Suppl):9S-16S.
[39] Scott NW, McCormack K, Graham P, Go PM, Ross SJ, Grant AM. Open mesh versus non-mesh for repair of femoral and inguinal hernia. Cochrane Database Syst Rev. 2002;CD002197.
[40] Fingerhut A, Millet B, Veyrie N, et al. Inguinal hernia repair, update 2006. In: Edmund AM, Neugebauer S, Fingerhut A, et al. EAES Guidelines for Endoscopic Surgery. 1. Springer; 2006:294-307.
[41] Pisanu A, Podda M, Saba A, Porceddu G, Uccheddu A. Meta-analysis and review of prospective randomized trials comparing laparoscopic and Lichtenstein techniques in recurrent inguinal hernia repair. Hernia. Jul 18 2014;
[42] Chung L, O'Dwyer PJ. Treatment of asymptomatic inguinal hernias. Surgeon. Apr 2007;5(2):95-100; quiz 100, 121.
[43] O'Dwyer PJ, Norrie J, Alani A, Walker A, Duffy F, Horgan P. Observation or operation for patients with an asymptomatic inguinal hernia: a randomized clinical trial. Ann Surg. Aug 2006;244(2):167-73.
[44] Fitzgibbons RJ Jr, Giobbie-Hurder A, Gibbs JO, et al. Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: a randomized clinical trial. JAMA. Jan 18 2006;295(3):285-92.
[45] Chung L, Norrie J, O'Dwyer PJ. Long-term follow-up of patients with a painless inguinal hernia from a randomized clinical trial. Br J Surg. Nov 30 2010;
[46] Koch A, Edwards A, Haapaniemi S, Nordin P, Kald A. Prospective evaluation of 6895 groin hernia repairs in women. Br J Surg. Dec 2005;92(12):1553-8.
[47] Woods B, Neumayer L. Open repair of inguinal hernia: an evidence-based review.Surg Clin North Am. Feb 2008;88(1):139-55
[48] Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J, et al. European Hernia Society guidelines on the treatment of inguinal hernia in adult patients. Hernia. Aug 2009;13(4):343-403.
[49] Woods B, Neumayer L. Open repair of inguinal hernia: an evidence-based review. Surg Clin North Am. Feb 2008;88(1):139-55, ix-x.
[50] Lichtenstein IL, Shulman AG, Amid PK, Montllor MM. The tension-free hernioplasty. Am J Surg. Feb 1989;157(2):188-93.
[51] Malangoni MA, Rosen RJ. Hernias. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL (Editors). Sabiston Textbook of Surgery. 18th edition. Philadelphia, PA: Elsevier; 2007.
[52] Starling JR, Harms BA. Diagnosis and treatment of genitofemoral and ilioinguinal neuralgia. World J Surg. Sep-Oct 1989;13(5):586-91.
[53] Wijsmuller AR, Lange JF, Kleinrensink GJ, et al. Nerve-identifying inguinal hernia repair: a surgical anatomical study. World J Surg. Feb 2007;31(2):414-20
[54] Lichtenstein IL, Shulman AG, Amid PK, Montllor MM. Cause and prevention of postherniorrhaphy neuralgia: a proposed protocol for treatment. Am J Surg. Jun 1988;155(6):786-90.
[55] Wantz GE. Complications of inguinal hernial repair. Surg Clin North Am. Apr 1984;64(2):287-98.
[56] Franklin ME Jr, Gonzalez JJ Jr, Glass JL. Use of porcine small intestinal submucosa as a prosthetic device for laparoscopic repair of hernias in contaminated fields: 2- year follow-up. Hernia. Aug 2004;8(3):186-9.
[57] Ferzli GS, Edwards E, Al-Khoury G, Hardin R. Postherniorrhaphy groin pain and how to avoid it. Surg Clin North Am. Feb 2008;88(1):203-16, x-xi.
[58] Delikoukos S, Fafoulakis F, Christodoulidis G, Theodoropoulos T, Hatzitheofilou C. Re-operation due to severe late-onset persisting groin pain following anterior inguinal hernia repair with mesh. Hernia. Dec 2008;12(6):593-5.
[59] Shamberger RC, Ottinger LW, Malt RA. Arterial injuries during inguinal herniorrhaphy. Ann Surg. Jul 1984;200(1):83-5.
[60] Sanchez-Manuel FJ, Lozano-García J, Seco-Gil JL. Antibiotic prophylaxis for hernia repair. Cochrane Database Syst Rev. Jul 18 2007;CD003769.
[61] Shankar VG, Srinivasan K, Sistla SC, Jagdish S. Prophylactic antibiotics in open mesh repair of inguinal hernia - a randomized controlled trial. Int J Surg. 2010;8(6):444-7.
[62] Earle DB, Mark LA. Prosthetic material in inguinal hernia repair: how do I choose?.Surg Clin North Am. Feb 2008;88(1):179-201, x.

[63] Amid PK. How to avoid recurrence in Lichtenstein tension-free hernioplasty. Am J Surg. Sep 2002;184(3):259-60.
[64] Sanders DL, Waydia S. A systematic review of randomised control trials assessing mesh fixation in open inguinal hernia repair. Hernia. May 7 2013;
[65] Akyol C, Kocaay F, Orozakunov E, Genc V, Kepenekci Bayram I, Cakmak A, et al. Outcome of the patients with chronic mesh infection following open inguinal hernia repair. J Korean Surg Soc. May 2013;84(5):287-91.
[66] van Veen RN, Mahabier C, Dawson I, et al. Spinal or local anesthesia in lichtenstein hernia repair: a randomized controlled trial. Ann Surg. Mar 2008;247(3):428-33.
[67] Nordin P, Zetterstrom H, Gunnarsson U, Nilsson E. Local, regional, or general anaesthesia in groin hernia repair: multicentre randomised trial. Lancet. Sep 13 2003;362(9387):853-8.
[68] Nordin P, Haapaniemi S, van der Linden W, Nilsson E. Choice of anesthesia and risk of reoperation for recurrence in groin hernia repair. Ann Surg. Jul 2004;240(1):187-92.
[69] Amid PK, Shulman AG, Lichtenstein IL. Local anesthesia for inguinal hernia repair step-by-step procedure. Ann Surg. Dec 1994;220(6):735-7.
[70] Fitzgibbons RJ, Filippi CJ, Quinn TH. Inguinal hernias. In: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE (Editors). Schwartz's Principles of Surgery. 8th Edition. New York, NY: McGraw-Hill; 2005.
[71] Sanabria A, Dominguez LC, Valdivieso E, Gomez G. Prophylactic antibiotics for mesh inguinal hernioplasty: a meta-analysis. Ann Surg. Mar 2007;245(3):392-6.
[72] Terzi C. Antimicrobial prophylaxis in clean surgery with special focus on inguinal hernia repair with mesh. J Hosp Infect. Apr 2006;62(4):427-36.
[73] Amid PK. Lichtenstein tension-free hernioplasty. In: Fischer JE. Mastery of Surgery. 2. 5th. Lippincott Williams & Wilkins; 2007:1933-9.
[74] Stylianidis G, Haapamäki MM, Sund M, Nilsson E, Nordin P. Management of the hernial sac in inguinal hernia repair. Br J Surg. Mar 2010;97(3):415-9.
[75] Franklin ME Jr, Gonzalez JJ Jr, Michaelson RP, Glass JL, Chock DA. Preliminary experience with new bioactive prosthetic material for repair of hernias in infected fields. Hernia. Dec 2002;6(4):171-4.
[76] Hakeem A, Shanmugam V. Inguinodynia following Lichtenstein tension-free hernia repair: a review. World J Gastroenterol. Apr 14 2011;17(14):1791-6.
[77] Chastan P. Tension-free open hernia repair using an innovative self-gripping semi- resorbable mesh. Hernia. Apr 2009;13(2):137-42.
[78] Bekker J, Keeman JN, Simons MP, Aufenacker TJ. A brief history of the inguinal hernia operation in adults. Ned Tijdschr Geneeskd. 2007;151(6):924–931.
[79] Gould J. Laparoscopic versus open inguinal hernia repair. Surg Clin North Am. 2008;88:1073–1081. doi:10.1016/j.suc.2013.06.013.
[80] Salma U, Ahmed I, Ishtiaq S. A comparison of post operative pain and hospital stay between Lichtenstein's repair and Laparoscopic Transabdominal Preperitoneal (TAPP) repair of inguinal hernia: A randomized controlled trial. Pak J Med Sci. 2015;31(5):1062–66.
[81] McCormack K, Scott NW, Go PM, Ross S, Grant AM. EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. Cochrane Database Syst Rev. 2003;1:CD001785.
[82] Koning GG, de Schipper HJ, Oostvogel HJ, Verhofstad MH, Gerritsen PG, van Laarhoven KC, et al. The Tilburg double blind randomised controlled trial comparing inguinal hernia repair according to Lichtenstein and the transinguinal preperitoneal technique. Trials. 2009;10:89.
[83] Kumar S, Wilson RG, Nixon SJ, Macintyre IM. Chronic pain after laparoscopic and open mesh repair of groin hernia. Br J Surg. 2002;89:1476–147.
[84] Pokorny H, Klingler A, Schmid T, Fortelny R, Hollinsky C, Kawji R, et al. Recurrence and complications after laparoscopic versus open inguinal hernia repair: results of a prospective randomized multicenter trial. Hernia. 2008;12(4):385–389.
[85] Aly O, Green A, Joy M, Wong CH, Al-Kandari A, Cheng S, et al. Is laparoscopic inguinal hernia repair more effective than open repair? J Coll Physicians Surg Pak. 2011;21(5):291–296.
[86] Kuhry E, Van Veen RN, Langeveld HR, Steyerberg EW, Jeekel J, Bonjer HJ. Open or endoscopic total extra peritoneal inguinal hernia repair? A systematic review. Surg Endosc. 2007;21:161–166.
[87] Eklund A, Rudberg C, Smedberg S, Enander LK, Leijonmarck CE, Osterberg J, Montgomery A. Short-term results of a randomized clinical trial comparing Lichtenstein open repair with totally extraperitoneal laparoscopic inguinal hernia repair. Br J Surg. 2006 Sep;93(9):1060-8.
[88] Bringman S, Ramel S, Heikkinen T-J, Englund T, Westman B, Anderberg B. Tension-free inguinal hernia repair: TEP versus mesh-plug versus Lichtenstein: a prospective randomized controlled trial. Annals of surgery. 2003;237(1):142.
[89] Douek M, Smith G, Oshowo A, Stoker D, Wellwood J. Prospective randomised controlled trial of laparoscopic versus open inguinal hernia mesh repair: five year follow up. Bmj. 2003;326(7397):1012-3.

[90] Ahmed I, Dian A, Azam UF, Khan M. Evaluation of outcome of totally extra peritoneal laparoscopic inguinal hernia repair with lichtenstein open repair. Pak Armed Forces Med J 2015;65(1):16-21.
[91] Abid KJ, Karki B, Haider H, Ashraf M, Islam HR. Surgical Outcome of Totally Extra Peritoneal (TEP) Laparoscopic Repair Versus Tension Free Mesh Repair (Lichtenstein) in Inguinal Hernias. Annals. 2010;16:66-8.
[92] Fegade S, Mishra R K. Laparoscopic versus open repair of inguinal hernia. World Journal of Laparoscopic Surgery, Jan-Apr 2008;1(1):41-8.
[93] Chung RS, Rowland DY. Meta-analyses of randomized controlled trials of laparoscopic conventional inguinal hernia repairs. 1999;12:321-5.