

Comparison of operative outcome of open versus laparoscopic inguinal hernia in rural tertiary care hospital in Haryana: A randomized controlled study



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ABSTRACT

Background: Hernia surgery is one of the commonly done procedures in General surgery. A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. **Aims and Objectives:** Comparison of morbidity in terms of total analgesic usage, mean length of hospital stay, comparison among open and TEP repair of hernias in primary inguinal hernias among males. **Material and Methods:** This study was done on 80 patients with clinical diagnosis of primary inguinal hernia over a period of one year to compare the result of two surgeries, open lichtenstein repair (n = 40) and TEP repair (n = 40). **Results:** Postoperative pain using VAS was found to be lower in patients having laparoscopic TEP hernia repair when compared to open lichtenstein tension free repair (p < 0.01). Operating time was observed to be more with TEP group with mean of 59 ± 17.02 minutes compared with open group which had mean of 44.92 ± 12 minutes. Mean number of analgesic in open cases was 6.65 ± 1.81 whereas in case of TEP group it was 4.35 ± 1.47 over a period of one month. **Conclusion:** Lichtenstein tension free mesh hernioplasty still remains the gold standard operation done for inguinal hernia. TEP repair has proven to be superior in terms of perioperative hemorrhage and post-operative analgesia requirement. Study concluded that laparoscopic TEP repair of inguinal repair have a considerable clinical advantage over open hernia repair in terms of postoperative pain and analgesia requirement, hospital stay and postoperative complications.

Key words: Operative outcome; Open; Laparoscopic; Inguinal hernia

INTRODUCTION

A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. It is the bulging of a part of the contents of the abdominal cavity through a weakness in the abdominal wall. Hernia may occur at various sites of the body, most commonly through the anterior abdominal wall, particularly the inguinal region. Inguinal hernia is more common in men. Lifetime risk for men to develop hernia is 27%, whereas for women, it is 3%.¹ There are two types of inguinal hernia, medial (direct) and lateral (indirect or oblique), which are defined by their relationship to the inferior epigastric vessels.²

Groin hernias occur most often before the age of one and after the age of 50 years.³ About 30% of patients with inguinal hernia are asymptomatic, and up to 50% of the patients know about their symptoms. Three percent of the patients present with incarceration. Indirect hernia corresponds to more than 70% of cases among adults. Hernia is a multifactorial condition affecting individuals of all ages and of both sexes. The recurrence after surgery ranges from 3% to 8%.^{4,5} Various methods for inguinal hernia repair have been described. Tension-free repair is the procedure of choice due to its low recurrence rate.⁴ These can be categorized into two groups based on the approach: Laparoscopic and open.⁶ The use of prosthetic

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mesh is preferable over non-mesh techniques, for creating a tension-free repair due to reduced recurrence.⁷

In open mesh repair after the introduction of tension-free surgical repair with the use of prosthetic mesh, recurrence rates were reported to be <5% and patient's comfort was reported to be significantly improved over that achieved by the traditional, tension-producing techniques.

Inguinal hernia was repaired laparoscopically soon after the establishment of laparoscopic cholecystectomy as the gold standard for cholelithiasis. However, unlike laparoscopic cholecystectomy, which was very quickly accepted by the surgical community, laparoscopic hernia repair has remained a contentious issue since its inception. The choice of approach to the laparoscopic repair of inguinal hernia is controversial due to the scarcity of data comparing the two approaches and some questions remain unanswered about their relative merits and risks.^{8,9} Transabdominal pre-peritoneal (TAPP) requires access to the pre-peritoneal space after initially entering the peritoneal cavity. The mesh is placed in the pre-peritoneal space, covering all potential hernia sites in the inguinal region. The peritoneum is then closed above the mesh. Total extraperitoneal (TEP) is different in that the peritoneal cavity is not entered, and mesh is used to seal the hernia sites from outside the peritoneum. TEP is a technically more difficult procedure than TAPP but may lessen the risk of damaging intra-abdominal organs and of adhesion formation leading to intestinal obstruction (which has been linked to TAPP), and it may save operative time as it is not necessary to incise and close the peritoneum from the inside. TEP is also thought to reduce post-operative pain.^{10,11}

The indirect comparison between the open and laparoscopic hernia repair raises questions that can only be satisfactorily addressed by well-designed studies and systematic reviews of such studies that directly compare the open technique with TEP. Increasingly, however, laparoscopic techniques are chosen as the primary treatment of choice for inguinal hernia as these techniques seem to be advantageous compared to conventional open repair due to the smaller incisions with less post-operative pain and faster recovery. Although a variety of procedures are performed, none can be termed as an ideal procedure as each one is accompanied by varied early or late complication, the most significant being pain and recurrence.

Aims and objectives

The aim of this study is to compare advantages, disadvantages, and limitations and arrive at a conclusion as to the best modality of treatment after comparison of morbidity in relation to the published literature in terms of total analgesic usage and mean length of hospital stay.

Primary objective

To determine among the parameters of operative time and postoperative pain using visual pain analogue scale, a better modality among TEP and open hernia repair.

MATERIALS AND METHODS

This study was done in the Department of General Surgery, Bhagat Phool Singh Government Medical College for Women, Haryana, on 80 male patients over with age of 18 years with a clinical diagnosis of primary inguinal hernia who visited outpatient department for 1 year after ethical committee approval. This was a randomized controlled prospective study which compared the result of two surgeries, open Lichtenstein repair and TEP repair, that is, 40 cases each.

Inclusion criteria

Inclusion criteria were as follows: Patients who were diagnosed as having inguinal hernias (unilateral), Patients with age >18 years, and patients of male gender.

Exclusion criteria

Exclusion criteria were as follows: Patients requiring emergency exploration, for example, strangulated, obstructed hernias, other hernias such as femoral, ventral wall hernias, recurrent hernias, patients with severe systemic illness or comorbidities, for example, uncontrolled hypertension, diabetes and chronic obstructive pulmonary disease.

Pre-operative work up

A detailed history was taken, and a clinical examination of the abdomen of all patients of clinical features of primary inguinal hernia in males was done. Thorough pre-operative evaluation was done, including cardiac evaluation. Explanation about the open and laparoscopic procedure and its complications with written consent was taken. All the patients were either subjected to TEP or open hernia repair based on computer-generated table of randomization.

Procedure: (i) TEP approach

A 12 mm sub umbilical incision extending up to linea alba was given. The skin and subcutaneous tissue were cut and retracted to the side of the hernia. The subcutaneous tissue was dissected to expose the anterior rectus. The anterior rectus sheath was incised transversely and was separated with a curved hemostat to expose the rectus muscle. The entire rectus muscle was retracted to anterolateral side to enter the space between that of muscle and the posterior rectus sheath. The balloon was tied on the tip of 5 mm trocar and was inflated with 150 mL NS. After 5 min, the NS was drained. A 11 mm port was introduced without its

sharp tip with a 30° laparoscope. A small pre-peritoneal pocket was created by manipulating the laparoscope in a sweeping motion. Once the telescope was placed properly, a 5 mm port was inserted under the direct view approximately 4–5 cm above the pubis. Another 5 mm trocar was placed halfway after identifying lighthouse (i.e., symphysis pubis), between the symphysis pubis and umbilicus. The dissection was started by tracing the inferior epigastric vessels toward the deep ring. In TEP repair of hernia, stopa's perietalization technique was used for dissection of the spermatic cord from the peritoneum by separating the elements of the spermatic cord from the peritoneum and peritoneal sac. The upper border of the hernia sac was recognized because indirect hernia was lateral to the inferior epigastric vessels. The dissection was continued all around the sac to encircle the neck. The dissection was continued medially to separate the vas from the sac. The sac was tied with 2–0 vicryl and cut. A 15×12 cm of polypropylene mesh was grasped with a 5 mm instrument and pushed into extraperitoneal space through a 10 mm port. The mesh was adjusted to cover all three potential hernial sites. After the mesh was properly placed, CO₂ was evacuated. Closure of 10 mm trocar site was done after the removal of the trocar with absorbable suture. The 5 mm ports were removed and the wounds were closed, and antiseptic dressing was applied.

Open (tension-free anterior inguinal hernia repair) (Lichtenstein method)

A 5 cm skin incision, which started from the pubic tubercle and extended laterally within the langer's line. After the skin incision, the external oblique aponeurosis was incised with incision extending into the medial side of the external inguinal ring. The lower leaf of the external oblique freed till the Poupart ligament. The upper leaf of the external oblique aponeurosis was freed from the underlying internal oblique muscle and aponeurosis at a distance of 3 cm above the inguinal floor. Ilioinguinal nerve was freed carefully and pulled to one side. The cremasteric fibers, Vas deferens, and adjacent vessels were separated from the sac. Sac was then lifted and opened. Contents were replaced back into the peritoneal cavity. Sac was closed with a purse string suture. A sheet of the synthetic mesh of size 7.5 cm×15 cm was used with a lateral slits for cord and medial blunt for pubis. Mesh anchored to the pubic tubercle with a non-absorbable suture. Continuous sutures are taken in the inferior edge of the mesh to the inguinal ligament. Sutures were taken superiorly to secure the mesh to the internal oblique muscle. A slit was made at the lateral end of the mesh creating two tails, the upper wide tail was grasped and passed to the head end of the patient from underneath the spermatic cord, crossed and placed over the lower leaf, and was held with a hemostat. The lower edge of the upper leaf and the lower edge of the lower leaf is sutured to the inguinal ligament. The excess mesh of the

lateral side was trimmed, leaving at least 5 cm of the mesh beyond the internal ring. The incisions were closed in layers. Adequate post-operative care, including NPO till anesthetic effects wear off, parenteral antibiotics (Inj. Augmentin 1.2 g IV followed by tablet Augmentin 625 mg TDS for 5 days), and provision of analgesia (injection diclofenac Na 50 mg was given TDS on the day of surgery, followed by provision of tablet diclofenac 50 mg from day 1 on demand). Documentation of post-operative complications and number of analgesics consumed was done.

Post-operative assessment

Postoperatively, patients were asked to rate their level of pain according to VAS on days 1, 2, 3, 4, 5, 6, and 7 of surgery. Patients were assessed for pain levels, activity levels, and the use of pain medications on return to OPD for follow-up. Data collection was done using a structured pre-prepared case pro forma to enter the patient details, detailed clinical history including presenting complaints, past and family history, and physical examination of patients who meet the inclusion criteria. The collected data were analyzed statistically. Mean±standard deviation was calculated for quantitative data. Percentage and proportion were calculated for categorical data. The Chi-square test was used for categorical data. Student-t-test/Mann–Whitney test was used to find out the mean difference of open and laparoscopic tests using the Statistical Package for the Social Sciences (ver. 20) software. P<0.05 was considered statistically significant.

RESULTS

Most number of the patients operated was in the age group of 40–50 years, that is, 24. Mean age was 50.75 with a range of 18–84 years. The mean age of patients undergoing open surgery was 52.075±13.91 years, and that of patients undergoing TEP was 49.42±14.49 years (P>0.05 NS). In the present study, among the 80 patients that were operated, a total number of right inguinal hernia was 61, and 19 patients had left inguinal hernia. Among Group A, 28 patients had right-sided inguinal hernia, whereas 12 patients had left-sided inguinal hernia. Among Group B, eight patients had left-sided inguinal hernia and 32 patients had right-sided inguinal hernia (P=0.301 NS). In the present study, 30 patients had an indirect inguinal hernia, whereas 50 patients had a direct inguinal hernia. Out of 40 patients, among open 27 had direct and 13 had indirect inguinal hernia. Among 40 patients of TEP, 23 patients had direct inguinal hernia and 17 had indirect inguinal hernia (P=0.35, NS).

None of the patients undergoing the surgery suffered any major complications. However, peritoneal breach was seen intraoperatively in 8 (20%) patients in Group B (TEP).

There were no TEP procedures that were converted to open. One patient developed surgical emphysema among the TEP group (Table 1).

In Table 2, it shows that inguinal paresthesia was present in 14 (35%) patients in Group A and in 11 (27%) patients in Group B; Orchitis was seen postoperatively in 11 (27%) patients in Group A compared to 1 patient in Group B. Scrotal edema occurred in eight patients of Group A compared to none in Group B. Chronic pain occurred in seven patients of Group A compared to none in Group B. Local paresthesia occurred in six patients of Group A compared to one patient in Group B. The side effects were not significantly different in between Group A and Group B; however, the numbers indicate that complications are much higher in open technique.

In the present study, the mean post-operative VAS for POD 1 day was 3.72 ± 1.48 in Group A and 2.77 ± 1.12 in Group B. Mean VAS was lower in patients having laparoscopic (TEP) as compared to the patients of open surgery with the difference of mean 0.95 and $P=0.0064$. Which makes VAS scoring of the TEP group is much lower than open group and statistically significant. In the present study, the mean post-operative VAS on POD 2 of the patients of Group A is 2.62 ± 1.21 and Group B is 1.65 ± 0.75 . $P=0.00024$ which makes the VAS scoring of the TEP group is much lower than that of the open group and statistically significant. In the present study, the mean post-operative VAS on POD 3 of the patients of Group A is 1.65 ± 0.85 and Group B is

1.05 ± 0.6 with a $P=0.0002$ which makes VAS scoring of the TEP group is much lower than open group and statistically significant. In the present study, the mean post-operative VAS on POD 4 of the patients of Group A is 1.52 ± 0.97 and Group B is 0.25 ± 0.43 with a $P<0.00001$ value of which makes the VAS scoring of the TEP group is much lower than open group and statistically significant. In the present study, the mean post-operative VAS on POD 5 of the patients of Group A is 0.95 ± 0.94 and Group B is 0.25 ± 0.43 with a $P<0.00038$ value of which makes VAS scoring of the TEP group is much lower than open group and statistically significant. In the present study, the mean post-operative VAS on POD six of the patients of Group A is 0.7 ± 0.8 and Group B is 0.05 ± 0.22 with a $P<0.00086$ value of which makes VAS scoring of the TEP group is much lower than open group and statistically significant. In the present study, the mean post-operative VAS on POD seven of the patients of Group A is 0.45 ± 0.7 and Group B is 0.05 ± 0.22 with a $P<0.04$ value of which makes VAS scoring of the TEP group is much lower than open group and statistically significant.

In the present study, the mean number of analgesics consumed over 30 days was 6.65 ± 1.81 in Group A and 4.35 ± 1.47 in Group B. Mean analgesics required is lower in laparoscopic (TEP) patients as compared to the patients having open surgery with the difference of mean 2.30 and $P=0.00001$ which is statistically significant. In the present study, the mean number of analgesics consumed by Group A was 1.95 ± 0.5 , with 70% of patients taking two tablets on day 1. In Group B, the mean was 1.45 ± 0.73 , with 40% taking two analgesics per day. $P=0.00512$ was found statistically significant. The mean number of analgesics consumed by Group A was 1.15 ± 0.6 , with 60% of patients taking one tablet on day 2. In Group B mean was 0.77 ± 0.56 , with 62.5% taking one analgesic per day. $P=0.02034$ was found statistically significant. In the present study, the mean number of analgesics consumed by Group A was ± 0.5 , with 70% of patients taking one tablet on day 3 and 25% of patients taking 0 tablets. In Group B, the mean was 0.2 ± 0.4 , with 32% taking 0 analgesics per day. $P=0.02034$ was found statistically significant. In the present study, the mean number of analgesics consumed by Group A was 1.05 ± 0.6 . In Group B, the mean was 0.42 ± 0.49 . $P<0.00001$ was found statistically significant. In the present study, the mean number of analgesics consumed by Group A was ± 0.7 . In Group B, the mean was 0.47 ± 0.5 . $P<0.013$ was found statistically significant. In the present study, mean number of analgesics consumed by Group A was 0.35 ± 0.52 . In Group B, the mean was 0.075 ± 0.263 . $P<0.012$ was found statistically significant. In the present study, the mean number of analgesics consumed by Group A was 0.175 ± 0.38 . In Group B, the mean was 0.075 ± 0.26 . $P<0.442$ was found statistically insignificant.

Table 1: Comparison of intraoperative complications in Group A and Group B

Intraoperative complications	Group A		Group B	
	No.	%	No.	%
Injury to bowel	0	-	0	-
Injury to bladder	0	-	0	-
Injury to blood vessels	0	-	0	-
Peritoneal breach	0	-	8	20
Injury to visual analog scale deferens	0	-	-	-

Table 2: Comparison of post-operative complications among Group A and Group B

Post-operative complications	Group A		Group B		P-value
	No.	%	No.	%	
Hematoma	4	10	0	0	0.58
Seroma	5	12	3	7	0.356
Urinary retention	3	7	9	22	0.73
Inguinal paresthesia	14	35	11	27	0.315
Scrotal edema	8	20	0	0	0.00
Orchitis	11	27	1	2	0.00
Recurrence	2	5	0	0	0.210
Local paresthesia	6	15	1	2	0.04
Chronic pain	7	17	0	0	0.006
Port site hernia	0	0	0	0	00

In the present study, the mean length of hospital stay is 4.55 ± 1.18 in Group A and 2.575 ± 0.99 in Group B with a $P=0.00001$, which is statistically significant. In the present study, the mean operating time of the open group (group A) was 44.92 ± 12 in Group A and 59.3 ± 17.02 in Group B with a $P=0.00004$, which is statistically significant.

DISCUSSION

Hernia surgery is one of the most commonly done procedures in general surgery. Surgery for inguinal hernia was first attributed to Erasistratus of Keos in the 3rd century and probably described by Celsus in the first century AD. However, Edoardo Bassini of Italy, who described his technique of hernia repair by reconstruction of the inguinal floor along with high ligation of the hernia sac in 1884, is generally regarded as “The Father of Hernia Surgery.” In the middle of the 20th century Bassini’s concept was improved by Shouldice (1945), McVay and Anson (1942), showing the importance of fascia transversalis. The introduction of the prosthesis for surgical repair of inguinal hernias was first performed by Usher In 1955. However, it was Lichtenstein who, in 1986, applied the tension-free mesh repair concept for inguinal hernia surgery, describing a technique that would reduce the recurrence rate associated with the tension of the herniorrhaphy suture.

In the present study, most number of patients that were operated was in the age group of 40–50 years of age. The mean age group was 50.75, with a range of 18–84. The mean age of patients undergoing open surgery was 52.075 ± 13.91 years and that of patients undergoing TEP was 49.42 ± 14.49 years with a $P=0.43$ that was found to be statistically insignificant. In a study conducted by Sudarshan et al., the mean age group of patients included in open hernioplasty was 46.73, whereas in laparoscopic hernia, it was 42.10. The mean age at diagnosis of inguinal hernia was 35 ± 5 years, and ranged between 25 and 60 years of age with the most number of cases among the age group of 25–34.¹²

In the present study, among the 80 patients that were operated, the total number of right inguinal hernia was 61, and 19 patients had left inguinal hernia. Among Group A, 28 patients had right-sided inguinal hernia whereas 12 patients had left sided inguinal hernia. Among group B, eight patients had left-sided inguinal hernia and 32 patients had right-sided inguinal hernia. P-value was found to be 0.30 making it to be statistically insignificant. The right-sided hernia was more commonly reported in the literature. Saeed et al., evaluated inguinal hernias and found that 70.8% were right-sided, 33.3% were left-sided, 45.8% were indirect inguinal hernias, and 58.3% were

direct inguinal hernias.¹³ In the present study, 30 patients had indirect inguinal hernia were as 50 patients had a direct inguinal hernia. Out of 40 patients, among open, 27 had direct and 13 had indirect inguinal hernia. Among 40 patients of TEP, 23 patients had direct inguinal hernia and 17 had indirect inguinal hernia.

Post-operative pain in the present study was assessed in three parameters VAS scoring on days 1, 2, 3, 4, 5, 6, and 7 number of analgesics consumed on days 1, 2, 3, 4, 5, 6, 7, and a total number of analgesics consumed for 30 days. In the present study, mean post-operative VAS was 3.72 ± 1.48 in Group A and 2.77 ± 1.12 in Group B. Mean VAS was lower in patients having laparoscopic (TEP) as compared to the patients having open surgery with the difference of mean 0.95 and $P=0.0064$, that was statistically significant. In a comparative study on open versus laparoscopic hernia repair Sudarshan et al., found that the mean pain score on POD 0 between the two groups were almost similar. However, there was a significant difference in between the two groups on POD 3 and POD 7. The mean pain score was significantly less in laparoscopic hernioplasty groups on POD 3 and POD 7 (POD 3 mean pain score in OH-4.13 and LH-2.87, on POD 7, mean pain score in OH-2.90 and LH-1.23).¹²

It should be noted that there was no standardized scale for assessing pain across the studies. Since pain perception is variable and can be influenced by cultural and environmental factors, a bias could surface when patients were asked to grade their own pain levels. Thus, a more objective method is considered better. More pain in the patients of the open group is attributed to the length of incision on the inguinal region, nerve irritation or entrapment, foreign-body sensation to mesh, fibrosis in the inguinal region, and mesh contraction are also believed to be reasons for pain.

In the present study, the mean number of analgesics was 6.65 ± 1.81 in Group A and 4.35 ± 1.47 in Group B. Mean analgesics required is lower in laparoscopic (TEP) patients as compared to the patients having open surgery with the difference of mean 2.30 and $P=0.00001$. In a study conducted by Dhawan et al., in 2014–2015 compared the number of analgesics consumed by patients of open and laparoscopic repair shows a significant difference in post-operative pain in patients undergoing laparoscopic hernia repair when compared to the patients of open hernia repair. The mean analgesic tablet consumed was 5.27 ± 1.72 in Lichtenstein open mesh repair and 3.53 ± 1.93 in laparoscopic repair ($P<0.05$).¹⁴

In the present study, peritoneal breech was seen intraoperatively in 8 (20%) patients. It was observed that

during initial cases, the number of TEP cases having peritoneal breach was high; however, with time, the number of cases having peritoneal breach reduced significantly. There were no TEP procedures that were converted to open. One patient developed surgical emphysema among the TEP group.

In the present study, inguinal paresthesia was seen in 14 (35%) patients in Group A and in 11 (27%) patients in Group B; orchitis was seen postoperatively in 11 (27%) patients in Group A compared to 1 patient in Group B. Scrotal edema occurred in eight patients of Group A compared to none in Group B. Chronic pain occurred in seven patients of Group A compared to none in Group B. Local paresthesia occurred in six patients of Group A compared to one patient in Group B. The side effects were not significantly different in between Group A and Group B. A comparative study by Shah et al., found that wound infection was seen in 4 (13.33%) cases in an open group compared to 1 (5%) in laparoscopically operated cases. Orchitis was more prevalent in the laparoscopic hernioplasty patients, with the incidence among 3 (15%) cases compared to 1 (3.33%) in the open group. 2 (6.67%) cases of seroma were found in the hernioplasty group, whereas none in laparoscopic repair group. Overall post-operative complications were fewer in laparoscopic hernia repairs when compared to the open hernia repair group, which may be due to less sample size of laparoscopic inguinal hernioplasty patients (n=20). Further, the p-value is not significant between the two groups.¹⁵

Aly et al., in a meta-analysis of the data on complications between the two types of surgery, shows that there was no significant statistical difference. This does not, however, imply that the two techniques are clinically equal in terms of safety, as some complications are more severe than others.¹⁶

In the present study, the mean length of hospital stay is 4.55 ± 1.18 in Group A and 2.575 ± 0.99 in Group B. Length of hospital stay is lower in laparoscopic (TEP) patients as compared to the patients having open surgery. Length of hospital stay is lower in laparoscopic (TEP) patients as compared to the patients having open surgery. Most number of the patients undergoing TEP were discharged after 2 days (55%), but most of the patients undergoing TEP were fit for discharge on POD 1 as patients had passed flatus and stool and were accepting oral medications. Three patients were discharged on POD 1. However, discharge was given when the patient had almost complete relief of pain. One patient was discharged on day 5 of TEP. Most number of patients were discharged on POD 4 of surgery (30%). The longest stay among the open group was 7 days which was due to seroma formation in the wound and pain that the patient experienced. In a comparative study on open versus

laparoscopic hernia repair Sudarshan et al., observed that the mean duration of stay for open hernioplasty patients was 7.8 days compared to stay for laparoscopic hernioplasty patients, which was 3.07 days. Hence, the duration of hospital stay was less (almost <4 days) compared to those undergoing open hernioplasty.¹² A comparative study Shah et al., observed that the mean length of the hospital stay was found to be 3.23 days for the open hernioplasty compared to the laparoscopic hernia group, which was around 3.5 days, but the P-value is insignificant.¹⁵

In the present study, the mean operating time of the open group (group A) was 44.92 ± 12 in Group A and 59.3 ± 17.02 in Group B with a $P=0.00004$, which is statistically significant. A meta-analysis by Aly et al., compares six studies that showed operating time was reported by six of the papers showing times for each TEP operation to be 47 ± 12 , 50, 54, 62 ± 14 , 81 ± 27 , and 55 min, respectively. A meta-analysis by Aly et al., compared six studies that showed operating time was reported by six of the papers showing times for each TEP operation to be 47 ± 12 , 50, 54, 62 ± 14 , 81 ± 27 , and 55 min, respectively. The Lichtenstein method operating times were 58 ± 12 , 45, 49, 46 ± 11 , 59 ± 20 , and 55 min respectively. In the MRC trial group, the mean operating time in laparoscopic was 58.4 min and for open, it was 43.3 min. Mean operative time was significantly longer in the SILS-TEP compared with the open group (108.9 vs. 87.6 min, $P=0.001$).¹⁶ Intraoperative time was longer in initial surgeries; however, with the experience, the intraoperative time became shorter. Operative time was observed to be more in patients with high body mass index.

The length of the surgical scars after the surgery was obviously significantly shorter in TEP group, and the scar below the umbilicus was almost not visible. Whereas the scar of the inguinal hernia repaired with the open technique was much larger in length. The surgical incision of TEP took almost 2 weeks to heal completely, whereas the incision of the open hernia repair took almost 3 weeks to heal. The patients that got seroma and hematoma in the open group even took longer. In almost half of the patients of TEP group, the scar was not visible by the end of 1 month. The TEP repair is superior in case of cosmetic results for hernia repair (Figures 1-4).

Limitations of the study

1. This study has 40 cases in each. The sample size is not sufficient to make any conclusions. However, when clubbed with other studies we can derive fruitful results and gold standard for hernia can be established.
2. Follow up period of the present study is less due to limitation of time. A longer follow up period is required to establish the advantages and disadvantages

of both the procedures.

3. Follow up for at least 1 to 2 years is required to observe the recurrence as it most common after 6 months.

CONCLUSION

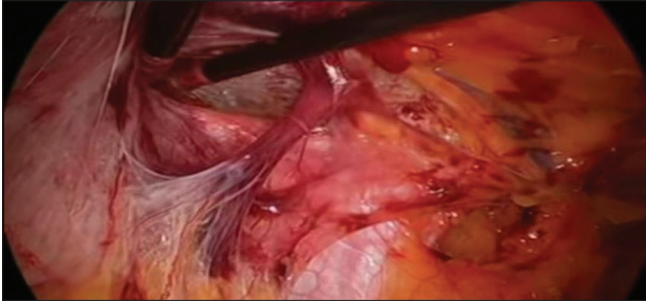


Figure 1: Dissection in total extraperitoneal repair

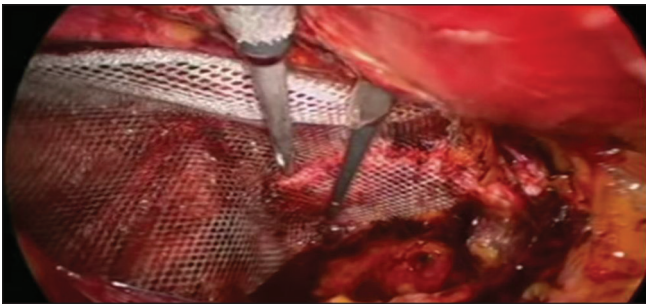


Figure 2: Deployment of mesh in total extraperitoneal repair

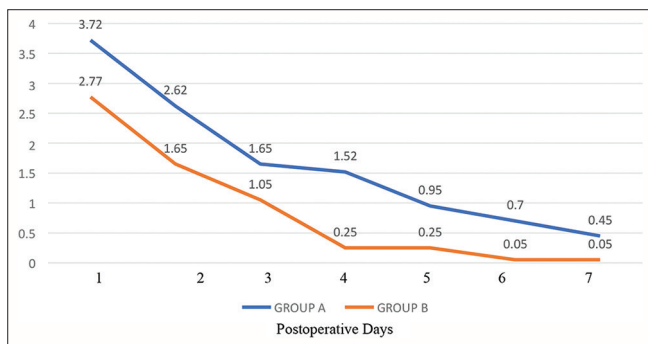


Figure 3: Comparison of visual analogue scale scoring among Group A and Group B over a period of 7 days

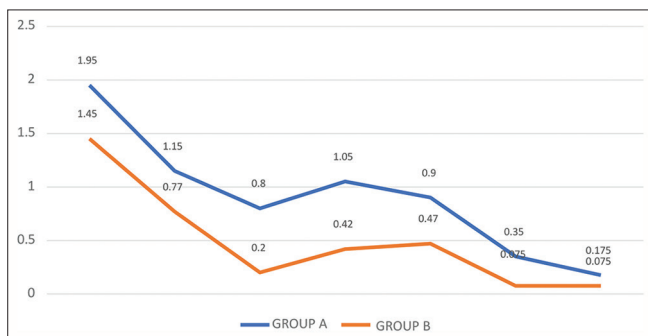


Figure 4: Comparison of the mean number of analgesic consumed by Group A and Group B over a period of 7 days

Lichtenstein tension-free mesh hernioplasty still remains the gold standard operation done for inguinal hernia, but in the era of minimally invasive surgery, newer techniques have evolved, that is, Laparoscopic TEP and TAPP. In the initial learning phase for surgeons, TEP is a longer procedure to perform as compared to open but with practice, it becomes shorter. TEP repair has proven to be superior in terms of perioperative hemorrhage and post-operative analgesia requirement. There was a significant difference between TEP and open hernioplasty in terms of post-operative hospital stay and other post-operative complications in the present study. As the surgeon becomes more experienced in the Laparoscopic approach, there was a substantial decrease in the operative time. Intra and post-operative complications remain minimal if the surgeon is thoroughly familiar with the anatomy of the inguinal region. At present, both open and laparoscopic procedures are being performed for inguinal hernia repairs and they have various advantages and disadvantages. The present study concluded that laparoscopic TEP repair of inguinal repair had a considerable clinical advantage over open hernia repair in terms of post-operative pain and analgesia requirement, hospital stay, and post-operative complications. We further recommended that as complications such as hematoma, seroma, and chronic groin pain are less in TEP than in open as well as there was less need for analgesia and early mobility and discharge of the patient, therefore where the turnover of the patient is more, they should be advised to go for TEP procedure. However, there is a long learning curve for TEP, so young surgeons should be trained initially under supervision.

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REFERENCES

1. Jenkins JT and O'Dwyer PJ. Inguinal hernias. *Br Med J*. 2008;336(7638):269-272. <https://doi.org/10.1136/bmj.39450.428275.AD>
2. 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 Bull*. 2011;58(2):C4243.
3. Domino FJ. *The 5-Minute Clinical Consult*. 22nd ed. Philadelphia, PA.: Wolters Kluwer Health, Lippincott Williams and Wilkins; 2014. p. 562.
4. HerniaSurge Group. International guidelines for groin hernia management. *Hernia*. 2018;22(1):1-165. <https://doi.org/10.1007/s10029-017-1668-x>
5. McClusky DA 3rd, Mirilas P, Zoras O, Skandalakis PN and Skandalakis JE. Groin hernia: Anatomical and surgical history.

- Arch Surg. 2006;141(10):1035-1042.
<https://doi.org/10.1001/archsurg.141.10.1035>
6. Heikkinen T, Bringman S, Ohtonen P, Kunelius P, Haukipuro K and Hulkko A. Five-year outcome of laparoscopic and lichtenstein hernioplasties. *Surg Endosc.* 2004;18(3):518-512.
<https://doi.org/10.1007/s00464-003-9119-4>
 7. Sajid MS, Ladwa N, Kalra L, McFall M, Baig MK and Sains P. A meta-analysis examining the use of tacker mesh fixation versus glue mesh fixation in Laparoscopic inguinal hernia repair. *Am J Surg.* 2013;206(1):103-111.
<https://doi.org/10.1016/j.amjsurg.2012.09.003>
 8. Meyer A, Dulucq JL and Mahajna A. Laparoscopic hernia repair: Nonfixation mesh is feasibly? *Arq Bras Cir Dig.* 2013;26(1): 27-30.
<https://doi.org/10.1590/S0102-67202013000100006>
 9. Hanif M, Ahmed A and Khan MM. Laparoscopic total extraperitoneal inguinal hernia repair: A study at Rawalpindi medical college and allied teaching hospitals. *J Postgrad Med Inst.* 2014;28(3):303-307.
 10. Belinsky I, Tsirlina VB, Klima DA, Walters AL, Lincourt AE and Heniford TB. Prospective, comparative study of postoperative quality of life in TEP, TAPP, and modified lichtenstein repairs. *Ann Surg.* 2011;254(5):709-715.
<https://doi.org/10.1097/SLA.0b013e3182359d07>
 11. Langeveld HR, Weidema WF, Laurents PS, Stassen LP, Steyerberg EW, Lange J, et al. Total extraperitoneal inguinal hernia repair compared with lichtenstein (the LEVEL-trial) a randomized controlled trial. *Ann Surg.* 2010;251(5):819-824.
<https://doi.org/10.1097/SLA.0b013e3181d96c32>
 12. Sudarshan PB, Sundaravadanan BS, Kaarthik VP and Shankar PS. Laparoscopic versus open mesh repair of unilateral inguinal hernia: A comparative study. *Int Surg J.* 2017;4(3):921-925.
<https://doi.org/10.18203/2349-2902.isj20170505>
 13. Saeed BB, Rabee B, Aram FO and Abdulla A. Inguinal hernia repair by darnning. *Yemen J Med Sci.* 2009;1(3):1-5.
<https://doi.org/10.20428/yjms.v3i1.246>
 14. Dhawan N, Thawait A, Goyal KS and Goel K. Comparative study of post-operative pain in open (Lichtenstein) repair versus laparoscopic repair for unilateral inguinal hernia. *Int J Contemp Med Res.* 2019;6(10):6-9.
<https://doi.org/10.21276/ijcmr.2019.6.10.36>
 15. Shah A, Rathod J and Yagnik V. A comparative study between laparoscopic hernia repair and open lichtenstein mesh repair. *Br J Med Med Res.* 2017;21(9):1-8.
<https://doi.org/10.9734/BJMMR/2017/32834>
 16. The MRC Laparoscopic Inguinal Hernia Trial Group. Laparoscopic versus open repair of groin hernia: A randomised comparison. *Lancet.* 1999;354(9174):185-190.
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