

## Original Research Article

# Evaluation of laparoscopic total extraperitoneal hernioplasty versus open hernioplasty in the management of uncomplicated inguinal hernia

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## ABSTRACT

**Background:** Inguinal hernia repair is one of the most common operations in general surgery. Inguinal hernias are among the most common of abdominal wall hernias accounting for almost 75% with lifetime risk of 27% in men and 3% in women. Laparoscopic techniques for inguinal hernia repair, shown to be superior to open repair in terms of postoperative pain and recovery.

**Methods:** In this study, 54 patients with inguinal swelling were taken, 27 cases each for laparoscopic TEP repair and 27 for open mesh repair were studied and results were analyzed.

**Results:** This study shows the maximum number of patients were in the age group of 51-60years in open repair whereas 41-50years in laparoscopic TEP repair. In both the groups, right sided hernia is common. Time duration of surgery varies from 47minutes to 90minutes in open hernia repair whereas in laparoscopic repair it was 85minutes to 136.67minutes. This longer duration of surgery was attributed to learning curve. The mean duration of hospital stay was 3.26days in laparoscopic TEP repair compared to 5.85days in open repair group.

**Conclusions:** Laparoscopic TEP repair offers a significant advantage over open mesh hernia repair. It is associated with less postoperative pain and complications, early post-operative recovery and reduced hospital stay and early resumption of normal activity and better quality of life. However, operative time was prolonged in laparoscopic TEP repair as compared to open due to the learning curve in the institution.

**Keywords:** Laparoscopic hernia repair, Open hernia repair, Totally extraperitoneal repair

## INTRODUCTION

The word “hernia” is derived from a Latin term meaning “a rupture”.<sup>1</sup> A hernia is the bulging of part of the contents of the abdominal cavity through a weakness in the abdominal wall.<sup>2</sup> Abdominal wall hernias are more common and account for about 15-18% of all surgical procedures.<sup>3</sup> Inguinal hernias are among the most common of abdominal wall hernias accounting for almost 75% with lifetime risk of 27% in men and 3% in women.<sup>4</sup> Inguinal hernia repair is one of the most common operations in general surgery. Surgeons and patients face many decisions when it comes to inguinal hernias like

repair or no repair, mesh or no mesh, what kind of mesh, open or laparoscopic, extraperitoneal or transabdominal, and so forth.<sup>5</sup>

Laparoscopic techniques for the repair of inguinal hernias have recently been introduced and is similar to the open pre-peritoneal approaches of either transabdominally or totally extraperitoneal but this procedure has been slow to gain acceptance. This reluctance is mainly because of reports of rare serious complications during and after surgery which include visceral, vascular, nerve injury, and small bowel obstruction. For laparoscopic techniques, adequate patient selection and training might

minimize the risks for infrequent but serious complications in the learning curve.<sup>6</sup> In several small trials, these techniques have been shown to be superior to open repair in terms of postoperative pain and recovery.<sup>7</sup>

The primary aim of the studies was to evaluate the treatment groups undergoing open and laparoscopic repair of hernia with respect to time to return to normal physical activity, complications, early recurrence rate and quality of life assessment. The main aim was to study laparoscopic TEP repair and open hernioplasty. The objective was to study incidence of inguinal hernia in tertiary care hospital, average time required for the procedure, the role of time required for operations with respect to post-operative recovery, advantage and disadvantage of laparoscopic hernia repair, advantages and disadvantages of open hernioplasty and to decide superiority between these two methods of surgery.

To achieve the above aims and objectives an observational prospective study was conducted at Dr. B.R.A.M. hospital, Raipur over a period of one year from July 2017 to July 2018.

## METHODS

The patients having bulge/swelling in inguinal region whether unilateral/bilateral, direct/indirect, primary/recurrent resulting in discomfort or dragging pain with positive cough impulse admitted in surgical wards of Dr. B.R.A.M. hospital, Raipur, were included in the study.

All operated patients were assessed in terms of duration of surgery, intra-operative/post-operative complications, post-operative pain, mobilization, duration of hospital stay and duration for return to normal work. After discharge patients were called for follow up after 7days and for 3months.

All patients above 18years and below 65years, only male patients with direct/indirect inguinal hernia, unilateral/bilateral inguinal hernia, primary/recurrent inguinal hernia and the patients fit for general anaesthesia were included.

Children below the age of 18years and elderly above 65years, female patients, patients with strangulated, irreducible, obstructed inguinal hernia, huge inguinoscrotal hernia, patients unfit for general anaesthesia, patients not consenting for the study and bleeding diathesis were excluded. Twenty-seven cases each for laparoscopic TEP repair and 27 for open mesh repair for inguinal hernioplasty (total 54) were studied from July 2017 to July 2018.

Patients were admitted in the surgical wards of Dr. B.R.A.M. hospital, Raipur and the facilities in the wards were utilized. The biochemical laboratory facilities, the radiological, sonographic and ECG facilities of the same were utilized. Patients were operated in surgical theatre

of the same hospital. General anaesthesia was given to all patients for laparoscopic hernia repair and spinal anaesthesia was given to patients of open mesh repair. The instruments used for routine hernia surgeries and laparoscopic facilities available in the same hospital were used. The demographic details like age of the patients were elucidated in both the study group (laparoscopic TEP repair) and the control group (open mesh repair). The site of hernia namely right, left or bilateral was also noted.

Patient presenting with hernia for first time were included as primary hernia group in both laparoscopic and open hernia group. The well-known risk factors for occurrence of inguinal hernia were studied e.g. smoking, tobacco chewing, chronic cough/ COPD, bronchial asthma. The associated co-morbid conditions were studied, which would influence the choice of anaesthesia, post-operative management and associated complications. These included diabetes mellitus, hypertension and ischemic heart disease, COPD.

The type of anaesthesia administered was also noted, whether general anaesthesia or spinal anaesthesia was given was noted. The operative time was calculated from the time of skin incision to the time of skin closure. Intra operative complications like pneumoperitoneum, densely adherent sac, vascular injury, conversion to open repair were noted. The post-operative complications which were assessed included seroma formation, haematoma, wound infection, cord oedema.

Patients were assessed for post-operative pain on post-operative day 1<sup>st</sup>, 2<sup>nd</sup> and 7<sup>th</sup>, which was assessed using visual analogue scale. The analgesic used was Diclofenac sodium with a single dose of 50mg and the dosage was given as per the requirement not more than 3 doses per day. The duration of hospital stay was analyzed in both the study and control groups in number of days. Wound-related complications like wound infection, purulent discharge, wound swelling was investigated. It is defined as time taken after operation in days when inguinal discomfort did not interfere with normal daily activities. Chronic pain was defined as any pain reported by the patient at or beyond 3months post-operatively as per the International Association of the Study of Pain which was recorded on the VAS scale.

### *Operative technique of laparoscopic repair of inguinal hernia by total extraperitoneal approach*

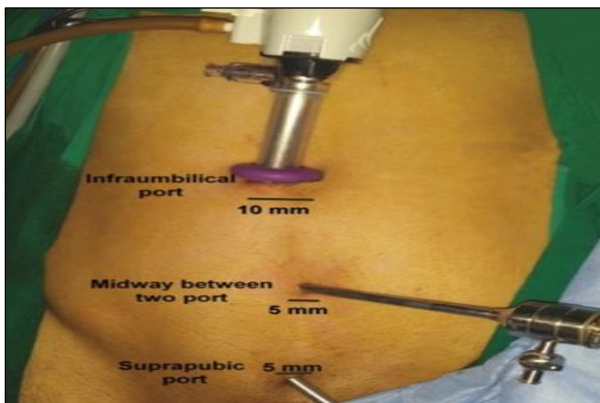
The pre-operative check list includes the patient's details (name, age, sex, address), correct side or bilateral hernia, patient was nil by mouth for more than 6hours, patient has given consent for surgery including for conversion to open hernia repair if required and check if patient was prepared from xiphoid to groin and mid- thigh. Total Extraperitoneal (TEP) repair was done under general anaesthesia, adds to its efficacy with respect to early recovery.

### Operating room set up

Patient in supine position with arms by the side. The surgeon was usually opposite to side of hernia during placement of ports and insufflating the pre-peritoneal space, after that they can move to head end of the patient with camera assistant on the same side. The patient was given head low position to allow bowel loops to fall away from the inguinal region. The scrub nurse usually stands on the same side with the surgeon or at foot end of patient along with the laparoscopic trolley. The monitor was placed at the foot end of the patient.

### Total extraperitoneal repair (TEP) procedure:

- An infraumbilical 1.5cm incision was made using 15 knife blades.
- The subcutaneous tissues are dissected bluntly and the umbilical stalk was grasped with Kocher clamp and retracted upward.
- Anterior rectus sheath was incised and ipsilateral rectus abdominis muscle was retracted.
- A balloon trocar was inserted into the space between the rectus abdominis muscle anteriorly and the posterior rectus sheath posteriorly. The balloon was inflated by using saline and the preperitoneal space was created.

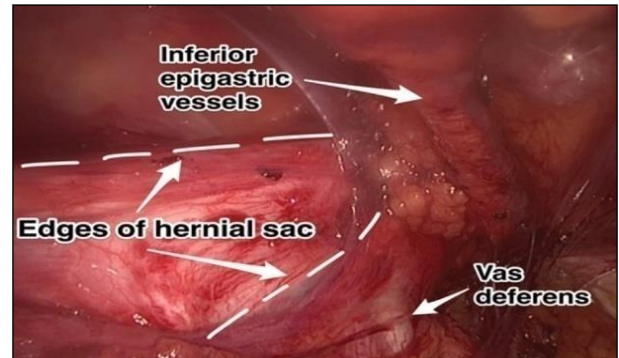


**Figure 1: Port placement.**

- Insertion of 10mm trocar: The balloon was removed and blunt tip 10mm trocar was introduced into the preperitoneal space thus CO<sub>2</sub> gas was insufflated to the cannula and preperitoneal space was created further.
- Insertion of 30-degree telescope: A 10mm telescope attached to the light source and camera was introduced through the sub-umbilical cannula. Further, creation of the preperitoneal space may be achieved by blunt dissection using the telescope.
- Placement of subsequent ports: Placement of two more 5mm port was required. One 5mm port was inserted in the midline under direct vision about 1cm above the symphysis pubis. Another 5mm port was inserted in the midline midway between the suprapubic and sub-umbilical trocar. Patient was

placed in the trendelenburg position with the side of the hernia being tilted up.

- The inferior epigastric vessels are identified and retracted.

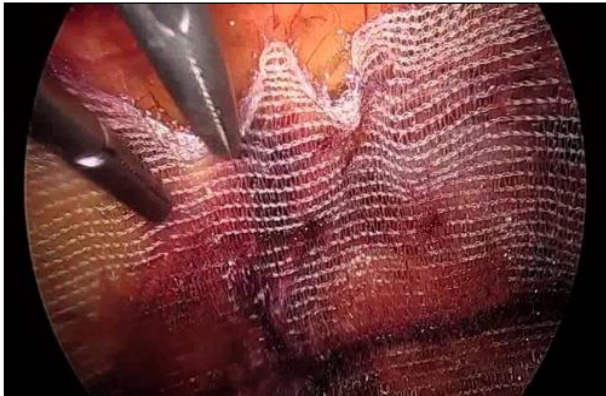


**Figure 2: Visualization of the structures.**

- Dissection of hernia sac: The cooper ligament was identified lateral to the symphysis pubis and cleared of any preperitoneal fat. If direct hernia was present the sac will be readily identified during this dissection and reduced.
- Dissection of indirect sac: The lateral dissection was done by using a maryland grasper. The indirect hernial sac lies lateral to the inferior epigastric vessels and anterolateral to the cord structures. The hernial sac was dissected of from the cord structures taking care not to injure the testicular vessels and the vas deferens.
- Paritalization of cord structures: For ease of placement of the mesh the cord structures are dissected from the preperitoneal loose areolar tissue till the point of divergence of the vas deferens and the testicular vessels.
- During dissection of the preperitoneal space if the peritoneum was opened inadvertently there will be loss of preperitoneal space due to creation of pneumoperitoneum. In this situation the option will be:

- To close the peritoneal rent,
- To insert a veress needle into the peritoneal cavity for deflation or,
- To convert this to an open procedure.
- Placement and fixation of mesh in preperitoneal space: A propylene mesh size of 12cm \*15cm was ideal for inguinal hernia repair, the mesh was rolled and a suture was placed in the middle of the rolled mesh which helped in better placement and unrolling. The rolled mesh was inserted into the preperitoneal space through the 10mm trocar. Medially, the mesh was placed upto symphysis pubis and laterally 2cm medial to the anterior superior iliac spine. Below the mesh was placed along the cooper's ligament and lateral to the deep ring along the inguinal ligament. The mesh was

unrolled and spread to cover the deep inguinal ring and the Hesselbach's triangle. Mesh was fixed by endosuture to the cooper's ligament medially above the anterior abdominal wall.



**Figure 3: Placement and fixation of mesh.**

- De-sufflation of the preperitoneal space and the trocars are removed.
- Closure of 10mm port site: Anterior rectus sheath was sutured by 2-0 vicryl suture and skin with monofilament polyamide suture.

The open inguinal hernia repair procedure was performed according to the Lichtenstein method as described by Amid PK.<sup>8</sup>

## RESULTS

The study was conducted from July 2017 to July 2018. The study showed the following results. The patients were selected from the age group of 18-65years in both the study and control groups. The maximum number of patients were in the age group of 51-60years in open repair whereas 41-50years in laparoscopic repair. The mean age was 47years in open repair against 43years in laparoscopic repair (Table 1).

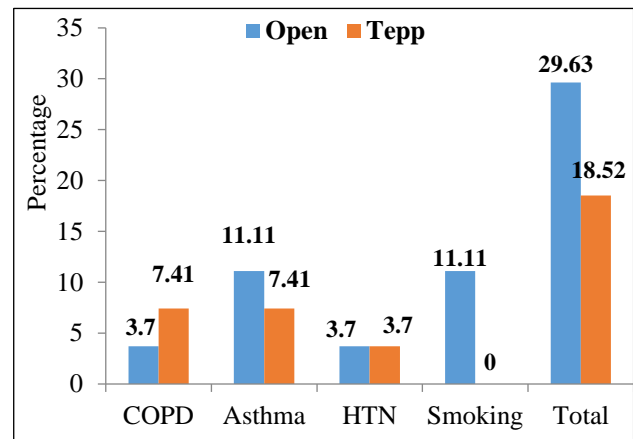
**Table 1: Mean age distribution.**

Procedure	Open repair		Laparoscopic repair	
	Mean	SD	Mean	SD
	47.07	11.30	43.66	13.57
P value	0.32 NS			

In both the groups (laparoscopic and open repair) right sided hernia was common. No risk factors were seen in 19 patients from open repair and 22 patients from laparoscopic repair. Among them, 8 patients from open repair (1-COPD, 3-Asthma, 1-hypertension, 3-smoking) and 5 patients in the laparoscopic repair (2-COPD, 2-asthma, 1-hypertension) had one of the above-mentioned risk factors (Figure 4).

Mean operative time in the study done was as follows. The mean duration of time in open repair for open U/L-

47min, for open B/L-90min whereas for laparoscopic repair was lap U/L-85min, lap B/L-136.67min (Table 2).

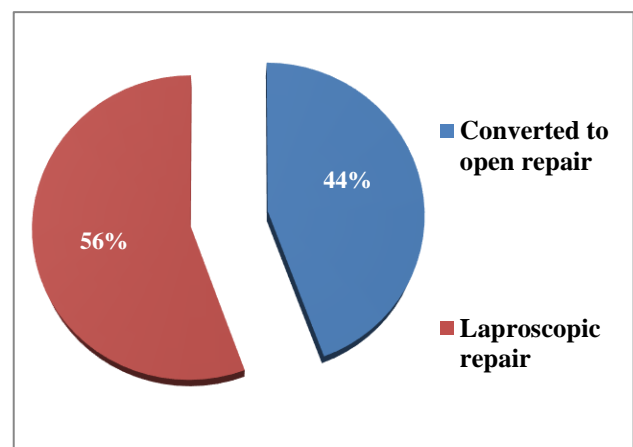


**Figure 4: Risk factors studied.**

**Table 2: Duration of open and laparoscopic repair.**

Procedure	Open U/L	Open B/L	Lap U/L	Lap B/L
No. of cases	25	2	12	3
Mean	47.00	90.00	85.00	136.67
SD	4.564	0.000	5.145	15.275

Thus, the overall operative time for laparoscopic repair was relatively more than the open repair. The result was statistically significant in correlation between duration of surgery favoring open inguinal hernia repair. In this study, author had observed that out of 27 cases in laparoscopic repair group, 12 cases (44%) are converted to open repair (Figure 5).

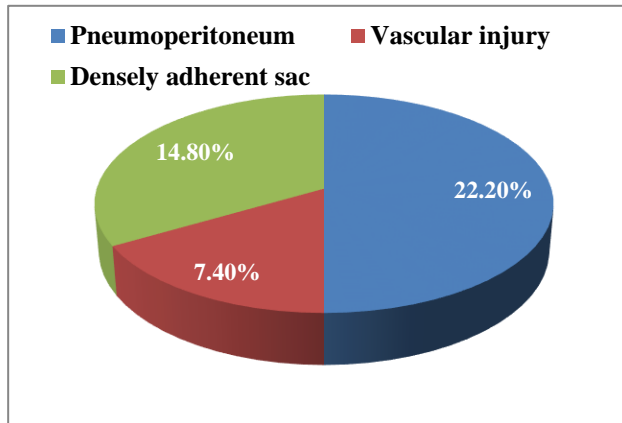


**Figure 5: Conversion to open repair.**

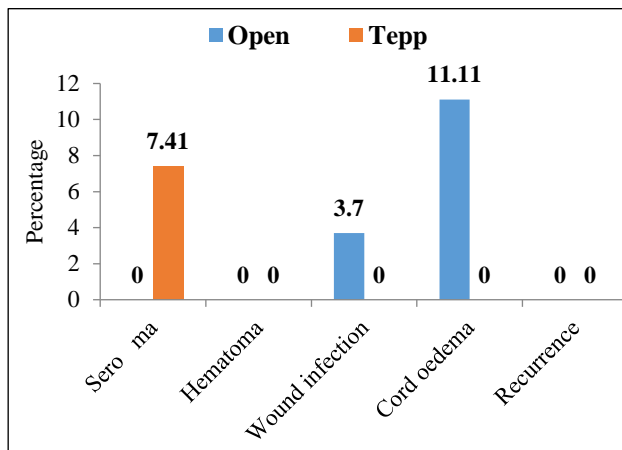
This conversion was due to intraoperative complications like pneumoperitoneum, vascular injury, densely adherent sac which was seen among 12 patients of laparoscopic TEP repair (Figure 6).



All patients in the open repair were given spinal anaesthesia and those of laparoscopic repair were given general anaesthesia. Some patients in the open repair developed wound infection (3.7%), seroma formation, haematoma formation, cord oedema (11%) while in laparoscopic repair only 2 patients (7%) developed seroma formation (Figure 7).



**Figure 6: Percentage of complications for conversion.**



**Figure 7: Post-operative complications.**

**Table 3: Mean duration of hospital stay.**

Procedure	Open repair		Laparoscopic repair		P value
	Mean	SD	Mean	SD	
Duration of hospital stay (days)	5.85	1.37	3.26	1.61	<0.0001 HS

All open repair patients have pain score of 5-6 and in laparoscopic repair it was 2-3. In case of Laparoscopic to open repair, 12 patients have pain score of 4. The mean duration of hospital stay was 5.85days in open repair while it was 3.26days in laparoscopic TEP repair (Table 3) which was statistically significant. The mean time of returning to normal activity was 16.44days in open repair

while it was 7.18days in laparoscopic TEP repair (Table 4) which was also statistically significant.

**Table 4: Time of returning to normal activity.**

Procedure	Open repair		Laparoscopic repair		P value
	Mean	SD	Mean	SD	
Time of returning to normal activity (days)	16.44	2.15	7.18	3.40	<0.0001 HS

## DISCUSSION

Hernias have been a subject of interest since the dawn of surgical history. The ideal repair should allow a patient a rapid return to normal work, leisure and recreation at a reasonable cost. The laparoscopic technique has replaced the open approach in many surgical procedures, this development has largely taken place, providing safety and benefit to the patient.

This study reports the TEP laparoscopic repair for inguinal hernia repair, which has less postoperative pain, early postoperative recovery and rapid return to normal occupational activity, than to comparable postoperative characteristics of classical open hernia repair approaches. In this study, 70.37% patient were of right sided inguinal hernia in open repair and 62.96% in laparoscopic TEP repair.

So, it is the most common side of hernia in this study which is well correlated with current demographic parameter and with studies of Juul P and Christensen K. The mean age is 47.07years in open repair whereas 43.66years in laparoscopic TEP repair. Among those operated, large percentage of patient's are between 31-40years and 51-60years in open repair while in laparoscopic TEP repair it was 41-50years.<sup>9</sup>

In this study, 29.63% of open repair and 18.52% of laparoscopic repair had one of the risk factors like COPD, asthma, smoking, hypertension.

In this study, the mean operative time for open U/L-47 min, for open B/L-90min in open hernia repair group and for lap U/L-85min, for lap B/L-136.67min in laparoscopic hernia repair group. The overall mean operative time was less in open repair than in laparoscopic repair, which was in concordance with other studies.

Wellwood J et al, reported no significant difference in operative time for laparoscopic (46.6min) and open hernia repair group (46.8min) whereas Paganini AM et al, and Picchio M et al, reported more operative time in laparoscopic hernia repair group (66.6 and 49.6min respectively) than open hernia repair (48.2 and 33.9min respectively).<sup>10-12</sup>

In this study out of 27 patients, 12 (44%) patients were converted from laparoscopic TEP repair to open repair due to peritoneal tears, vascular injury and densely adherent sac. This conversion rates are well correlated with the studies of Felix EL et al, Dulucq JL et al, Vanclooster P et al, Khoury N et al, who reported conversion rates of 1.8%, 1.2%, 0.5% and 1.5% respectively.<sup>13-16</sup> In this study, laparoscopic hernia repair was in the beginning of the learning curve, hence it was expected to require skilled surgeons to avoid conversion rates, as in the institution surgeries are done by many budding surgeons.

In this study, post-operative complications occurred in open hernia repair were wound infection, cord oedema while in laparoscopic TEP repair only 2 patients developed seroma formation which was well correlated with the studies of Dulucq JL et al, Vanclooster P et al, who found less post-operative complication rates in laparoscopic group.<sup>14,15</sup> Postoperative pain was assessed using visual analogue scale (VAS).

In patients who underwent open hernia repair, VAS pain score was higher than for laparoscopic TEP hernia repair. However, the difference between the two groups was statistically significant ( $p < 0.05$ ). The mean duration of hospital stays in this study, in laparoscopic TEP repair group was 3.26days to that of open hernia repair group was 5.85days ( $p < 0.0001$ ) which was well correlated with studies of Champault G et al, who reported 3.2days in laparoscopic repair and 7.3days in open repair groups.<sup>17,18</sup>

The mean time to return to normal activity in the laparoscopic TEP repair group was 7.18days to that in open repair group was 16.44days ( $p < 0.0001$ ). One of the significant advantages of laparoscopic TEP repair over open hernia repair was less postoperative recovery period which was well correlated with the studies of Champault G et al, Beets GL et al, who reported similar findings.<sup>17,18</sup>

## CONCLUSION

Laparoscopic TEP repair offers a significant advantage over open Lichtenstein hernia repair. It is associated with less postoperative pain and analgesia requirement. The frequency of postoperative chronic pain is also less with laparoscopic TEP repair as compared to open repair. Laparoscopic TEP repair is associated with early post-operative recovery and reduced hospital stay and early resumption of normal activity and better quality of life.

However, operative time was prolonged in laparoscopic TEP repair as compared to open due to the learning curve in the institution. It has statistical advantage in relation to wound infection, seroma and haematoma formation. The choice of the procedure should be based on surgeon or patient preferences. Although, most hernia repairs are performed as open procedures, there is a room for an expansion of laparoscopic hernia repair. Bilateral and recurrent inguinal hernia are well accepted indications.

Laparoscopic TEP repair had long learning curve phase and requires skilled surgeon and minimal technical errors. Hence, laparoscopic hernia repair is safe and effective method available at lower cost and it gives greater patients satisfaction and better cosmetic results, also it produces less complications than conventional open methods.

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