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Totally Extraperitoneal (TEP) Versus Transabdominal Preperitoneal (TAPP) Techniques of Laparoscopic Inguinal Hernia Repair: A Comparative Study

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Abstract

Background: Evolution in the treatment of inguinal hernias having paralleled technological developments in the field. The most significant advances to impact inguinal hernia repair have been introduction of laparoscopy to surgical procedures. Comparison of different laparoscopic approaches is also important.

Aim: To compare the totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) techniques of laparoscopic inguinal hernia repair

Materials and Method: Study design: Prospective observational study. Study population was the inguinal hernia repair patients in Private Speciality Hospital in Pune city of Maharashtra state, India. Study was carried out for the period of two years. Randomly selected patients were divided for surgical intervention into 2 groups, Group 1 TEP group and Group 2 TAPP group. The outcomes of the surgery were studied with respect to some import intraoperative time, intraoperative complications, conversion rates, postoperative complications and recovery time and these were compared amongst 2 groups.

Statistical analysis: Mean, standard deviation were used as descriptive statistics. For Inferential statistics Chi-square test, Fisher's exact test, student t test were used.

Results: A total of 50 patients were included in the study. 47 were males and 3 were females. Study subjects were equally divided in to 2 groups, Group 1 TEP (n = 25) and Group 2 TAPP (n = 25) group. There were 1 female and 24 males in the TEP group with mean age of 58.08 years (SD = 12.27) and 2 females and 23 males in the TAPP group with mean age of 55.68 years (SD = 15.03). There was no statistically significant difference was observed between two groups with respect to occurrence of vascular injury or serosa, ingunodynia, superficial wound infection ($p > 0.05$). Similarly no difference was observed in duration of surgery, length of hospital stay as well as time required for ambulation and for daily activities ($p > 0.05$).

Conclusion: There was no significant difference found between the two approaches considering intraoperative time and complications, postoperative recovery and postoperative complications.

Keyword: *Inguinal hernia; Laparoscopic repair; TEP; TAPP; Comparison*

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Introduction

A hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity. The external abdominal hernia is the commonest form, the most frequent varieties being the inguinal, femoral and umbilical, accounting for 75% of cases. The rarer forms constitute 1.5%, excluding incisional hernias [1]

The treatment of inguinal hernia is integral to the history of general surgery; evolution in the treatment of inguinal hernias having paralleled technological developments in the field. The most significant advances to impact inguinal hernia repair have been the addition of prosthetic materials to conventional repairs and the introduction of laparoscopy to surgical procedures. No disease of the human body, belonging to the province of the surgeon, requires in its treatment a better combination of accurate anatomical knowledge with surgical skill than hernia in all its varieties was rightly said by Sir Astley Cooper in 1804 [1].

The era of laparoscopy which exploded with the introduction of cholecystectomy is continuing to march forward through various advanced laparaoscopic surgeries. Even though laparoscopic hernia repairs were reported as early as 1982, the widespread interest in laparoscopic herniorrhaphy did not occur till the 1990's. Disappointing early recurrence rates (as high as 25%), excessive cost and steep learning curve were the major stumbling blocks which prevented the routine use of laparoscopy in the management of inguinal hernias [2].

With two decades of experience in laparoscopic hernia surgery, the dust seems to be settling down more towards accepting the superiority of laparoscopic repairs over open repairs. Transabdominal preperitoneal (TAPP) repair requires access through the peritoneal cavity with placement of mesh through a peritoneal incision. In totally extraperitoneal (TEP) repair, the peritoneal cavity is not entered and mesh is used to seal the hernia from outside the peritoneum [3].

There is scarcity of data comparing the laparoscopic TAPP approach with laparoscopic TEP approach and questions remain about their relative merits and risks. The present prospective study was carried out to compare the totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) techniques of laparoscopic inguinal hernia repair with respect to intraoperative time, intraoperative complications, Conversion rates, postoperative complications, and recovery time and recurrence rate.

Material and Method

Study area: Tertiary care speciality Hospital in Pune city of Maharashtra state, India.

Study population: Patients who were operated for inguinal hernia at during the study time period and were included in the study as per the inclusion and exclusion criteria, mentioned below.

Sample size: Study group consists of total 50 cases who have undergone inguinal hernia repair. All cases were selected randomly based on inclusion and exclusion criteria.

Study design: Prospective cross sectional.

Inclusion Criteria

1. Direct or Indirect Inguinal hernia
2. Age > 18 years
3. Non-obstructed/Non-reducible hernia
4. Patient willing for follow up of minimal period of 6 months

Exclusion Criteria

1. Age < 18 years
2. Obstructed or reducible hernia
3. Coagulopathy
4. Patient on chemotherapy
5. Liver disease
6. Chronic liver failure

Study Protocol

Patients were selected on the basis of above inclusion and exclusion criteria. A case record proforma was prepared for each patient. The case record proforma contained general identification records of the patient, details of history of presenting complaints, detailed examination and investigations, preoperative evaluation, intraoperative events and postoperative recovery, complications and follow up details. Patient were posted for laparoscopic inguinal hernia repair after completing preoperative requisitions.

Patient were followed up at 1 month, 3 months, 6 months, 1 year and 2 years (when applicable) to assess the results and also for complications related to the procedure. At the end of the study, the data of all the patients was assessed to compare between the two techniques of laparoscopic inguinal hernia repair.

Duration of operation was defined as time from first incision to last suture. 'Opposite' method initiated was defined as a laparoscopic repair initiated when an open repair was allocated, or vice versa. A conversion was defined as a procedure initiated as a laparoscopic but converted to an open repair. 'Postoperative pain' included data collected on the first, second or third day. Haematoma included wound or scrotal haematoma or ecchymosis but not bruising. Seroma included hydrocele. Wound/superficial infection was defined as wound-related infections only and included pus from wound, fistula and sinus formation. Length of postoperative stay was defined as time from admission to discharge. Time to return to usual activities was defined as number of days to resumption of normal social activities or work where this was not available. Persisting pain was defined as groin pain of any severity (including testicular) persisting at 1 year after the operation or at the closest time point to 1 year provided that this was at least 3 months after surgery.

Statistical Analysis

Data analysis was done by using statistical package Primer of Biostatistics. Mean, standard deviation, percentages, proportions were used for descriptive statistics. Statistical analysis of the observations was done and the comparison between the two techniques of laparoscopic inguinal hernia repair was established. For group statistics Independent Sample t-test was used. For duration statistics where data was skewed, Mann Whitney U-test was used. For rest analysis, Pearson's chi (x^2) square test and Fischers's exact p test was used. A probability value of less than 0.05 ($p = < 0.05$) was deemed statistically significant.

Ethical considerations

The study was conducted according to the Declaration of Helsinki. Institutional Ethical Committee Approval was taken prior to commencement of the study. Written and informed consent was taken from all patients for including them into this study. Patients were provided with Patient information sheet, which had detailed information about the study being conducted and details about their participation and confidentiality of their data.

Results

A total of 50 patients were included in the study. 47 were males and 3 were females. Study subjects were equally divided in to 2 groups, Group 1 TEP (n = 25) and Group 2 TAPP (n = 25) group. There were 1 female and 24 males in the TEP group with mean age of 58.08 years with a standard deviation of 12.278 years and 2 females and 23 males in the TAPP group with mean age of 55.68 years with a standard deviation of 15.030 years.

Superficial wound infection	Method of laparoscopy		Total	P-value
	TEP	TAPP		
Yes	1	1	2	0.999
No	24	24	48	
Total	25	25	50	N.S.

Table 1: *Distribution of patients with respect to occurrence of superficial wound infection and method of laparoscopy used.*

S. No	Parameter/ Variable	Method used	Length of stay		P-value
			Mean	SD	
1	Length of stay	TEP	3.28	0.74	0.503
		TAPP	3.12	0.93	
2	Duration of Surgery	TEP	77.84	25.14	0.427
		TAPP	83.48	24.66	
3	Time required for 1st analgesia	TEP	7.08	3.23	0.356
		TAPP	6.36	2.25	
4	Time required for ambulation	TEP	3.56	1.66	0.262
		TAPP	4.16	2.06	
5	Time required for daily activities	TEP	15.48	7.88	0.655
		TAPP	16.40	6.50	

Table 2: *Comparison of important parameter/variables with respect to method of laparoscopy used. (TEP n = 25, TAPP n = 25).*

Occurrence of vascular injuries with respect to method of laparoscopy used was studied and it was observed that there is no association between occurrence of vascular injuries and method of laparoscopy used. Similarly Occurrence of seroma with respect to method of laparoscopy used was studied and it was observed that there is no association between occurrence of seroma and method of laparoscopy used. There was no association between superficial wound infection and method of laparoscopy used.

There was no association between occurrence of Inguinodynia or Neuralgia with respect to method of laparoscopy used. In TAPP group 2 patient had inguinodynia or neuralgia while none of the patient in TEP group had the same.

As per above mentioned table in all parameter/variable there was no significant association observed. Though numerical difference can observed in the duration of surgery in which TEP group had 77.84 minutes mean duration while TAPP group had 83.48 minutes mean duration. But time required for 1st analgesia was about 1 minute less in TAPP group compared to TEP group. Although there was no statistically significant difference.

Discussion

Hernia is a protrusion of the inner lining of the coelomic epithelium through an abnormal opening in the wall of the parietes in which it is normally contained and may include a viscus. An inguinal hernia is a weakness in the wall of the abdominal cavity that is large enough to allow escape of soft body tissue or internal organ, especially a part of the intestine. It appears as a lump and for some people can cause pain and discomfort, limit daily activities and the ability to work.

The most common laparoscopic techniques for inguinal hernia repair are transabdominal preperitoneal. Repair and totally extraperitoneal repair. In TAPP the surgeon goes into the peritoneal cavity and places a mesh through a peritoneal incision over possible hernia sites. TEP is different in that the peritoneal cavity is not entered and mesh is used to seal the hernia from outside the peritoneum (the thin membrane covering the organs in the abdomen). This approach is considered to be more difficult than TAPP but may have fewer complications. Laparoscopic repair is technically more difficult than open repair [4].

A meta-analysis identified one RCT (Schrenk 1996) which reported no statistical difference between TAPP and TEP when considering duration of operation, haematoma, length of stay, time to return to usual activity and recurrence. The eight non-randomised studies suggest that TAPP is associated with higher rates of port-site hernias and visceral injuries whilst there appear to be more conversions with TEP. Vascular injuries and deep/mesh infections were rare and there was no obvious difference between the groups [4].

A meta-analysis "TAPP vs TEP laparoscopic techniques for inguinal hernia repair." by Wake BL., *et al*. Identified one RCT which reported no statistical difference between TAPP and TEP when considering duration of operation, haematoma, length of stay, time to return to usual activity and recurrence. The eight non- randomised studies suggest that TAPP is associated with higher rates of port-site hernias and visceral injuries whilst there appear to be more conversions with TEP. Vascular injuries and deep/mesh infections were rare and there was no obvious difference between the groups. No studies reporting economic evidence were identified. Very limited data were available on learning effects but these data suggest that operators become experienced at between 30 and 100 procedures. Finally the author concluded that there is insufficient data to allow conclusions to be drawn about the relative effectiveness of TEP compared with TAPP. Efforts should be made to start and complete adequately powered RCTs, which compare the different methods of laparoscopic repair [4].

In a study by Cohen RV., *et al*. the operative time was shorter in TAPP (not statistically significant). Surgeons complained of more technical difficulties while performing the TEP approach (70% complaints of difficulty in TEP--four conversions to TAPP). There was no difference in hospital stay (mean of 30 h) and return to work (TAPP 7 days and TEP 5.5 days). Regarding the complication rate (TAPP = 20.5% and TEP = 13.5%; not significant), none were related to the pneumoperitoneum technique or its systemic effects. In the TAPP approach, two trocar site hernias occurred, and in the TEP approach, one severe cellulitis occurred, which was managed without surgical intervention. The mean follow-up period for each procedure was not the same, so the recurrence rates are not comparable statistically (rate of 1.85% in TAPP and 0 in TEP). Both techniques are safe and have the same advantages, but TAPP is easier: a better view of the anatomy is achieved, shortening the learning curve. They suggested that TAPP can be an adequate laparoscopic approach to groin hernias. A longer follow-up period and more cases are needed to determine recurrence rates [5].

A study by Gass M, Banz., *et al*. is one of the first population based analyses comparing TEP and TAPP in a prospective cohort of more than 4,500 patients. Intraoperative and surgical postoperative complications were significantly higher in patients undergoing TEP. TEP is also associated with longer operating times and higher conversion rates. Therefore, on a population-based level, the TAPP technique appeared to be superior to the TEP repair in patients undergoing unilateral inguinal hernia repair [6].

In the study by Krishna A, Misra MC., *et al*. TEP had a significant advantage over TAPP for significantly reduced postoperative pain up to 3 months, which resulted in a better patient satisfaction score. The other intraoperative complications, postoperative complications, and cost were similar in both groups. In terms of results, both repair techniques seemed equally effective, but TEP had an edge over TAPP [7].

Conclusion

To conclude in the present prospective study of 50 patients undergoing laparoscopic inguinal hernia repair by transabdominal and totally extraperitoneal approach, there was no significant difference found between the two approaches considering intraoperative time and complications, postoperative recovery and postoperative complications. Ultimately surgeon's location on the learning curve plays an important role in the results following hernia surgery.

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