

A Single Surgeon's Experience of Total Extra Peritoneal Repair vs Transabdominal Preperitoneal Repair- A Prospective Cohort Study

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ABSTRACT

Introduction: Hernia surgery has evolved over a period of 2500 years from the Bassini-Shouldice era to conventional Lichtenstein's meshplasty to the laparoscopic era. Since inception of the laparoscopic approach 25 years ago, there were several advancements in the techniques of inguinal hernia repairs. The two most commonly practiced laparoscopic approaches are the Total Extra Peritoneal (TEP) and Transabdominal Preperitoneal (TAPP) repair.

Aim: To compare the outcomes for TEP and TAPP approaches in laparoscopic inguinal hernia surgery in terms of operative time consumed, postoperative pain, duration of hospital stay, complications and recurrence rate when performed by a single surgeon.

Materials and Methods: A prospective interventional cohort study was carried out among 70 patients with uncomplicated inguinal hernia. Patients were divided equally into two groups of 35 patients and underwent TAPP and TEP repairs depending on group randomisation. All surgeries were performed by the same surgeon. Factors including operative time, postoperative pain, duration of hospital stay, complications and recurrence were

documented and compared for both the groups. The statistical analysis was done using Statistical Package for the Social Sciences (SPSS) software version 21. Unpaired t-test was used to compare the mean between the two groups. The p-value of <0.05 was considered to be statistically significant.

Results: The mean operative time measured in minutes for TEP repair was 31.03 minutes and TAPP repair was 42.26 showing a difference of 11.23 minutes which was statistically significant (p=0.001). The mean Standard Deviation (SD) pain score at 24 hours for TEP repair was 2.43 (1.195) and TAPP repair was 3.43 (0.917). The mean (SD) pain score at 48 hours for TEP repair was 1.31 (1.051) and TAPP repair was 2.20 (0.901). The mean (SD) pain score at one week for TEP repair was 0.37 (0.690) and TAPP repair was 0.91 (0.781). The mean (SD) duration of hospital stay in TEP repair was 2.60 days (0.553) when compared to 3.49 days (0.658) in TAPP repair. All the results were statistically significant with a p-value of 0.001.

Conclusion: TEP repair had superior outcomes in terms of reduction in operative time, less postoperative pain and shorter hospital stay than TAPP repair.

Keywords: Hernia repair, Inguinal hernia, Laparoscopy

INTRODUCTION

Hernia is the most common problem that is encountered in the surgical Outpatient Department [1]. Knowledge and understanding of the disease process, treatment of hernia repairs had undergone a great evolution since it was first described more than 2500 years ago from the ancient Egyptian era to the era of laparoscopic surgeries. History in the treatment of hernia remotes back to the idea of containing the hernial sac inside the body cavity by using inguinal belts, as even today it is been used in various parts of the world for unfit patients. In the 16th century, an Italian anatomist, Gabriele Fallopio proposed the golden stich technique where the hernial sac, contents and skin was excised securing the neck with a 'golden stich'. Inguinal anatomy was still evolving by the 17th century but major advantage was that they understood incarcerated hernia if not reduced or operated was a direct risk for mortality.

Antisepsis, asepsis and anaesthesia led to safer operations in the 19th century with two important rules in hernia surgery that is the high ligation of the hernia sac and closure of deep inguinal ring [2,3]. Bassini E in 1887 revolutionised the idea of restoring the normal anatomy in the inguinal region for radical cure of hernia. The era of the tension repairs ended with the Shouldice, which was done by complete incision in the transversalis fascia, four layered sewing of the posterior wall with monofilament material and rapid ambulation of the patient. The advent of using prosthesis changed the face of

hernia repair when Usher in 1959 first reinforced Bassini's technique with a mesh [4,5]. Lichtenstein in 1984 enlightened the concept of tension free meshplasty and Gilbert in 1987 used a cone plug to cover the defect which later became the Prolene hernia system. However, Lichtenstein tension free repair became the gold standard technique worldwide owing to its simplicity and great results. Ger R in 1982 was the first surgeon to perform hernia repair by laparoscopy.

By early 1990s, minimally invasive techniques were introduced TAPP repair was first performed by Leroy in 1990, followed by the TEP repair by Dulucq in 1991 and McKernonin 1992 [6]. Since then, TEP repair and TAPP repair has evolved a long way and are now considered the best offered treatment for inguinal hernia. TAPP repair has been reported to be easier to learn but associated with longer operative time, increased postoperative pain and visceral injuries. TEP repair, on the other hand avoids violation of the peritoneal cavity, consumes shorter time duration to perform and decreases the risk of vascular and visceral injury. The main drawbacks of TEP repair include access related complications and space creation which requires a longer learning curve to master the technique [7-9].

The aim of this study was to compare the outcomes for TEP and TAPP approaches in laparoscopic inguinal hernia surgery in terms of operative time consumed, postoperative pain, duration of hospital stay, complications and recurrence rate when performed by a single surgeon.

MATERIALS AND METHODS

A single centre prospective interventional cohort study was done among 70 patients with inguinal hernia who were divided equally into two groups of each 35 patients. One group was for TAPP repair and the other group for TEP repair. It was a single blinded study. The study was started after obtaining Institutional Ethical Committee (IEC) Clearance from SRM University (IEC no. 1389 dated 25.04.2018) and was conducted from April 2018 to October 2020 for a duration of two years and six months. Simple randomisation was done by selecting every alternate patient for TAPP and TEP. In order to maintain authenticity and eliminate bias, all the operations in the study population were performed by a single surgeon.

Sample size was calculated based on a prospective randomised controlled trial conducted by Asuri K et al., on laparoscopic inguinal hernia repair that compared TAPP vs TEP, which showed s1 and s2 of 0.433 and 0.295, respectively and m1 and m2 of 1.83 and 1.09, respectively when substituted in $n=2(z_{\alpha}+z_{1-\beta})^2 (s1^2+s2^2)/(\mu1-\mu2)^2$ gave a value of 27.9 which when calculated including the dropouts came out to be 35 in each groups [10].

The patients consenting for the study were included after being explained in their native language about the study in detail. The work has been reported in line with the Strengthening the Reporting of Cohort Studies in Surgery (STROCSS) criteria [11]. Unilateral uncomplicated inguinal hernias undergoing laparoscopic hernioplasty and willing for regular follow-up were included in the study. Patients with complicated hernias, bilateral hernias, recurrent hernias, requiring concomitant abdominal procedures, connective tissue disorders, patients on steroid therapy were excluded from the study.

All patients underwent routine blood work-up which included complete hemogram, serum urea, serum creatinine, serum electrolytes and random blood glucose sugar. A complete diabetic profile was done in diabetics, cardiac fitness in presence of hypertension or cardiac conditions and chest physician clearance was obtained in presence of respiratory symptoms. Ultrasonogram of the abdomen was done in all patients to look for prostate size and to note the volume of post-void residual urine if any to rule out Benign Prostatic Hypertrophy (BPH). Urologist opinion and clearance was obtained for all patients with BPH.

After anaesthetic fitness, patients were posted for TAPP or TEP repair under general anaesthesia. All patients received Tab. Paracetamol 500 mg thrice daily for analgesia for three days postoperatively. Any additional requirements were documented. Visual Analogue Score (VAS) scale was used. The pain was monitored by the postoperative ward staff nurse at 12 hours, 24 hours, 48 hours in the hospital and on follow-up, by the outpatient department staff nurse at seven days, one month, three months and six months. The total time taken for the surgery was noted in minutes. The wound in the postoperative period was assessed by standard wound Additional treatment, Serous discharge, Erythema, Purulent exudate, Separation of deep tissues, Isolation of bacteria and Stay duration (ASEPSIS) scoring system with scores of 0-10 denoting satisfactory healing and scores of 41 to 50 denoting severe wound infection [12]. The total duration of hospital stay was recorded. The patients were followed-up for a minimum of one year and patient developing hernia at the same site was taken as recurrence and documented.

STATISTICAL ANALYSIS

The statistical analysis was done SPSS Software version 21. Unpaired t-test was used to compare the mean between two groups. A p-value of <0.05 was considered to be statistically significant.

RESULTS

A total of 70 patients were included in the study where they were divided into two groups, 35 patients for TEP repair and 35 patients for TAPP repair. About 34 patients (48.6%) were from the age group 41 to 60 years, 18 patients (25.7%) were over 60 years, 17 patients (24.3%) were between 21 to 40 years and 1 patient (1.4%) was lesser than 20 years formed the study population.

The mean operative time measured in minutes for TEP repair was 31.03 minutes and TAPP repair was 42.26 showing a difference of 11.23 minutes which was statistically significant (p-value 0.001) [Table/Fig-1]. The mean (SD) duration of hospital stay in TEP repair was 2.60 days (0.553) when compared to 3.49 days (0.658) in TAPP repair. The difference was statistically significant with p-value 0.001 [Table/Fig-1].

Variables		N	Mean	SD	t-value	p-value*
Operation time (minutes)	TEP	35	31.03	1.948	-20.312	0.001
	TAPP	35	42.26	2.627		
Duration of hospital stay (days)	TEP	35	2.60	0.553	-6.093	0.001
	TAPP	35	3.49	0.658		

[Table/Fig-1]: Summary statistics- operation time; duration of hospital stay.
*unpaired t-test, p-value <0.05 considered statistical significance; SD: Standard deviation

The mean (SD) pain score at 12 hours for TEP repair was 3.17 (1.339) and TAPP repair was 4.17 (1.043). The mean (SD) pain score at 24 hours for TEP repair was 2.43 (1.195) and TAPP repair was 3.43 (0.917). The mean (SD) pain score at 48 hours for TEP repair was 1.31 (1.051) and TAPP repair was 2.20 (0.901). The mean (SD) pain score at 1 week for TEP repair was 0.37 (0.690) and TAPP repair was 0.91 (0.781). Patients undergoing TAPP repair experienced more pain at 12 hours, 24 hours, 48 hours and at 1st week postoperatively and the difference between the groups was statistically significant [Table/Fig-2].

Type of hernia repair		N	Mean	SD	t value	p-value*
Pain at 12 hours	TEP	35	3.17	1.339	-3.486	0.001
	TAPP	35	4.17	1.043		
Pain at 24 hours	TEP	35	2.43	1.195	-3.928	0.001
	TAPP	35	3.43	0.917		
Pain at 48 hours	TEP	35	1.31	1.051	-3.786	0.001
	TAPP	35	2.20	0.901		
Pain at 1 week	TEP	35	0.37	0.690	-3.082	0.003
	TAPP	35	0.91	0.781		
Pain at 1 month	TEP	35	0.11	0.323	-0.676	0.502
	TAPP	35	0.17	0.382		
Pain at 3 months	TEP	35	0.00	0.000	-	-
	TAPP	35	0.00	0.000		
Pain at 6 months	TEP	35	0.00	0.000	-	-
	TAPP	35	0.00	0.000		

[Table/Fig-2]: Pain scores after TEP and TAPP at various time intervals.
*unpaired t-test, p-value <0.05 considered statistically significant

There were no major wound complications or wound infection in either of the study group. One patient developed seroma who underwent TEP repair (1.4%) which was insignificant (p=0.314) as depicted in [Table/Fig-3]. Two patients in TEP group were converted to open meshplasty due to multiple rents in the peritoneum and one patient from the TAPP group was converted to open meshplasty due to dense adhesions within the hernial sac and surrounding structures. On comparing the need for conversion to open meshplasty [Table/Fig-4], TEP repair (5.7%) had one conversion more than TAPP (2.9%) repair which was statistically insignificant with a p-value of 0.555. All the patients in the study

Seroma		Type of hernia repair		Total
		TEP	TAPP	
Present	N	1	0	1
	%	2.9	0	1.4
Absent	N	34	35	69
	%	97.1	100	98.6
Total	N	35	35	70
	%	100	100	100

[Table/Fig-3]: Group statistics-Seroma formation.

Conversion		Type of hernia repair		Total
		TEP	TAPP	
Present	N	2	1	3
	%	5.7	2.9	4.3
Absent	N	33	34	67
	%	94.3	97.1	95.7
Total	N	35	35	70
	%	100	100	100

[Table/Fig-4]: Group statistics- Conversion to open meshplasty.

population were followed-up for a minimum period of one year and no recurrence was noted.

DISCUSSION

The two standardised laparoscopic inguinal hernia surgery techniques practiced worldwide are the TAPP approach and the TEP approach. Various studies have compared the two techniques in past 25 years, the outcomes of TAPP and TEP repairs were almost similar or with no statistical significance [8,13-15].

This study was done to compare the outcomes of TAPP and TEP repair in terms of operative time consumed, postoperative pain, duration of hospital stay, complications and recurrence rate. All the operations in the study population were performed by a single surgeon in a tertiary center as laparoscopic skill level may vary from surgeon to surgeon. Majority of the patients in the study population were in the age group of 41-60 years (48.6%) In comparison of the operative time, there is a clear advantage for TEP over TAPP in this study, which was statistically significant. The results of operative time were similar with the study conducted by Köckerling F et al., with a mean age group of 55.04±15.95 [13].

Meta-analysis by Wei FX et al., has failed to establish a statistical significance on account of pain scores comparing the TEP and TAPP repairs [14]. On comparing the pain scores from this study, it is clear that patients in TAPP repair group experienced more pain at 12 hours, 24 hours, 48 hours and at 1st week postoperatively than the TEP group. The results from the comparison of these pain scores were statistically significant. However, the results of pain scores at one month, three months and six months of follow-up were identical amongst the groups and were not statistically significant.

The patients who underwent TAPP repair had to stay longer when compared to that of TEP repair in this study which was similar to results from a meta-analysis conducted by Bracale U et al., though it was not statistically significant [15].

As there were no major wound complications or wound infection from the 70 patients forming the study population, authors were unable to infer on wound complications between the study groups. Authors had three conversions to open meshplasty in a total of 70 patients, two following TEP repair and one following TAPP repair. Conclusions from similar to studies conducted by McCormack K et al., and Kockerling F et al., showed that

patients underwent TAPP had higher rate of complications when compared to those who underwent TEP. Port site hernias and visceral injuries were more in TAPP, while there were more conversions in cases of TEP [8,13]. Felix EL et al., reported reduced risk for intra peritoneal organ injury following TEP repairs [9]. Czechowski A and Schafmayer A in their study with a follow-up for 5-6 years, the recurrence rates post TEP and TAPP were about 2.3% for TAPP and 1.5% for TEP [16].

In the institute, authors observed that first 50 cases for the surgeon performing TEP repair had troubleshooting in pre-peritoneal space creation, managing peritoneal rents during dissection and associated with poor ergonomics which resulted in longer operating time, increased number of conversions with minor complications and immediate recurrences when compared to that of the same surgeon performing first 50 cases with TAPP repair. Once the initial learning curve in TEP repair has been surpassed by the surgeon, TEP repair is simple to perform is less complicated and takes lesser operating time without violating the peritoneal cavity with overall benefits.

Limitation(s)

The limitations of this study include shorter follow-up period of one year and it was a single blinded study.

CONCLUSION(S)

In spite of a steep learning curve and access related difficulties encountered in TEP repair worldwide; once the technique has been mastered by the surgeon as in this study, TEP repair is associated with extremely satisfactory results. Thus, it can be concluded that TEP repair was superior to TAPP repair in terms of reduction in operative time, less postoperative pain and shorter hospital stay. The complications and recurrence rate were minimal following TEP and TAPP repair in this study and was not comparable between the two.

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