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ORIGINAL RESEARCH

Laparoscopic Transabdominal Preperitoneal (TAPP) approach versus Laparoscopic Totally Extraperitoneal (TEP) Approach for Inguinal Hernia Repair: A single center experience

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ABSTRACT

Background: Two popular methods for repairing inguinal hernias are laparoscopic Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) procedures. Based on clinical and demographic results from a single-center experience, this study contrasted these two strategies. **Methods:** Data were retrospectively analyzed from patients who underwent laparoscopic inguinal hernia repair using either the TAPP or TEP approach. Baseline characteristics, operating time, duration of hospital stay, and gender distribution were assessed. Statistical comparisons were performed to evaluate differences between the groups. **Results:** A total of 59 patients (mean age: 44.24 ± 17.56 years) were analyzed. The mean operating time was 91.07 ± 17.78 minutes, and the hospital stay averaged 4 ± 1.42 days. No significant differences were found between TAPP and TEP in age, hospital stay duration, or operating time across subgroups. Male patients were evenly distributed, while female patients exclusively underwent TAPP (2 cases). **Conclusion:** Both TAPP and TEP approaches for laparoscopic inguinal hernia repair demonstrated comparable outcomes with no statistically significant differences in age distribution, duration of hospital stay, operating time, or gender distribution. The choice between these techniques can be guided by patient factors and surgeon expertise. Further large-scale studies are warranted to confirm these findings.

Keywords: Laparoscopic Transabdominal Preperitoneal (TAPP), Laparoscopic Totally Extraperitoneal (TEP), Inguinal Hernia

INTRODUCTION

The most widely performed surgical procedure in the world is hernia repair. With laparoscopic surgeries in vogue for almost four decades, treating this condition using laparoscopy is an established practice.The choice of approach to the laparoscopic repair of inguinal hernia is controversial. There is a scarcity of data comparing the laparoscopic transabdominal preperitoneal (TAPP) approach with the laparoscopic totally extraperitoneal (TEP) approach and questions remain about their relative merits and risks [1, 2].The two different approaches known as TAPP (transabdominal pre-peritoneal) or TEP (totally extraperitoneal) are now being used in both small and

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large centers in a big way. There are several studies, even large multicenter studies comparing open hernia repair procedures such as Lichtenstein or Should ice to laparoscopic techniques either TAPP or TEP and found that the rate of recurrence in time did not differ [3,4].In TAPP, the peritoneal cavity is entered and a mesh is placed through a peritoneal incision over possible hernia sites where as in TEP, the peritoneal cavity is not entered and mesh is used to seal the hernia from outside the peritoneum.

In the TAPP technique, by creating apneumoperitoneum, access to the peritoneal cavity is gained and after the incision of the parietal peritoneum and sac dissection, the mesh is placed in the pre-preperitoneal space which covers the entire myopectineal orifice (MPO). At the end, the peritoneum is closed over the mesh. Some studies have reported a higher incidence ofcord edema and longer operation time's inTAPP due to the increased area of dissection to obtain the retroperitoneal pouch to placethe mesh.TEP achieves this without the need to access the abdominal cavity, thus the risk of injury to major abdominal organs is minimized. Also, the chances of developing postoperative adhesions is decreased. The mesh is placed to plug the hernia from the outside of the peritoneal cavity. Due to this fact, some studies have reported lower pain in the TEP technique. As the area of dissection is situated outside the peritoneal cavity, the laparoscopic surgeon may not be that comfortable with the anatomy as he or she is when access is gained through the peritoneal cavity. The longer learning curves are expected in mastering the technique of TEP due to not so familiar plane and space constraints[5].

The goal of our study was to evaluate the TAPP and TEP techniques in the treatment of unilateral inguinal hernia with respect to indications and outcomes of each procedure using the experience gained by our centre compared with results from the literature.

MATERIAL AND METHODS

The design of the study is retrospective.The study period was for four years extending from 01.01.2018 to 31.12.2022.The diagnosis was based on clinical history of a hernia, clinical examination and ultrasonography of the abdomen. Data was obtained from the Department of General Surgery, Hamdard Institute of medical sciences& Research, New Delhi. Data regarding preoperative diagnosis, age, gender, type of hernia, the surgical technique, intraoperative and postoperative complications, and duration of the procedure, postoperative hematoma and wound infection were obtained from operative protocols, patient charts, and laparoscopic recordings. Diagnosis of an inguinal hernia operated with minimally invasive techniques either TAPP or TEP and age 18 years and above.

Statistical Analysis

All the statistical Analysis was done by the IBM SPSS (Statistical Packages for Social Sciences) version 25.0 software and the data was entered in the Microsoft Excel. The baseline characteristics of the participants were shown by the frequencies and percentages, mean ± SD and range (minimum and maximum). The two sample independent t-test was used to determine whether a statistically significant difference exists between the groups regarding age (in years), surgery duration (in days) and operating time (in minutes) between the TEP and TAPP. The Fisher's exact test was used to check the association between the gender and surgery group (TAPP and TEP). P-value < 0.05 means statistically significant. The visualization were shown by the bar plot.

RESULTS

The total number of patients were 59 in this study, of which 30 was operated with the TAPP technique and 29 with the TEP technique. The group consisted mainly of males (n=57) and n= 2 female. The mean ageof the patients in both groupsTAPP or TEP were 44.24 years(Table 1).

Table 1: Baseline Characteristics of the patients

Baseline characteristics	Mean	SD	Min	Max
Age	44.24	17.56	18	78
Operating Time (in minutes)	91.07	17.78	56	130
Duration of Stay (in Days)	4	1.42	1	7

Table 2: Significant difference between the TAPP and TEP with Age, Duration of Stay and Operating time

Characteristics	TAPP Mean ± SD	TEP Mean ± SD	P-value
Age			
Less than 40	23.5 ± 4.46	28.4 ± 7.68	0.076
Equal and more than 40	55.67 ± 9.72	57.32 ± 10.47	0.623
Duration of Stay (in days)			
Less than 3 days	1.6 ± 0.55	1.8 ± 0.45	0.546
Equal and more than 3 days	4.24 ± 0.97	4.5 ± 0.98	0.356
Operating Time (in minutes)			
Less than or equal 90	75.33 ± 10.60	79.89 ± 9.05	0.192

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More than 90	106.40 ± 8.98	109.63 ± 10.21	0.401

Table 3: Association between the Surgical Techniques (TAPP and TEP) with Gender (male and Female)

	TAPP N (%)	TEP N (%)	Total	p-value
Gender				0.492
Male	28 (49.12)	29 (50.88)	57 (100)	
Female	2 (100)	0 (0.00)	2 (100)	

- The mean age of the patient in both the groups is **44.24 years**, with a standard deviation (SD) of **17.56 years**, and ages range from **18 to 78**years. The mean operating time is **91.07 minutes**, with a SD of **17.78 minutes**, and times range from **56 to 130 minutes**. The average duration of stay is **4 days**, with a SD of **1.42 days**, and stays range from **1 to 7 days**.

Table 2: Comparison of TAPP vs. TEP (with *p*-values)

This Table compares the characteristics between two groups: **TAPP** and **TEP** for different age, duration of stay, and operating time categories. Inage groups of less than of 40 years, the TAPP group (23.5 ± 4.46), TEP group (28.4 ± 7.68), with a p-value of 0.076 had no significant difference.In age groups of 40 years or more, TAPP group (55.67 ± 9.72) and TEP group (57.32 ± 10.47), with a p-value of 0.623 also had no significant difference).As far as duration of Stay (in days) is concerned, less than 3 days as the criterion, TAPP group (1.6 ± 0.55) and TEP group (1.8 ± 0.45), with a p-value of 0.546 had no significant difference. For 3 days or more, TAPP group (4.24 ± 0.97) and TEP group (4.5 ± 0.98), with a p-value of 0.356 also showed no significant difference. Theoperating time (in minutes),less than or equal to 90 minutes, TAPP group (75.33 ± 10.60) and TEP group (79.89 ± 9.05), with a p-value of 0.192 had no significant difference. In more than 90 minutes, TAPP group (106.40 ± 8.98) and TEP group (109.63 ± 10.21), with a p-value of 0.401 also had no significant difference.

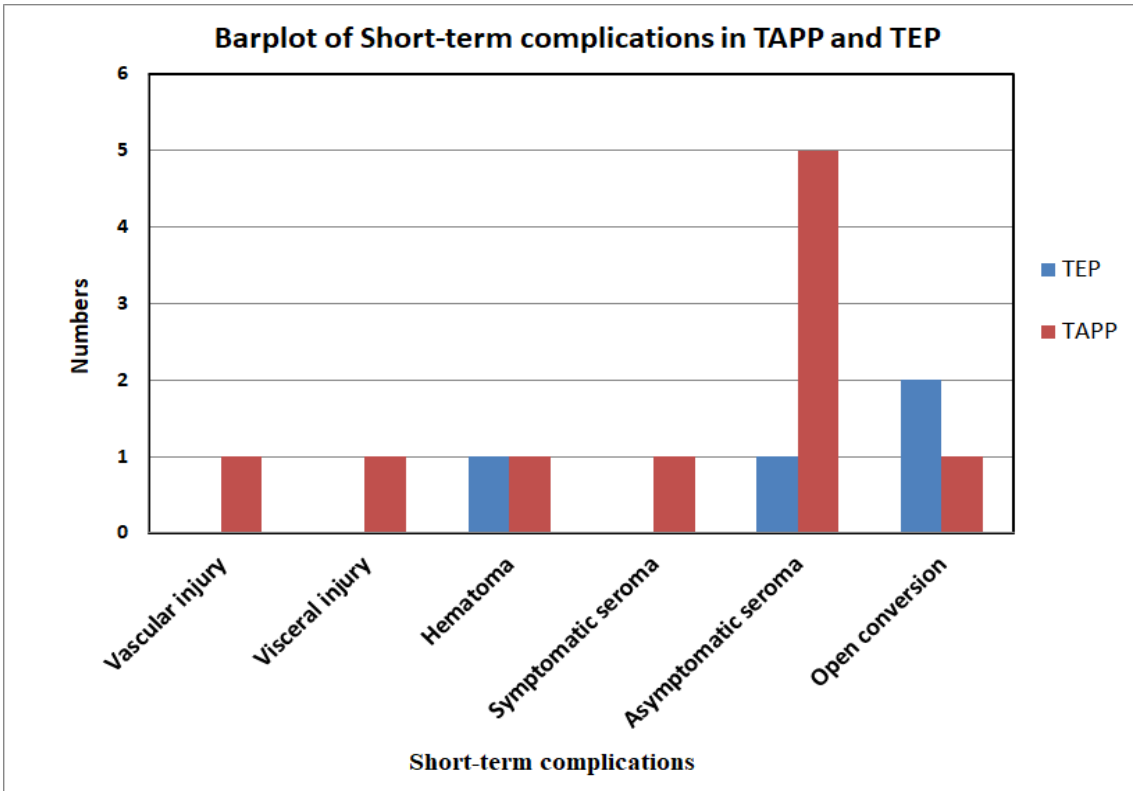

Figure 1: Short term complications

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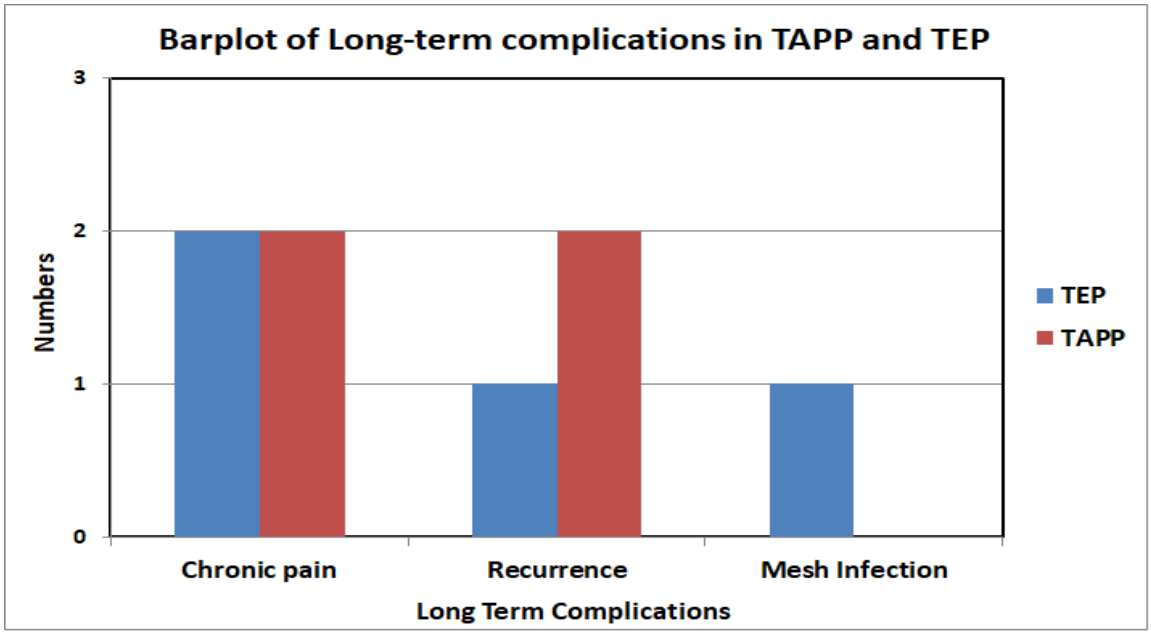

Figure 2: Long term complications

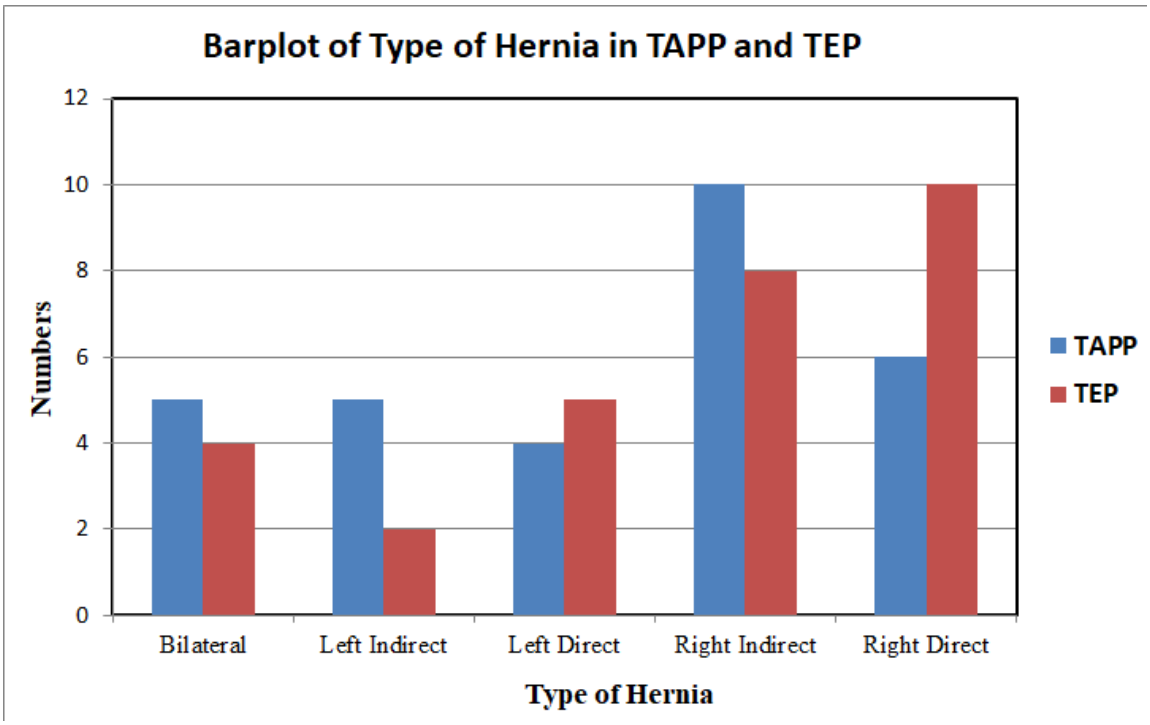

Figure 3: Type of Hernia in surgical techniques (TAPP and TEP)

TAPP provides a large working space and easier visualization of anatomical landmarks.The visceral or known blood vessels injuries were not encountered in large numbers.Although substantial bleeding was experienced in a few cases when dissecting the Retzius space in theTEP technique. This led to an increase in surgery time due to impaired visualization of operative field.Also, otherareas of bleeding encountered were the "corona mortis"vascular anastomosis and inferior epigastric artery. There were no recorded wound infections inthe study group.TEP avoids entering the abdominal cavity, reducing the risk of injury to abdominal organs, lower likelihood of postoperative adhesions and potentially less pain.But TAPP has disadvantages of entering the peritoneal cavity leading to a higher risk of abdominal organ injury and may also require more tackers for mesh fixation hence increasing costs.TEP is more challenging technique with a longer learning curve. With increased risk of bleeding during dissection in the Retziusspace, operating time was slightly longer for TEP but not statistically significant. Postoperative pain and hospital stays were comparable between the two techniques. But no significant difference in

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complications like wound infections or vascular injuries were observed.TAPP avoids peritoneal tears common in TEP but has a higher risk of injuries to abdominal organs. TEP has a higher risk of issues like bleeding in the preperitoneal space.

DISCUSSION

The most important approaches to laparoscopic inguinal hernia repair are the TAPP and TEP techniques which vary regarding the approach to the inguinal defect. The advantages like reduced hospital stay, faster ambulation using minimally invasive techniques have been adequately documented [6,7].TEP or TAPP techniques used in the study follow the standards well established in the existing literature [8,9].While comparing these two techniques, the measurement of difficulty level is highly subjective, as it depends on multiple variables such as ease of preperitoneal space creation, type of hernia(indirect and direct), iatrogenic injury to surrounding structures and difficulties encountered during mesh placement due to the use of fixation devices such as tackers or sutures. These factors have an impact on the choice of procedure; but for the patient, the most important aspects are postoperative pain and the rate of recurrence.

The corner stone, on which the success rate of a laparoscopic hernia repair depends, is the creation of an adequate work space and fast management of intraoperative events. How one achieves this is one of the important factors when comparing these two techniques. One needs to obtain a proper space to work as to correctly identify the anatomical landmarks. Some of the important factors which lead to conversion from TEP to TAPP as reported by Bittner et al. are peritoneal tears which can have an incidence of 11%, bleeding and local adhesions due to prior surgeries which use the preperitoneal space, for example, prostatectomies (8).We had two conversions in our series from TEP to open and one in TAPP to open. Both of TEP conversions were the consequence of peritoneal tearing with secondary unwanted pneumoperitoneum which compromised the working space while TAPP conversion was due to minor visceral and vascular injury. It has been suggested by Keidar et al that the incidence of peritoneal tears may be decreased by a medial approach to dissection of the preperitoneal space when compared to the lateral approach [2].In the TAPP technique, this troublesome complication is avoided. There is enough free space in the peritoneal cavity to maneuver with ease the laparoscopic instruments.Vascular injuries are of utmost importance in laparoscopy due to the restricted space to stop the bleeding. Inferior epigastric artery injury is reported more commonly in the TEP technique than TAPP with an incidence of 0.3% [3, 4].We did not encounter any inferior epigastric artery in our study. The inferior epigastric artery serves as a landmark to differentiate direct from indirect hernia and for the dissection of the hernia sac. In laparoscopy the chances to encounter this complication are greater than in open hernia repair. One can injure the inferior epigastric artery in TEP when the sack is being prepared or the tackers are applied to the abdominal wall. In the TAPP technique, the risk to injure the inferior epigastric artery is the greatest when the peritoneal flap is created. Operating time in TEP was slightly increased when compared to TAPP. This increased time is attributed to the increased difficulty at dissection and limited workspace as reported in a meta-analysis by Bittneret eta al. Our study is not describing lesser operating times in TAPP due to suturing to closing the peritoneum using absorbable sutures done in most of the cases in our practice.

Fixation of the mesh in laparoscopic inguinal repair still raises issues as some authors argue that in TEP it is not necessary due to the risk of chronic inguinal pain. In our study, the parietal defect was covered in all cases with polypropylene mesh and fixed with tackers placed in safe point. TAPP required more tackers than TEP due to the fact that they were used to fix the peritoneal flap butone can use just as simple a continuous suture. These extra costs can be regarded as less expensive as compared to TAPP. We are in agreement with these observations, in the study group we did not encounter mesh related infections other than one periostitis in a patient in which the mesh had to be removed to due to persistent pain. Laparoscopic hernia repair is mentioned in literature more frequently as one-day surgery [9]. This is true in most cases, but a safety protocol has to be followed when deciding to discharge the patient early.

In our experience, the patient can be mobilized 5-6 hours after surgery under direct supervision, but there must be constant communication between the anesthesiologist, surgeon, patient, and family of the patient. Postoperative pain is one of the most important aspects for the patient after he/she undergoes surgery, and postoperative pain may be one of the important factor in deciding to choose between TAAP and TEP. Plenty of data is available in existing literature reporting lower pain scores after TEP procedures, due to the fact that there is limited area of dissection and no peritoneal breech.Whereas there was no significant difference in immediate post-operative and chronic pain in both the groups. This observation comes from the fact that even in TAPP, the extent of dissection was kept to desired levels.

Deep mesh infections in modern laparoscopic surgery are rare, and there is no difference in incidence between the two techniques reported in literature.The TEP technique is usually avoided in large parietal defects while large inguino-scrotal hernias are often repaired with the TAPP technique as we observed in our study. Literature reports the same observations. There is an extensive decision-making strategy when to use TAPP or TEP technique. The factors that are taken into account, but surgeon experience seems to play a key role [10]. It is our opinion that in large inguino-scrotal hernias which are present for many

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years with extensive adhesions and irreducibility, an open Lichtenste in procedure assures the best results for the surgeon and the patient.

CONCLUSION

Both TEP or TAPP are reasonable surgical options to treat an uncomplicated inguinal hernia. Advantages and disadvantages vary: In TEP, there is an increased risk of bleeding when dissecting the pre-peritoneal space. The TAPP technique comes with the advantage of increased workspace to maneuver the laparoscopic instruments but presents an increased risk to injure major abdominal organs. Due to the use of more tackers in TAPP to cover the mesh with peritoneum the costs goes up. Large inguinoscrotal hernias may be better suited for TAPP due to better access and maneuverability. Both techniques were deemed viable options for uncomplicated hernias.

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