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Comparative Study of Laparoscopic Extended Totally Extra Peritoneal (e-TEP) Repair of Inguinal Hernia Versus Laparoscopic Totally Extra Peritoneal (TEP) Repair of Inguinal Hernia

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Abstract: ***This research paper aims to compare the advantages and disadvantages between eTEP technique and TEP technique of Laparoscopic inguinal hernia repair. The study evaluates parameters such as safety and efficacy of the procedures, operating times, post operative complications and duration of hospital stay to determine the most efficient treatment method. Introduction: Laparoscopic Inguinal hernia repair is indicated for bilateral hernias or recurrent following open repair. A complete history and physical examination are mandatory to assess the patient's fitness for general anaesthesia. The two laparoscopic approaches are worldwide adopted namely Trans Abdominal Pre Peritoneal Approach (TAPP) and Totally Extra Peritoneal (TEP) Objective: This study aims to compare the advantages and disadvantages of Laparoscopic eTEP repair over TEP repair of inguinal hernia. To compare between both techniques on the basis of operative time, complication (both intraoperative and post operative), ease of feasibility of both technique, length of stay in hospital, post operatively return to work. Methodology: The study involved a comparative analysis of patients undergoing e-TEP and TEP laparoscopic inguinal hernia repair techniques. Parameters such as intraoperative variables (operative time and ease of operability), post operative complications, and post-operative recovery periods were recorded and analyzed. Results: The results indicated that eTEP has shorter operative time, less intra operative complications, better visualisation of landmarks and better ease of mesh fixation, hence better surgeon. Discussion: Currently, five laparoscopic techniques are available for managing an inguinal hernia: TEP, TAPP, e-TEP, Transabdominal preperitoneal, Intra-peritoneal on -lay mesh and laparoscopic herniotomy. The current paper reports on the comparison of eTEP approach versus TEP approach of inguinal hernia repair. The eTEP approach employs a conundrum of surgical strategies and maneuvers with the primary aim of improving the extraperitoneal workspace. ConclusionBoth TEP as well as eTEP provide similar results in experienced hands; however, eTEP provides an overall better surgeon satisfaction score. A larger sample size in setting of a multicentric study is needed to determine the superiority of eTEP over conventional TEP.***

Keywords: Extended totally extraperitoneal repair, totally extraperitoneal repair, trans abdominal pre peritoneal repair

1. Introduction

Primary care physicians frequently surgically manage hernias.[1] Hernias are classified into indirect, direct, and femoral types based on their location relative to the inguinal triangle. Indirect hernias protrude through the internal inguinal ring, direct hernias through the posterior wall of the inguinal canal, and femoral hernias beneath the inguinal ligament. Each year, about 500,000 out of 1.6 million groin hernias in the US are surgically treated. The lifetime risk of developing a groin hernia is twenty-seven percent higher in males than in women.[2] Patients aged 75 to 80 undergo groin hernia surgeries 4.2% more often than those under 18. Most groin hernias in the US are inguinal, with about 20% being bilateral cases.[3] Femoral hernias, affecting 16% to 37% of women, constitute 4% of groin hernias. Risk factors for inguinal hernias include age, low body mass index, male sex, connective tissue disorders, and prior radiation or prostatectomy. [5-6] Higher height, persistent cough, umbilical hernia, and rural living are linked to inguinal hernias in women, but alcohol and smoking have no proven effect. [7-8] Inguinal hernia repair has advanced with ERAS techniques, leading to more laparoscopic surgeries. TAPP (1991) and TEP (1993) are both used; TEP avoids transabdominal issues, while TAPP is preferred by some for its shorter learning curve.[9] A hernia is an organ protruding through an irregular opening. An inguinal hernia (IH) is when abdominal contents push through the inguinal canal. IHs, along with femoral and umbilical hernias, make up 75% of external abdominal hernias. They affect 1.7% of the general population and 4% of those over 45, with a 27% lifetime risk for men and 3% for women. [9-10] Inguinal hernia diagnosis often relies on clinical examination, with radiography if needed. Mesh repair is preferred for its low recurrence rate, though herniorrhaphy is cost-effective. Pediatric cases use herniotomies or Mayo's repair. Laparoscopic surgery, despite its higher cost and learning curve, is favored for faster recovery and less pain. Lichtenstein's mesh repair is the standard for open surgeries. Laparoscopy, including TAPP and TEP methods, is the gold standard due to better outcomes, despite longer operating times and potential for early recurrence. [11-17] Introduced in 1992, laparoscopic TEP repair is popular for its good outcomes, though prior lower abdominal surgery can complicate access. Safety and viability in these cases remain debated.[18] Laparoscopic surgery offers less pain and faster recovery than open repair and can detect other hernias. However, it has a steeper learning curve and higher risk of complications. TEP is preferred over TAPP due to lower risks of adhesions and injuries but requires 50 to 100 cases to master. [19-20] Extended-TEP (eTEP), introduced in 2012, offers a larger preperitoneal space and improved ergonomics compared to TEP, though it also has a learning curve. There are no specific guidelines for eTEP due to a lack of comparative data with TEP or TAPP. Both eTEP and TEP improve upon open repair with less postoperative discomfort and shorter hospital stays. Further research and long-term follow-up are needed to optimize outcomes and tailor surgical techniques to individual patient needs.

2. Materials and Methods

This prospective study will compare laparoscopic extended totally extraperitoneal (e-TEP) and totally extraperitoneal (TEP) mesh repair for inguinal hernia, using data from patients at the Department of Surgery, S.N. Medical College, Agra, between June 2022 and June 2024. The study will include patients aged 18 or older with unilateral or bilateral inguinal hernias, including recurrent cases, who consent to participate. Exclusions are made for patients with strangulated hernias, failed prior laparoscopic repairs, or those unsuitable for general anesthesia. Participants will undergo pre-operative evaluations and, if deemed unfit for general anesthesia, will be considered for open repair. Outcomes such as procedure efficacy, complication rates, recurrence, pain, operation duration, hospital stay, and patient satisfaction will be assessed. Statistical analysis using SPSS will include mean and standard deviation calculations, Chi-square tests for dichotomous variables, and Student's t-test for comparing means, with significance set at $p < 0.05$.

3. Results

The study found that while both laparoscopic e-TEP and TEP mesh repairs for inguinal hernia had similar patient demographics and hernia characteristics, e-TEP offered some advantages. Specifically, e-TEP had a significantly shorter operative time and patients returned to daily activities faster compared to TEP. However, there were no notable differences in intraoperative or postoperative complications, including seroma, wound infection, and recurrence. Hospital stays and postoperative pain levels were similar between the two procedures. Surgeons expressed higher satisfaction with e-TEP despite its greater challenge in visualization and mesh placement. Overall, e-TEP may be preferred for its efficiency, but the choice between e-TEP and TEP should consider surgeon preference, patient factors, and available resources.

Parameter	TEP	e-TEP	P Value
Demographics			
Mean Age (Years)	43.68 ± 7.79	45.63 ± 6.57	t=1.207, p=0.2312
Age Distribution (41-50 Yrs)	40.54%	45.24%	X=2.407, p=0.6613
Gender (Male)	56.76%	64.29%	X=0.4677, p=0.4941
BMI (Obese >30)	45.95%	47.62%	X=0.3281, p=0.8487
Hernia Characteristics			
EHS Type (Lateral)	56.76%	57.14%	X=0.01800, p=0.9910
Defect Size (1.5-3 cm)	64.86%	61.90%	X=0.2170, p=0.8972
Surgical Outcomes			
Operative Time (minutes)	69.35 ± 12.51	66.13 ± 9.53	t=22.84, p<0.0001*
Intraoperative Complications (Minor Hemorrhage)	5.41%	2.38%	X=0.1389, p=0.7094
Postoperative Complications (Seroma)	5.41%	2.38%	X=1.333, p=0.7212
Hospital Stay (days)	1.13 ± 0.21	1.08 ± 0.15	t=1.228, p=0.2231
Return to Daily Activities (days)	9.22 ± 1.35	8.31 ± 1.45	t=2.874, p=0.0052*
Postoperative Pain (VAS)	4.53 ± 0.72	4.67 ± 0.81	t=0.8072, p=0.4220
Surgeon Satisfaction			
Ease of Visualization of Landmarks	6.92 ± 0.55	1.81 ± 0.43	t=46.27, p<0.0001*
Ease of Spreading of Mesh	5.67 ± 0.71	1.12 ± 0.35	t=36.79, p<0.0001*
Overall Surgeon Satisfaction	7.33 ± 0.90	8.77 ± 0.81	t=7.485, p<0.0001*

* shows significant results

4. Discussion

The comparison between laparoscopic e-TEP (Extended Totally Extraperitoneal) and TEP (Totally Extraperitoneal) mesh repairs for inguinal hernias reveals that both techniques share similar patient demographics and hernia characteristics. However, e-TEP demonstrates certain advantages over TEP. Notably, e-TEP offers a significantly shorter operative time, allowing patients to return to daily activities faster than those undergoing TEP. Despite these benefits, there are no significant differences between the two techniques in terms of intraoperative or postoperative complications, including seroma, wound infection, and hernia recurrence. Hospital stays and postoperative pain levels remain comparable for both procedures. Interestingly, while surgeons report higher satisfaction with e-TEP, they acknowledge the technique's increased difficulty in visualization and mesh placement.

The versatility of TEP is highlighted by CD Lin et al. (2016) [22], who demonstrated the efficacy of LESS TEP even after previous groin hernia repairs, showing that TEP can be adapted for complex cases. Similarly, Belyansky et al. (2018) [24] illustrated the adaptability of the e-TEP approach for ventral and incisional hernias, suggesting that e-TEP's advantages extend beyond inguinal hernia repair. In contrast, studies like T Zuiki et al. (2018) [23] revealed that patients with prior lower abdominal surgeries might face challenges with TEP, pointing to e-TEP's potential superiority in such complex scenarios.

The learning curve associated with these techniques is also a consideration. Wakasugi et al. (2019) [25] noted that mastery of the SILS-TEP technique required at least 20 cases, indicating that both TEP and e-TEP may demand a steep learning curve, especially for less experienced surgeons. However, Srivastava et al. (2023) [21] found that while the learning curve for e-TEP was initially steep, operative times eventually equalized with other laparoscopic techniques like TAPP. Meanwhile, N.J Hidalgo et al. (2023) [26] highlighted that while TEP had a shorter operative time than TAPP, it also had a higher conversion rate to open surgery, indicating that while efficient, TEP can be more challenging in certain cases.

In conclusion, e-TEP stands out for its efficiency and faster patient recovery, making it a potentially preferred option over TEP, particularly in less complicated cases. Nonetheless, the choice between e-TEP and TEP should take into account the surgeon's experience, patient-specific factors, and the complexity of the hernia repair.

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