

Evaluation of Safety and Feasibility of Single Incision with that of Conventional TEP Laparoscopic Repair of Inguinal Hernia

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Abstract

Introduction: As surgical procedures for hernia repair have advanced, tension-free surgery using a prosthetic mesh has become the standard of treatment in herniorrhaphy. There are various benefits to laparoscopic inguinal hernia surgery versus open treatment. As a result, laparoscopic Trans abdominal preperitoneal (TAPP) and completely extra peritoneal (TEP) methods are often employed. As a result, pain and incision-related concerns were decreased. Many surgeons have successfully conducted single-incision laparoscopic surgery (SILS), which was aimed to reduce the invasiveness of standard laparoscopy.

Aims and Objectives: The purpose of this research is to determine the effectiveness and safety profile of traditional completely extra-peritoneal and single-incision multiple port laparoscopic completely Extra Peritoneal inguinal hernia management. Methods: Patients who attended our hospital's outpatient department were included in this prospective research. The patients scheduled for inguinal heria repair were studied to compare their treatments. Patients were offered single-incision multiple port laparoscopic completely Extra Peritoneal (S-TEP) or conventional completely extraperitoneal (C-TEP) surgery based on their age (groups of 40 and >40 years), side of hernia (direct/indirect), and unilateral vs bilateral types. Before the surgical operation, baseline data were established, and complications and safety were measured thereafter. The statistical analysis was carried out across the groups.

Results: In order to assess surgical outcomes and cosmetic outcomes, 35 patients from the S-TEP group and 35 patients from the C-TEP group were matched equally. S-TEP for unilateral and bilateral hernia repair had a significantly longer mean surgical time ($P = 0.002$ and $P = 0.003$) than its conventional equivalent (C-TEP). The average blood loss in both groups was comparable ($P = 0.1$). There were no damage to the spinal cord or nerves in either group. The research also discovered that 2 (5.7%) of the S-TEP patients received conventional laparoscopy but no open conversion. The S-TEP group's mean pain score (VAS) was initially considerably greater ($p0.05$), but it was comparable on the seventh day.

Conclusion: The research concludes that SILS has the potential to provide patients with improved aesthetic outcomes, reduced discomfort, and more patient compliance. The VAS score for the single incision method revealed no benefits in terms of cosmesis or discomfort. Other secondary outcomes, such as postoperative pain (VAS), blood loss, complications, conversion, and duration of hospital stay, showed no statistically significant difference.

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Introduction

An inguinal hernia arises even before tissue, including a section of the intestine, protrudes through a weak area in the abdominal muscles. The resulting bulge may be unpleasant, particularly when coughing, leaning down, or carrying a large item [1]. Many hernias, on the other hand, are painless. An inguinal hernia may not necessarily cause excruciating agony. It does not, however, improve on its own and may result in life-threatening consequences. Inguinal hernia repair is a popular surgical treatment [1]. In this disease, soft tissue bulges via a weakness in the abdominal

muscles. The gut is usually connected with soft tissue. The bulge is simple to see and feel, but not all of it is visible to the patient, particularly if the patient is obese. One of the symptoms is pain, which occurs when a person coughs, bends, or lifts a heavy item [1]. The most frequent surgical technique done globally is inguinal hernia repair [2]. Many surgical procedures have been described, and tension-free repair using a prosthetic mesh has become the gold standard in herniorrhaphy. There are various benefits to laparoscopic inguinal hernia surgery versus open treatment. As a result,

laparoscopic Trans abdominal preperitoneal (TAPP) and completely extra peritoneal (TEP) methods are often employed [3-5]. When comparing the two strategies, TAPP is simpler to learn and may have a shorter learning curve [6]. This is because TAPP repair requires a huge quantity of work space. To further lessen the invasiveness of laparoscopy, recent research has focused on reducing the number of tiny incisions and port size. As a result, pain and incision-related concerns were decreased. Many surgeons have successfully conducted single-incision laparoscopic surgery (SILS) to reduce the invasiveness of standard laparoscopy [7-9]. A common cause is inguinal hernia, which may be treated in a number of methods. The laparoscopic fully extraperitoneal approach is becoming more common and yielding great outcomes. Single-incision laparoscopic surgical therapy, on the other hand, is increasing its relevant applications as a novel approach. Although interest in single-incision laparoscopic surgical interventions (SILSs) has increased in tandem with the advancement of the minimally invasive approach, the pace has been slow due to technical difficulties encountered by surgeons, such as loss of triangulation, instrument clustering, and a very narrow working angle [10]. SILS operations are getting more common as patients' knowledge of aesthetic looks develops. This is attributable, in part, to improved surgical learning curves and increasing patient awareness of aesthetic appearances. Since the initial report of SILS completely extra-peritoneal (TEP) in 2009 [11], only a few prospective cohort studies [12- 14] have shown its safety and feasibility. The major issue with the spread of SILS is the requirement of special instruments and modern expensive ports, which contribute to increased surgical costs, with added economic burden to the patients, and thus, solution to address as well as benefits of SILS remains out of reach for most, particularly in resource poor settings. To save the cost of special equipment, we adapted the approach to SILS by using the single-incision multiport laparoscopic surgery (SIMPLE) procedure with regular laparoscopic tools. Only a few experiments using SILSTEP using typical laparoscopic equipment have been reported [13]. As wound cosmesis is being recognised as an important body image-related result, single-incision surgeries are becoming more popular. We compared the potential advantages of single incision multiport laparoscopic completely extra-peritoneal (S-TEP) surgery to classic laparoscopic TEP (C-TEP) surgery in terms of operating time, post-operative discomfort, complications, cost, and cosmesis in this research.

Methods

Study Design

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A prospective study was conducted on the patients who came to the outpatient department of our hospital from October 2021 to October 2022. All inguinal hernia cases treated with S-TEP mesh at our institute were included in the study. Based on age (groups of 40 and >40 years), side of hernia (direct/indirect), and unilateral versus bilateral kinds, these were matched (1:1 proportion) with cases of C-TEP.

Inclusion and exclusion criteria

Patients who came to our hospital's outpatient department, followed the research procedure, and provided informed permission for the study are included. Patients who offer informed permission for the trial are enrolled. The research comprised patients with symptomatic direct or early indirect inguinal hernias who were scheduled for laparoscopic TEP hernia surgery. The research comprised a total of 80 patients. Patients who did not adhere to the research protocol, did not complete it, or did not grant consent were excluded from the study. Cases having a history of lower abdominal surgery, a large inguinoscrotal hernia graded >2 by the American Society of Anaesthesiologists, or reoccurring hernia were excluded from the research.

Statistical Analysis

Descriptive statistics were used to analyse demographic and disease-specific features. All quantitative data were expressed using the standard deviation and the mean (\bar{x}). The cosmesis and pain (VAS) ratings at different time intervals were compared with the rest of the continuous variables using a two-tailed Student's independent t-test. The Chi-square test or Fischer's exact test was used to compare categorical variables (clinicopathological and outcomes) depending on the dispersion of the data. Multivariate analysis was performed using factorial ANOVA, linear, and logistic regression models. The significance level was acceptable at $P < 0.05$. For the analysis, the statistical programme SPSS version 23 (IBM Corp. New York, USA) was used.

Results

In table 1, each group of 35 patients is split equally into two groups. Males outnumber females in both categories. In order to analyse surgical and aesthetic results, 35 patients from the S-TEP group and 35 patients from the C-TEP group were matched similarly.

There were no statistically significant variations in the clinical features of the patients between the two groups. In terms of operative results [Table 2], S-TEP had a significantly longer mean surgical time ($P = 0.002$ and $P = 0.003$) than its conventional counterpart (C-TEP) for unilateral and bilateral hernia repair. The average blood loss in both

groups was comparable ($P = 0.1$). A variety of sequelae, including vascular damage, peritoneal rupture, and cord and nerve injuries, were compared between two therapy groups. The most common intraoperative complication was a peritoneal rupture, however there was no noticeable difference between the two groups. Both 2 patients in the C-TEP group (5.7%) and 4 patients in the S-TEP group (11.4%) had vascular injury (inferior epigastric artery) without a significant difference ($P = 0.46$). There was no damage to the spinal cord or

nerves in either group. In the S-TEP group, two patients (5.7%) received conventional laparoscopy but no open conversion. Table 3 demonstrates that postoperative pain was measured on postoperative day (POD) 0, 1, the day before discharge, and POD 7th in the OPD during the first follow-up.

When the two treatment groups were compared, the mean pain score (VAS) in the S-TEP group was initially considerably greater ($p0.05$), but it was equivalent on the seventh day.

Table 1: Comparison of demographic variables in two treatment groups (n=70)

Demographics	C-TEP Group N=35	S-TEP Group N=35	P
Age (mean \pm SD)	45.27 \pm 13.15	46.38 \pm 12.55	0.8
Gender (male: female)	34:1	32:3	0.4
BMI(mean \pm SD)	24.79 \pm 3.45	23.55 \pm 3.12	0.12
ASA score			
I	26	27	0.6
II	10	9	

C-TEP: conventional totally extra-peritoneal, S-TEP: single-incision multiple ports laparoscopic totally extra-peritoneal, BMI: Body mass index, ASA: American Society of Anaesthesiologists, SD: Standard deviation

Table 2: Intraoperative outcomes characteristics (n=70)

Variable	C-TEP	S-TEP	P-Value
Operative time (min)			
Unilateral	45.07 \pm 10.65	73.12 \pm 14.89	0.002
Bilateral	62.12 \pm 10.20	90.89 \pm 11.20	0.003
Blood loss (ml)	16.1 \pm 2.5	17.1 \pm 4.3	0.1
Conversion	0	3 (5.6)	0.1
Intraoperative complications, n%			
Peritoneal tear	3 (8.6)	4 (11.4)	0.46
Vascular injury	2 (5.7)	4 (11.4)	

C-TEP: conventional totally extra-peritoneal, S-TEP: single-incision multiple port laparoscopic Totally Extra Peritoneal

Table 3: Intraoperative outcomes characteristics (n=70)

Variable	C-TEP	S-TEP	P-Value
Hospital stay, days	1.10 \pm 0.25	1.08 \pm 0.15	0.4
Complications			
Seroma	3 (8.6)	5 (14.2)	0.6
Recurrence	0	0	
Readmission	0	0	
Post-operative pain analysis, VAS score at			
POD 0	5.65	6.10	0.02
POD 1	3.12	3.76	0.03
POD 7	0.43	0.56	0.25
Cosmesis analysis, VAS score at			
1 week	5.6 \pm 0.3	5.8 \pm 0.5	0.002
6 weeks	6.5 \pm 0.86	7.5 \pm 0.67	0.002
6 months	9.3 \pm 0.7	9.8 \pm 0.2	0.5
Cost analysis (Rs.)	40,175 \pm 654	42,569 \pm 1605	0.2

C-TEP: conventional totally extra-peritoneal, S-TEP: single-incision multiple ports laparoscopic totally extra-peritoneal, POD: post-operative day, VAS: visual analog scale.

Discussion

From June 2021 to December 2022, Rajapandian et al. (2018) performed and reported on a prospective

specific instance examination of S-TEP vs CTEP patients. Each group had 36 patients. The clinical features of the two groups were equivalent. The

average length of surgery for a unilateral hernia in C-TEP and STEP was 45.13 10.58 min and 72.6315.23 min, respectively. The mean visual analogue scale (VAS) score for pain was substantially greater in the S-TEP group on postoperative day (POD) 0 and 1. However, there was no significant difference between the groups at POD 7. At 1-week and 6-week post-surgery, the S-TEP group had considerably superior cosmetic outcomes than the C-TEP group. Nonetheless, the scar in both treated groups was quite acceptable at 6 months. S-TEP using conventional laparoscopic tools is safe and feasible even in resource-limited situations. However, the indications and advantages of single-incision laparoscopic surgery should be reconsidered, since there was no difference in cosmeceutical overall outcome by VAS score in the S-TEP arm against the traditional laparoscopic arm at the end of 1 month [15]. Between January 2012 and December 2013, Han et al. (2017) researched and reported on 120 instances of SILTEP and 60 cases of CLTEP at Yonsei University Severance Hospital. The characteristics, operation specifics, and postoperative complications of each group's patients were compared. There was no significant difference in patient age, gender, body mass index, American Society of Anaesthesiologists score, hernia type, or location between SILTEP and CLTEP. In terms of operating time, SILTEP was faster (61.7716.48 minutes vs 77.8335.15 minutes, $P=0.001$). Postoperative complication rates did not vary statistically between SILTEP and CLTEP ($n=20$, 16.7% vs $n=16$, 26.7%, $P=0.114$). SILTEP is practical and delivers equivalent postoperative results to CLTEP. Even though SILTEP has its own set of challenges in mastering the approach, with sufficient practise, it is feasible to perform as well as CLTEP [16]. Ece et al. (2017) surveyed and reported on 148 patients in our surgical clinic who received TAPP or SILS-TAPP between December 2012 and January 2015. During the research period, 60 SILS-TAPP operations and 88 TAPP procedures were carried out. Gender, hernia type, and American Society of Anaesthesiologists (ASA) classification score were all comparable between the two groups. Patients in the SILSTAPP group were younger than those in the TAPP group. There was a considerably greater risk of port site hernia (PSH) in the SILSTAPP group, and all PSHs were reported in patients with severe comorbidities. The mean operational time is not substantially different between the two groups. All SILS operations were done satisfactorily without the need of standard laparoscopy or surgical repair. There were no difficulties throughout the procedure. There was no recurrence throughout the average follow-up time of 15.2 ± 3.8 months. SILS TAPP looks to be a practical, dependable procedure for inguinal hernia repair, analogous to the TAPP technique. Long-term clinical results, on the other hand, need

randomised studies [17]. Sodhi et al., (2019) investigated and reported on 50 patients who presented to Acharya Sri Chander College of Medical Sciences and Hospital, Sidhra, Jammu ASCOMS with uncomplicated inguinal hernia between November 2011 and October 2012, with 25 undergoing single port laparoscopic TAPP-(SPL-TAPP) hernia repairs and 25 undergoing traditional three port transabdominal preperitoneal hernia repair. There were no statistically significant variations in the patient demographics. The age group ranged from 20 to 60 years. The average age, weight, and height in SPL-TAPP were 44.4, 59.46, and 157.2 cm, respectively. The mean operational time and hospital stay in single port TAPP were considerably decreased when compared to traditional surgery. SPL-TAPP also had less postoperative problems, with nearly no recurrences. TAPP via a single port is safe and effective, resulting in fewer recurrences and a shorter hospital stay. [18] According to the research reviewed above, single-incision laparoscopic surgical surgery is safe and effective for hernias when compared to traditional treatment. TAPP with a single port is safe and effective, with fewer recurrences and a shorter hospital stay. The single incision procedure is clinically safe and viable for laparoscopic therapy, as well as surgery with a short hospital stay and low surgical cost. For the treatment of hernias, the single incision procedure is the only viable choice. [19]

Conclusion

According to the research, SILS has the potential to provide patients with superior aesthetic outcomes, less discomfort, and improved patient compliance. Because SILS removes the need for external ports during triangulation, an inguinal hernia repair surgery may be carried out via a single, microscopic portal of entry into the abdomen.

After a month, the VAS score for the single incision method showed no benefits in terms of cosmesis or discomfort. Even though no specialised equipment was needed, the modified SILS (SIMPLE) operations were more expensive than their laparoscopic equivalents. The extended operation durations are mostly responsible for the disparity. Other secondary outcomes, such as postoperative pain (VAS), blood loss, complications, conversion, and duration of hospital stay, showed no statistically significant difference. Single-TEP may be used safely if the surgeon is proficient in laparoscopic surgical techniques and has a solid grasp of inguinal anatomy. When using conventional laparoscopic instruments, S-TEP is safe and feasible even in resource-constrained areas. Nonetheless, there is a need to review the advantages and justifications for single-incision laparoscopic surgery, since there was no difference in the VAS score for the aesthetic result after a

month between the S-TEP and standard laparoscopic arms.

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