

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

Pragya Singh<sup>1</sup>, Vilas Panditrao Kulkarni<sup>2</sup>

<sup>1</sup>PG Resident, Dept. of General Surgery, Pacific Medical College and Hospital, Udaipur, Rajasthan

<sup>2</sup>Professor, Dept. of General Surgery, PMCH, Udaipur, Rajasthan

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Corresponding author: Dr Pragya Singh

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### Abstract

**Introduction:** There is advent of surgical techniques for hernia repair as well as tension-free repair with a prosthetic mesh has become the standard of care in herniorrhaphy. Laparoscopic inguinal hernia repair has several advantages over open repair. Laparoscopic Trans abdominal preperitoneal (TAPP) and totally extra peritoneal (TEP) techniques are therefore frequently used. Pain as well as issues associated to incisions was thus reduced. Single-incision laparoscopic surgery (SILS) was designed to decrease the invasiveness of traditional laparoscopy and has been performed successfully by many surgeons.

**Aims and Objectives:** This study intends to find efficacy and safety profile of conventional totally extra-peritoneal and single-incision multiple port laparoscopic Totally Extra Peritoneal in managing inguinal hernia.

**Methods:** This prospective study considered patients who visited the outpatient department of our hospital. The patients scheduled for inguinal heria repair was considered for comparison between their managements. Based on age (groups of 40 and >40 years), side of hernia (direct/indirect), and unilateral versus bilateral kinds, the patients were given single-incision multiple port laparoscopic Totally Extra Peritoneal (S-TEP) or conventional totally extra-peritoneal (C-TEP). Baseline characteristics were determined before the surgical procedure and complication and safety were assessed after the surgical procedure. The statistical analysis was conducted between the groups.

**Results:** 35 patients from the S-TEP group and 35 patients who underwent C-TEP could be matched equally in order to assess surgical outcomes and cosmetic outcomes. S-TEP for unilateral and bilateral hernia repair had a substantially longer mean surgical time ( $P = 0.002$  and  $P = 0.003$ ) than its conventional equivalent (C-TEP). Both groups saw a similar amount of average blood loss ( $P = 0.1$ ). In neither of the groups were there any cord or nerve injuries. The study also found that 2 (5.7%) patients in the S-TEP group underwent standard laparoscopy but no open conversion. The mean pain score (VAS) in the S-TEP group was initially significantly higher ( $p < 0.05$ ), although it was similar on the 7th day.

**Conclusion:** The study conclude that SILS has the potential to give patients better cosmetic results, less pain, and higher patients' compliance. The VAS score for the single incision approach didn't show any advantages in terms of cosmesis or pain.

There was no statistically significant difference in any of the other secondary outcomes, including postoperative pain (VAS), blood loss, complications, conversion, and the length of hospital stay.

**Keywords:** Trans abdominal preperitoneal, Totally extra peritoneal, Single-incision laparoscopic surgery, Inguinal hernia

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## Introduction

Even before tissue, including such a portion of the intestine, protrudes through a weak spot in the abdominal muscles, an inguinal hernia occurs. The bulge that results can be painful, especially when coughing, bending over, or lifting a heavy object [1]. Many hernias, however, are painless. An inguinal hernia is not always give severe pain. However, it does not improve on its own and can lead to life-threatening complications. Repairing an inguinal hernia is a common surgical procedure [1]. Soft tissue bulges through a weak point in the abdominal muscles in this condition. The soft tissue is frequently associated with the intestine. The bulge is easy to see and feel, though not all of it is visible to the patient, especially when obese. Pain is one of the symptoms, especially when a person coughs, bends, or lifts a heavy object [1].

Inguinal hernia repair is the largest common surgical procedure performed worldwide [2]. Many surgical techniques have indeed been outlined, as well as tension-free repair with a prosthetic mesh has become the standard of care in herniorrhaphy. Laparoscopic inguinal hernia repair has several advantages over open repair. Laparoscopic Trans abdominal preperitoneal (TAPP) and totally extra peritoneal (TEP) techniques are therefore frequently used [3-5]. When the two techniques are compared, TAPP is easier to learn and may have a shorter learning curve [6]. This is due to the large amount of work area in TAPP repair. Recent research has focused on decreasing the number of small cuts and port size to further reduce the invasiveness of laparoscopy. Pain as well as issues associated to incisions was thus reduced. Single-incision laparoscopic

surgery (SILS) was designed to decrease the invasiveness of traditional laparoscopy and has been performed successfully by many surgeons [7-9].

Inguinal hernia is a frequent cause that can be treated in a variety of ways. Nowadays, the laparoscopic completely extraperitoneal method is getting popular and producing positive results. However, as a new technique, single-incision laparoscopic surgical treatment is expanding its applicable fields. Although interest in single-incision laparoscopic surgical interventions (SILSs) grew in tandem with the advancement of the minimally invasive approach, the pace was slow, owing to technical difficulties encountered by surgeons, such as loss of triangulation, instrument clustering, and a very narrow working angle [10]. As patients' awareness of cosmetic appearances grows, SILS procedures are becoming more popular. This is due in part to enhanced learning curves of the surgical fraternity and increased patient awareness of cosmetic appearances.

SILS totally extra-peritoneal (TEP) was first reported in 2009 [11], and since then, just several prospective cohort studies [12-14] had already illustrated its safety and feasibility. However, 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. We have modified the approach to SILS utilizing the single-incision multi-port laparoscopic surgery (SIMPLE)

method utilizing traditional laparoscopic instruments to decrease the expense associated with special equipment. Only a few studies have been published on SILS-TEP utilizing traditional laparoscopic equipment [13].

Single-incision procedures are becoming more popular as wound cosmesis is increasingly highlighted as an essential body image-related outcome. In this study, we compare the potential benefits of single-incision multiport laparoscopic totally extra-peritoneal (S-TEP) surgery to traditional laparoscopic TEP (C-TEP) surgical procedure in terms of operative time, post-operative pain, complications, cost, and cosmesis.

## Methods

### Study design

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 the outpatient department of our hospital who followed the study protocol and give informed consent for the study are included. Patients who provide informed consent for the study are included in the study. Symptomatic direct or early indirect inguinal hernia that has been diagnosed and is scheduled for laparoscopic TEP hernia surgery was included in the study. Of the total 80 patients included in the study.

Patients who did not follow the study protocol did not finish it, or did not provide consent were not included in the study. Cases with a history of lower abdominal surgery, a big inguinoscrotal hernia with an American Society of Anesthesiologists

grade >2, and recurring hernia were excluded from the study.

### Statistical analysis

Demographic and disease-specific traits were assessed using descriptive statistics. Standard deviation and the mean () were used to express all quantitative data. Using a two-tailed Student's independent t-test, cosmesis and pain (VAS) scores at various time intervals were compared with the remainder of the continuous variables. Depending on the dispersion of the data, the comparison of categorical variables (clinicopathological and outcomes) was conducted using the Chi-square test or Fischer's exact test. Utilizing factorial ANOVA, linear, and logistic regression models, multivariate analysis was carried out. At P 0.05, the significance level was acceptable. The statistical program SPSS version 23 (IBM Corp. New York, United States) was utilized for the analysis.

### Ethical approval

The patients were given a thorough explanation of the study by the authors. The patients' permissions have been gotten. The concerned hospital's ethical committee has accepted the study's methodology.

### Results

In table 1 each set of 35 patients are evenly divided among two groups. Males are more prevalent in both categories. 35 patients from the S-TEP group and 35 patients who underwent C-TEP could be matched equally in order to assess surgical outcomes and cosmetic outcomes. No statistically significant differences were between the two groups in terms of the clinical characteristics of the patients.

In terms of operative outcomes [Table 2], S-TEP for unilateral and bilateral hernia repair had a substantially longer mean surgical time (P = 0.002 and P = 0.003) than its conventional equivalent (C-TEP). Both groups saw a similar amount of average blood loss (P = 0.1). Two treatment groups were compared with regard to a number of

sequelae, including vascular injury, peritoneal rip, and cord and nerve injuries. A peritoneal tear was the most frequent intraoperative complication, but there was no discernible difference between the two groups. Without a significant difference ( $P = 0.46$ ), 2 patients in the C-TEP group

(5.7%) and 4 patients in the S-TEP group (11.4%) both experienced vascular damage (inferior epigastric artery). In neither of the groups were there any cord or nerve injuries. 2 (5.7%) patients in the S-TEP group underwent standard laparoscopy but no open conversion.

**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 shows that the postoperative day (POD) 0, 1, the day before discharge, and POD7<sup>th</sup> in the OPD during the initial follow-up were used to measure post-

operative pain. When comparing the two therapy groups, the mean pain score (VAS) in the S-TEP group was initially significantly higher ( $p < 0.05$ ), although it was similar on the 7<sup>th</sup> day.

**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 ± 0.3	5.8 ± 0.5	0.002
6 weeks	6.5 ± 0.86	7.5 ± 0.67	0.002
6 months	9.3 ± 0.7	9.8 ± 0.2	0.5
Cost analysis (Rs.)	40,175 ± 654	42,569 ± 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

Rajapandian et al. (2018) conducted and reported on a prospective particular instance investigation of S-TEP versus C-TEP patients from June 2014 to December 2015. There were 36 patients in each group. Clinical characteristics were comparable between the two groups. In C-TEP and S-TEP, the average duration of surgery for a unilateral hernia was 45.13± 10.58 min and 72.63±15.23 min, respectively. At post-operative day (POD) 0 and 1, the mean visual analogue scale (VAS) score for pain was significantly higher in the S-TEP group. At POD 7, however, there was no significant difference between the groups. Cosmetic results were significantly better in the S-TEP group than in the C-TEP group at 1-week and 6-week post-surgery. Nevertheless, at 6 months, the scar across both treated group was highly acceptable. S-TEP using standard laparoscopic instruments is secure and possible even in resource-constrained settings. However, there is a need to revisit the indications and benefits of single-incision laparoscopic surgery, as there was no differential in cosmeceutical overall result by VAS score in the S-TEP arm versus the conventional laparoscopic arm at the end of 1 month [15].

Han et al. (2017) investigated and reported on 120 cases of SILTEP as well as 60 cases of CLTEP at Yonsei University Severance Hospital between January 2012 and December 2013. Each group's patients' features, operative specifics, as well as postoperative complications were compared. There was no statistical difference among SILTEP and CLTEP in patient age, gender, body mass index, American Society of Anesthesiologists

score, hernia type, or location. In terms of operative details, SILTEP had a shorter operation time (61.77±16.48 minutes versus 77.83±35.15 minutes, P =0.001). There was no statistical difference in postoperative complication rates between SILTEP and CLTEP (n = 20, 16.7% versus n = 16, 26.7%, P =0.114). When compared to CLTEP, SILTEP is feasible and provides comparable postoperative outcomes. Even though SILTEP has its own set of difficulties in having mastered the methodology, with some practice, it is possible to perform as well as CLTEP [16].

Ece et al. (2017) surveyed and reported on 148 patients who had TAPP or SILS-TAPP in our surgery clinic among December 2012 and January 2015. During the study period, 60 SILS-TAPP and 88 TAPP procedures were performed. Gender, type of hernia, and American Society of Anesthesiologists (ASA) categorization score were all similar between the two groups. When compared to the TAPP group, the patients in the SILS-TAPP group were younger. The SILS-TAPP group had a significantly higher rate of port site hernia (PSH), and all PSHs were recorded in patients with severe comorbidities. The mean operative time does not differ significantly between the two groups. All SILS procedures were successfully completed without the need for traditional laparoscopy or open repair. There were no intraoperative complications. During the average follow-up period of 15.2 + 3.8 months, there was no recurrence. SILS TAPP appears to be a feasible, reliable method that is comparable to the TAPP technique for inguinal hernia repair. Randomized trials, on the other hand, are required to assess long-term clinical outcomes [17].

Sodhi et al., (2019) studied 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 conventional three port transabdominal preperitoneal hernia repair. There were no significant differences in patient demographics. The age range was from 20 to 60 years. In SPL-TAPP, the average age, weight, and height were 44.4, 59.46, and 157.2 cm, respectively. When compared to conventional surgery, the mean operative time and hospital stay in single port TAPP were significantly lower. Furthermore, SPL-TAPP had fewer postoperative complications, with almost no recurrences. TAPP with a single port is safe and effective, with fewer reoccurrences and a shorter hospital stay. [18]

As per above discussed reported studies, single-incision laparoscopic surgical treatment is safe and good for the hernia when compare with conventional treatment. Single port TAPP offers to be safe and efficacious with minimum reoccurrences and shorter hospital stay. The single incisions method is clinically safe and feasible for laparoscopic treatment along with surgery option with minimum hospital stay and surgery cost. The single incision treatment is only feasible option for the treatment of hernia. [19]

### Conclusion

The study conclude that SILS has the potential to give patients better cosmetic results, less pain, and higher patients' compliance. Because SILS eliminates the need for external ports during triangulation, an inguinal hernia repair procedure can be performed through a single, tiny portal of entry into the belly. By the end of a month, the VAS score for the single incision approach didn't show any advantages in

terms of cosmesis or pain. Even though no special equipment was required, the modified SILS (SIMPLE) procedures cost more than their laparoscopic counterparts. The difference is primarily attributable to the longer operating times. There was no statistically significant difference in any of the other secondary outcomes, including postoperative pain (VAS), blood loss, complications, conversion, and the length of hospital stay. If the surgeon is skilled in laparoscopic surgical procedures and has a thorough understanding of inguinal anatomy, single-TEP can be employed without risk. S-TEP is safe and doable even in environments with limited resources when utilising standard laparoscopic tools. There is a need to reassess the benefits and indications for single-incision laparoscopic surgery, nonetheless, as there was no difference in the VAS score for the cosmetic outcome between the S-TEP and traditional laparoscopic arms after a month.

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