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Original Research Article

FEASIBILITY OF ROBOTIC TEP FOR GROIN HERNIA: AN OBSERVATIONAL STUDY

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ABSTRACT

Background: One of the most frequent manifestations in surgical field is a groin hernia, especially an inguinal hernia. Both the surgeries, laparoscopic Trans Abdominal Pre Peritoneal (TAPP) technique and laparoscopic Totally Extraperitoneal (TEP) technique have become the standards of care equally, because of reduction of postoperative pain and speeding up of recovery. As robotic surgical platforms have advanced, robotic-assisted TAPP (R-TAPP) has emerged as a promising alternative that offers improved dexterity and visualisation. But robotic assisted TEP (R-TEP) is still not practiced frequently, due to the apprehension of conducting the whole surgery in a very narrow limited space. very few robotic surgeons have ventured into robotic assisted TEP (R-TEP). However, its feasibility and safety, needs to be evaluated. Even further researches, particularly in settings with limited resources, are required. This study aims to evaluate the feasibility, safety, and outcomes of robotic TEP in the management of groin hernias.

Materials and Methods: A prospective observational study was conducted on 30 patients who underwent robotic TEP hernia repair at a tertiary care hospital between January and December 2024. Patient demographics, operative time, intraoperative complications, postoperative recovery, and short-term recurrence were analysed.

Results: All 30 procedures were completed successfully without conversion to laparoscopic or open surgery. The mean operative time was 85 ± 12 minutes. No minor intraoperative complications were observed. Two patients had early postoperative occurrence. Both of them had seroma formation, which responded and resolved to conservative management. None of them, suffered any other early postoperative complications (e.g., hematoma). No major complications, wound infections, or early recurrences were recorded during a 3-month follow up period. Neither any other complications were documented in their 6-months follow up period and 12-months follow up period. The average length of hospital stay was 1.2 days, and the majority of patients resumed normal activities within one week.

Conclusion: Robotic TEP is a feasible and safe approach for groin hernia repair. The technique offers potential advantages in precision, ergonomics, and recovery time. Larger randomized controlled studies are warranted to compare its efficacy and cost-effectiveness with conventional laparoscopic approaches.

Keywords: Robotic surgery, TEP hernia repair, Groin hernia.

INTRODUCTION

Groin hernias, especially inguinal hernias, are a frequent ailment impacting millions globally. About 27% of men and 3% of women will get an inguinal hernia in their lifetime.[1] With more than 20 million groin hernia repairs made annually globally, surgery is still the only proven cure.[2] The gold standard for open mesh repair has historically been the Lichtenstein technique, but laparoscopic procedures have become more and more popular since they are less intrusive and result in quicker recovery, less discomfort after surgery, fewer recurrences, and less wound related problems.[3,4]

Totally Extraperitoneal (TEP) repair has demonstrated exceptional results among laparoscopic methods, including benefits such a decreased risk of bowel damage and the avoidance of intraperitoneal dissection.[5] However, because of the limited instrument movement and narrow working space, the approach requires a high learning curve.[6]

The same concerns become more prominent and magnified for groin hernia surgeries, whereas ventral hernias are being performed at much ease. By offering wristed devices, three- dimensional vision, and improved ergonomics for the surgeon, robotic-assisted surgery has completely changed the scenario of minimally invasive techniques. While preserving its benefits, robotic-assisted TEP (R-TEP) seeks to address the technical issues with conventional laparoscopic TEP. Better mesh placement, better dissection, and maybe fewer complications are all possible outcomes of robotic hernia treatment, according to preliminary findings.[7–9]

Notwithstanding these encouraging advantages, R-TEP is still in its infancy, and there is currently little research on its viability, particularly in underdeveloped nations. Its broad use is hampered by issues with cost, operating time, and accessibility.[10,11] An observational analysis of 30 robotic TEP groin hernia repair procedures carried out in a tertiary care facility was the design of this study. The goal was to assess this innovative approach's viability, safety, intraoperative experience, short-term results, and early problems. This study is to evaluate the feasibility of robotic hernia repair in actual surgical settings and add to the expanding body of literature supporting the procedure by examining operative metrics and short-term outcomes.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Minimal Invasive and Robotic Gastro Intestinal Surgery, at Yashoda Hospitals (Somajiguda branch), from January 2024 to December 2024. The study aimed to evaluate the feasibility of robotic TEP (R-TEP) in the surgical repair of groin hernias.

Sample Size: 30 patients were included based on availability and suitability for robotic surgery.

Inclusion Criteria:

- Patients aged 18 years and above
- Diagnosed with primary/recurrent and unilateral/bilateral inguinal hernia
- ASA Grade I or II
- Provided informed written consent for robotic surgery

Exclusion Criteria:

- Irreducible or strangulated hernias
- Patients unfit for general anesthesia
- Prior extensive lower abdominal surgeries

Procedure: Under general anaesthesia, with 12mm Optiport entry using 0 degree robotic telescope, the preperitoneal space was created 3cm cranial and lateral to umbilicus, and two 8mm working ports on either sides of 12mm port, 8cm apart in a straight horizontal alignment. Hernia sac dissection and mesh placement (polypropylene, 17 x 12 cm) were performed robotically, and no fixation was used. All patients underwent R-TEP repair using the da Vinci Xi robotic system. Paracetamol 1gm, three doses were given at 8 hours interval was used for pain relief. Ambulation was started in the same day evening with soft diet at night. early return of bowel and bladder functions was observed

Data Collection:

The following parameters were recorded:

- Demographic details (age, sex, BMI)
- Operative time
- Intraoperative complications
- Conversion to open/laparoscopic surgery
- Postoperative pain (VAS scale)
- Duration of hospital stay
- Postoperative complications (seroma, hematoma, infection)
- Follow-up for recurrence (at 3 months, at 6 months, at 12 months)

Statistical Analysis

Descriptive statistics were used to analyse outcomes. Data were presented as mean ± SD for continuous variables and as frequencies for categorical variables. Ethical clearance was obtained from the Institutional Ethics Committee, and all patients provided informed consent.

RESULTS

The demographic information for 30 patients is shown in [Table 1]. There were 28 men and 2 females, with an average age of 48.6 years. The majority of patients were of normal weight, as shown by the mean BMI of 24.5 kg/m². In line with usual hernia patterns, bilateral hernias were more prevalent (73%) than unilateral hernias (27%). 80% were primary hernias and 20% were recurrent hernias. 18 patients (60%) had primary bilateral hernias and 4 patients (13.33%) had recurrent bilateral hernias. 6 patients (20%) had primary unilateral hernias and 2 patients (6.66%) had recurrent unilateral hernias.

Table 1: Demographic Profile of Patients

Parameter	Value
Number of Patients	30
Mean Age (years)	48.6 ± 12.4
Gender (M/F)	28 / 2
BMI (kg/m²)	24.5 ± 3.1
Type of Hernia	Primary Bilateral – 18 (60%) Recurrent Bilateral – 4 (13.33%) Primary Unilateral – 6 (20%) Recurrent Unilateral - 2 (6.66%)

Table 2: Operative and Intraoperative Parameters

Parameter	Value
Mean Operative Time (mins)	85 ± 12
Intraoperative Complications	0
Conversion to Open/Lap	0

The operative and intraoperative results are presented in [Table 2]. The average operative time was 85 minutes, demonstrating an effective surgical workflow. None of the patients had experienced any intraoperative complications, neither any conversion to open or laparoscopic surgery occurred, suggesting that the robotic TEP approach is highly feasible.

Table 3: Postoperative Outcomes

Parameter	Value
Hospital Stay (days)	1.2 ± 0.4
Early Postoperative Occurrence	2 (6.66%) (seroma)
Early Postoperative Complications (e.g. Hematoma)	0
Wound Infection	0
Early Recurrence (3 months)	0
Return to Normal Activity	6.5 ± 1.8 days

[Table 3] summarizes the surgical results. The average hospital stay was 1.2 days. Early postoperative occurrence (seroma) were noted in 2 patients, but none of them had hematoma formation. No early recurrences or wound infections occurred throughout the three-months, six-months and twelve-months follow-up period. After 2 days or so, the patients returned to their regular activities, suggesting a speedy recovery.

Table 4: Pain Scores (VAS)

Time Post-Op	Mean VAS Score
6 hours	3.2 ± 1.1
24 hours	2.1 ± 0.9
72 hours	0.8 ± 0.6

Visual Analogue Scale (VAS) postoperative pain ratings are displayed in Table 4; pain was considerable at 6 hours post-op (3.2), decreased at 24 hours (2.1), and negligible by 72 hours (0.8), demonstrating rapid postoperative comfort and efficient pain management.

DISCUSSION

With acceptable operative times, few complications, and favourable recovery profiles, R-TEP is a safe and viable surgical option. All 30 procedures in this series were successfully completed without conversion to open or conventional laparoscopic techniques, which is consistent with previous studies that have shown high completion rates with robotic approaches.[1,2] The current study sets out to assess the feasibility and short-term outcomes of robotic-assisted Totally Extraperitoneal (R-TEP) repair for groin hernias.

Our study's mean operative time was 85 ± 12 minutes, which is similar to the times reported by Kudsi et al. and Prabhu et al., who reported average times of 80 to 100 minutes during their initial robotic hernia repair serie.[3,4] Increased surgeon experience and improved ergonomics provided by robotic platforms are expected to improve operating times.[5] In our study we didn't face any intraoperative complications and the postoperative period was also uneventful. Two of them experienced early postoperative occurrence (seroma) but none of them had formed hematoma. Neither did they face any major complications such as vascular or visceral injuries. These results are consistent with other robotic hernia repair studies, where complication rates are low.[6,7]

The speedy recovery following surgery was a noteworthy finding; patients were released in an average of 1.2 days and returned to their regular activities within a week. These outcomes are similar to those of laparoscopic TEP procedures,[8] but with the added benefit of improved accuracy and possibly less fatigue for the surgeon during lengthy surgical procedures.[9] The 3-month to 1-year follow-up period showed no recurrence, which is encouraging,

but it is too soon to draw firm conclusions about recurrence rates, which usually call for long-term monitoring. Research by Carbonell et al. and others indicates that robotic repairs, when carried out with proper mesh placement and dissection, may have recurrence rates that are on par with or even lower than those of traditional methods.[10,11]

The cost of robotic hernia surgery is still one of the most contentious issues; although robotic platforms have higher initial and ongoing expenses, supporters contend that these costs may be offset over time by better results, lower conversion rates, and improved ergonomics.[12] Future research should assess the economic implications, especially in settings with limited resources. This study's prospective nature and emphasis on a standardised surgical technique are its main strengths, but its drawbacks include its small sample size, single-center design, and brief follow-up period.

In summary, our results add to the increasing evidence that robotic TEP is safe, technically feasible, and has good perioperative outcomes; however, larger randomised studies are required to directly compare robotic techniques with open and laparoscopic approaches, particularly with regard to cost-effectiveness, recurrence, and long-term efficacy.

CONCLUSION

This observational study reveals that robotic-assisted TEP (R-TEP) for groin hernia repair is a practical and safe surgical method with promising short-term results. The treatment was done successfully in all 30 patients, with minimal intraoperative and postoperative problems and no conversions to other surgical procedures. No recurrences were noted during the brief three-month follow-up period, and the mean operating time, hospital stay, and return-to-activity duration were all within acceptable clinical ranges.

The results corroborate the benefits of robotic platforms, which include better surgeon ergonomics, increased visualisation, and higher tool dexterity, particularly in the small preperitoneal space. Even though robotic surgery has greater upfront expenses, the better results can outweigh them, particularly in difficult cases or high-volume centres.

The study's shortcomings, including its small sample size and brief follow-up, must be noted even if it contributes useful information to the expanding body of research on robotic hernia repair. To determine the precise function of robotic TEP in the treatment of groin hernias, more extensive randomised controlled studies with long term results are required.

To sum up, robotic TEP is a secure and effective substitute for conventional laparoscopic methods and has the potential to be used more widely in contemporary hernia surgery.

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