

Early Institutional Outcomes of Extended Totally Extraperitoneal (eTEP) Repair for Ventral Hernias: A Retrospective Single-Center Cohort Study

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ABSTRACT

Background: Extended Totally Extraperitoneal (eTEP) repair is a new form of the minimally invasive ventral hernia repair technique, which integrates the benefits of laparoscopic surgeries with the best location of mesh in the retroposition on the retro-rectus space. There are few data of early results in Indian healthcare backgrounds.

Methods: It was a retrospective cohort study involving 38 consecutive patients with ventral hernia repair eTEP at one of the tertiary care centers between October 2023 and June 2025. The variables were 30-day complications in categories according to Clavien-Dindo system, operating time, length of stay, pain measurements, resumption of normal activity, and early rates of recurrence.

Results: The mean age of patients was 41.5 years out of which the male proportion was the largest (63.2% n=24). Mean BMI was 24.9 ± 2.3 kg/m². There were 13.2% (n=5) diabetic mellitus and 15.8% (n=6) hypertension cases. Mean defect size was 2.4 ± 0.8 cm. All the processes were done successfully and mean operation time of 124.7 +15.8 minutes. None of the intraoperative complications was observed (0%). Mean hospital stay was 6.9 ± 1.9 days. Every patient also attained normal wound healing with an average of 14.9+ 1.6 days of normal activities. No 30-day complications (0) and none of the recurrences (0) occurred during the research.

Conclusion: eTEP repair has shown great safety profile in the initial years with no morbidity and recurrence. The method seems to be practical and without risks, regarding the repair of ventral hernias, in properly chosen patients, and there are significant perspectives to prove that these good initial outcomes may be proved through bigger prospective trials.

Keywords: Extended totally extraperitoneal repair, eTEP, ventral hernia, minimally invasive surgery, laparoscopic hernia repair

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INTRODUCTION

Ventral hernias have been a serious issue in general surgery with an estimated prevalence of 15-20 percent¹ Traditional open repair methods, although effective, have been characterized by high morbidity with surgical site infections, chronic pain, and recurrence rates of 10-50 percent.^{2,3} The shift towards minimally invasive procedures has been

predetermined by the need to achieve lower postoperative pain, shorter hospitalization, and good cosmetic results.

The use of laparoscopic ventral hernia repair, including Trans Abdominal Pre Peritoneal (TAPP) and totally extraperitoneal (TEP) techniques, has enjoyed wide acceptance within the last 20 years.^{4,5} These methods are not without limitations,

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especially in terms of reaching the preperitoneal space to position the mesh more appropriately and obtain sufficient overlap in the larger defects.

The Totally Extraperitoneal (eTEP) repair which was first introduced by Daes et al. in 2012 is a new development in minimally invasive hernia repair; this method uses a longer dissection enabling the mesh to be laid in the preperitoneal area and the peritoneal barrier to be minimally violated. The eTEP method is theoretically associated with various benefits: the low risk of bowel adhesion to mesh, lower postoperative pain because of a minimum of peritoneal manipulation, and a better fixation of the mesh by means of anatomical planes.

Recent reports on Western populations have documented successful results with eTEP repair with low overall complication rates and good short-term outcomes.^{9,10} But overall outcome data in the Indian healthcare sectors and especially in a teaching setting with scarce resources is still inadequate. The fact that patient population is heterogeneous, differences in quality of healthcare infrastructure and disparities in postoperative care routines precondition the need of region-specific outcome research.

The main aim of the research was to assess the initial postoperative success of eTEP repair of ventral hernias in our organization. Secondary objectives were to determine the operative feasibility, the nature of possible complications and to determine early functional outcome. This study will provide useful information to the existing literature that dents in favor of the most minimally invasive hernia repair methods in the Indian subcontinent.

METHODS

Study Design and Setting

The study was a retrospective observational cohort study conducted at the Department of General Surgery, Chettinad Medical College and Hospital, Kelambakkam, Chennai which is a tertiary care teaching hospital. The Institutional Ethics Committee (IEC) approved the study protocol and the study was carried out in line with the Declaration of Helsinki. Since the study had a retrospective character, including mapping of already existing medical records without interacting with patients, the informed consent was waived according to the institutional rules.

Study Period and Participants

The patients to be analysed were all adult patients who had undergone eTEP repair of ventral hernias between October 1, 2023, and June 30, 2025.

Inclusion Criteria:

- Patients who underwent eTEP repair for Primary ventral hernias
- Complete medical records available for analysis

Exclusion Criteria:

- Patients who underwent concomitant major surgical procedures (bowel resection, organ transplantation)
- Emergency hernia repairs for complications (obstruction, strangulation)
- Patients with preoperative mesh infections or previous mesh complications
- Patients lost to follow-up within the first 30 days postoperatively
- Recurrent hernia

Surgical Technique

In supine position of the patient, parts painted and draped. A 12mm incision is made on one side of the epigastrium, below the costal margin and a space is entered in zero degree telescope by using optiport retrorectus space. The dissection is continued down to a point at which the pubic bone is visualised with the dissection being medial to the linea semilunaris. Two other work ports are established in the retro rectus space between the linea semilunaris in the midclavicular line, 5 cm apart. A the working ports dissection is performed to cross the midline and the retro rectus space on the other is dissected. Dissection is performed in order to access the pubic bone. Sac is determined and diminished. Anterior abdominal wall defect is sealed with barbed non absorbable sutures. A prolene mesh, 15x15 cm is placed into the retro rectus space and held in place with the use of tackers or sutures depending on the determination of the surgeon. Pneumoperitoneum emitted and incisions were sewn with sutures.

Data Collection

EMRs and operation theater records were extracted. All patient identifiers were deleted and substituted by unique study codes in order to provide confidentiality. The variables that were measured are as follows:

Patient Demographics and Comorbidities:

- Age, gender, body mass index (BMI)
- Comorbid conditions: diabetes mellitus, hypertension, chronic obstructive pulmonary disease

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- Smoking status and alcohol consumption history

Hernia Characteristics:

- Defect size measured intraoperatively in centimeters

Operative Details:

- Duration of surgery (minutes)
- Mesh size used
- Fixation method (tacks vs. sutures)
- Intraoperative complications

Postoperative Outcomes:

- Length of hospital stay
- Pain scores at discharge and follow-up visits (0-10 numerical rating scale)
- Wound healing status
- Time to return to normal activities
- 30-day complications classified per Clavien-Dindo system¹¹
- Recurrence within study period

Statistical Analysis

The statistical analysis has been conducted with the help of proper software. Normality was assessed in the form of visual inspection of the histograms of the continuous variables. Continuous variables were normally distributed and were indicated as the mean and standard deviation, and those that did not follow a normal distribution as median and interquartile range. Frequencies and percentages were used to give categorical variables.

Considering the nature of the study which is observation and lack of comparison groups, mainly the descriptive statistics were used. Proportions 95 percent confidence intervals were computed where necessary. Any comparative analyses were considered to be statistically significant in case of a p-value less than 0.05.

RESULTS

Patient Demographics and Characteristics

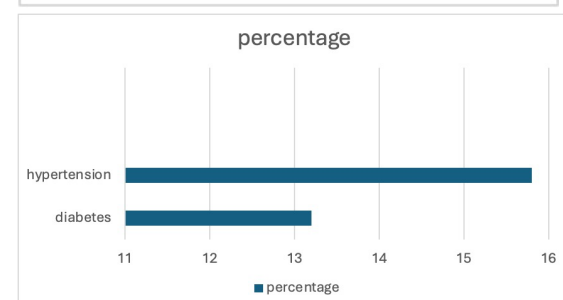
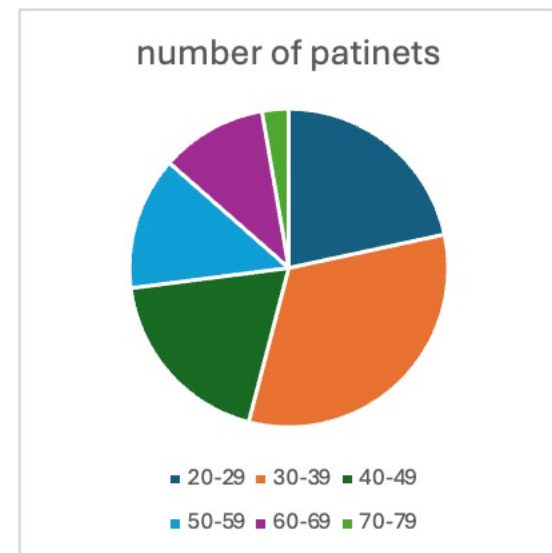
The number of patients, who were considered in the research, was 38 and all of them had a history of eTEP repair. The age range was 20-73 years with the mean age of the cohort being 41.5 ± 14.8 (means) with male pre-eminence of 63.2% (n=24). The BMI of the patients was 24.91023 kg/m^2 , which suggests that the patients are mostly normal and overweight (22-30 kg/m^2).

It was found in the analysis of comorbidity that diabetes mellitus was present in 13.2 percent (n=5) of the patients and hypertension in 15.8 percent (n=6) of the patients. None of the patients had

chronic obstructive pulmonary disease. On the lifestyle factors 13.2% (n=5) were current smokers, 15.8% (n=6) former smokers and 18.4% (n=7) alcohol users.

Table 1: Patient Demographics and Characteristics

Variable	Value
Total patients, n	38
Age (years), mean \pm SD	41.5 ± 14.8
Age range (years)	20-73
Male gender, n (%)	24 (63.2)
BMI (kg/m^2), mean \pm SD	24.9 ± 2.3
Diabetes mellitus, n (%)	5 (13.2)
Hypertension, n (%)	6 (15.8)
Current smoking, n (%)	5 (13.2)
Former smoking, n (%)	6 (15.8)
Alcohol consumption, n (%)	7 (18.4)



Hernia and Operative Characteristics

The average defect size was 2.4 ± 0.8 cm (range: 1.2-4.5 cm). The defects were classified into small (less than 2 cm), medium (2-3 cm), and large (more than 3 cm) in the proportion of 28.9 (n=11), 44.7 (n=17), and 26.3 (n=10) cases.

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All the operations were accomplished successfully through eTEP method and without open surgery conversion. The average duration of operation was 124.7 +/- 15.8 minutes (110 -150 minutes). All patients used a standard 15x15 cm mesh. Tack fixation and suture fixation were used to attain fixation in 78.9% (n=30) and 21.1% (n=8) cases respectively.

Table 2: Hernia and Operative Characteristics

Variable	Value
Operative time (min), mean ± SD	124.7 ± 15.8
Operative time range (min)	110-150
Mesh size (all patients)	15x15 cm
Tack fixation, n (%)	30 (78.9)
Suture fixation, n (%)	8 (21.1)

Postoperative Outcomes and Complications

None of the patients had intraoperative complications (0%)The average length of stay was 6.9 +/- 1.9 (4-10 days). Normal wound healing was observed in all the patients with no wound related complications.

The average pain score on numerical rating scale was 1.8 + 0.5 as a result of pain evaluation (range: 1-3). There was a progressive improvement in follow-up pain scores with a mean score of 1.2 +.5 and 0.3 +.5 at one week and one month after surgery, respectively.

The average recovery period was 14.9 +1.6 days (minimum: 13-18 days). It is worth noting that there were 0 30-day complications based on the Clavien-Dindo grading scheme (0%) No patient postoperative complication of any grade in the 30 days.

Table 3: Postoperative Outcomes

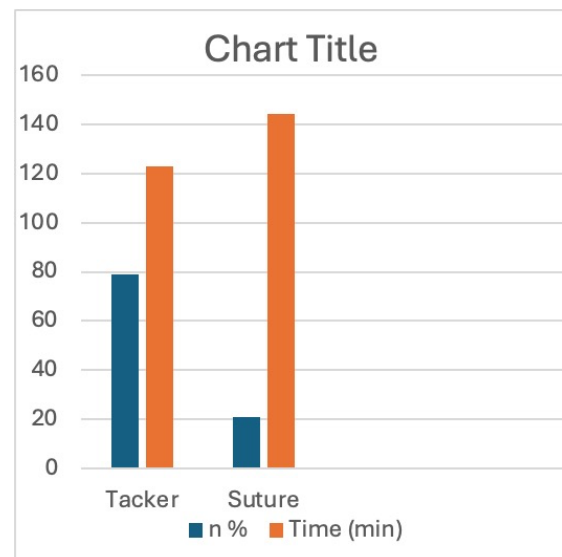
Variable	Value
Hospital stay (days), mean ± SD	6.9 ± 1.9
Hospital stay range (days)	4-10
Normal wound healing, n (%)	38 (100)
Discharge pain score, mean ± SD	1.8 ± 0.5
1-week pain score, mean ± SD	1.2 ± 0.5
1-month pain score, mean ± SD	0.3 ± 0.5
Return to normal activities (days), mean ± SD	14.9 ± 1.6

Subgroup Analysis

Outcomes analysis using fixation method revealed that there was no significant difference in hospital or normal activity coming back after tack fixation and

suture fixation. There was a minor difference in the duration of the operations (mean 144.0 vs. 120.3 minutes) and slightly higher pain scores at discharge in the patients that received suture fixation but the differences were not statistically tested because of the small sample sizes.

Defect size was not found to be correlated with the length of stay or complication in the hospital. On the same note, the age of a patient, his or her BMI, and the existence of comorbidities did not seem to have an effect in the immediate postoperative outcomes in this cohort.



DISCUSSION

This paper will present the first institutional experience of eTEP repair of ventral hernias with an outstanding early safety and effectiveness rate. The low rates of complications and a lack of early recurrence at the study period indicate that the use of eTEP repair may be provided safely and with the best short-term results to patients with a recent selection step.

Our cohort demographics (population of ventral hernias with a median age of 41.5 years and dominated by males) are in line with the existing trends in the demographic distribution of our population (BMI is relatively low, 24.9 kg/m², and the incidence of comorbidity is low). The comorbidity rates of diabetes (13.2) and hypertension (15.8) are expected in this patient group in Indian healthcare services.

Our performance of 124.7 minutes is in good disposition with what has been published on eTEP repair. The average operative time of the four series of 45 patients reported by Baig and Priya is 132 minutes.¹ The range of operative times of 90-180

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minutes stated by Belyansky et al. is the result of the consistency of the results.

In our series, the lack of intraoperative complications is notable, and it is more than what has been reported, which ranges between 2-8% in larger eTEP series.¹□□seven 'eight, which can be explained by the thin selection of patients, the proper level of complexity of the case to the institutional learning curve, and the expertise of the operating surgeons in laparoscopy.

Our series mean of 6.9 days is bigger than most Western reports of eTEP repair because in many cases of the series, it is performed as day surgery or with a 1-2 day hospital stay, not necessarily because of complications associated with the surgery. The prolonged stay was not due to any negative events as the complication rate was zero.

The results of pain in our series were excellent as discharge pain was low (1.8/10) and the pain reduced gradually to a minimal level (0.3/10) at one month and the majority of this was also due to the post operative discomfort experienced by the patient. The findings are in line with the theoretical benefits of eTEP repair, where less peritoneal movement and placement of the mesh in the preperitoneal area is optimal to decrease the postoperative pain. 21 The fact that the average duration to resume normal activity is 14.9 days makes the case even more convincing.

The fact that 100 percent of people have attained normal wound healing without surgical site infections is especially notable in the view of the fact that wound complications is one of the leading causes of morbidity in hernia surgery. This finding is probably indicative of the low invasiveness of eTEP repair, proper use of antibiotic prophylaxis in the perioperative period, and special consideration of the surgical procedure.

It is noteworthy that there was no follow-up on our follow-up period, which is encouraging but needs to be viewed with caution due to the relatively short time spent following the patient. Prolonged studies with long follow-ups are necessary to determine the long-term effectiveness of eTEP repair. Recurrences were 1.1 at a mean follow-up of 29 months in a 850-patient multicenter study by Belyansky et al. (2).

Clinical Implications

The good early results recorded in this study have a number of clinical implications. To start with, they show that eTEP repair can be implemented in Indian healthcare with proper training and case selection. Second, the findings indicate that eTEP could have

benefits over conventional open repair in regards to wound healing and early recovery.

The method seems to be especially adequately applied to younger patients with smaller and medium-sized defects and minor comorbidities as indicated in our cohort. Nevertheless, its generalizability to more complicated situations and older patients or those with severe comorbidities needs further research.

Limitations

These results are subject to a number of limitations when interpreting them. To begin with, the retrospective design is a limiting method of evidence quality and is prone to selection bias. The sample size (n=38) is relatively small and might not be representative of the entire range of possible outcomes as the power is limited because of the small sample.

The lack of a control group does not allow us to direct compare with other repair methodologies and this does not allow us to prove that eTEP is superior to other methods. The short follow-up time is sufficient to detect the early complications, but it cannot be used to evaluate the long-term outcomes of the recurrence and the development of chronic pain.

A single centre design, although permitting the use of standardized protocols, might restrict extrapolation to other centres that have variable resources, training levels and patients. The judicious selection of the case during the learning curve could have led to the best results but do not necessarily represent the results in the regular clinical practice. Furthermore, the absence of cost analysis merits does not allow making an evaluation of the economic consequences of adopting eTEP repair, which is essential in healthcare systems when making resource allocation decisions.

Future Directions

Due to these encouraging preliminary findings, there are a number of research directions that can be developed. There is a need to conduct large scale prospective multicenter trials, which can compare eTEP with proven repair procedures to come out with conclusive evidence on its position in the management of ventral hernias. It is crucial to conduct long follow-up studies after 2-5 years to determine the recurrence rates and chronic pain outcomes.

The healthcare policy decisions will be informed by the cost-effectiveness studies that will include the duration of operation, the duration of stay in the

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hospital, the rate of complications, and the long-term outcomes. Research on extended signs, such as larger lesions, elderly, and co-morbidity patients will assist in defining the best patient selection criteria.

Patient-centered outcome measures would be of value, and this would be achieved by the use of validated instruments in quality of life assessment. Also, the standardization of training programs and evaluation of learning curves will help in the increased use of the technique.

CONCLUSION

This retrospective cohort study proves that ventral hernia repair with eTEP is safe and has good initial results in properly-selected patients. The potential benefits of such a minimally invasive approach are supported by the one hundred percent preservation of zero complication and recurrence rates and the short time taken to resume normal activities as well as minimum postoperative pain.

These first impressions are promising, although they should be framed in the context of selective patient admissions and professional operating teams. The results explain the rationale of proceeding with bigger prospective studies to confirm these results and determine the durability of eTEP repair.

The implementation of eTEP repair in our institutional case study proves that using advanced minimally invasive approaches in the Indian healthcare setting is possible. Nevertheless, extensive training sessions, proper case assessment, and further outcome observation are crucial to achieving the best outcomes.

Further studies ought to be conducted on long term follow-up, comparative efficacy studies and inclusion of more complex patient groups in order to completely ascertain the role of eTEP repair in contemporary hernia surgery.

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CONFLICT OF INTEREST

The authors have no conflict of interest in this study.

FUNDING

No external funding was made in this research.

DATA AVAILABILITY

The datasets employed and studied in the ongoing research can be obtained with the author under the condition of a reasonable request in accordance with the institutional policy and ethics.

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