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Cranial PeTEP for ventral and incisional hernia repair

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Abstract:
Cranial PeTEP enables extraperitoneal mesh repair of selected ventral and incisional hernias. This multicentre retrospective study evaluated 24 adults undergoing cranial PeTEP repair. Mean operative time was 137 ± 47 minutes, with a median hospital stay of one day. Two patients (8.3%) experienced surgical site occurrences, with no surgical site infections. No recurrence was recorded during a mean 5.3-month follow-up, although longer surveillance is required.

Keywords: PeTEP, ventral hernia, incisional hernia, rectus diastasis, extraperitoneal mesh, minimally invasive surgery

Background:
Primary ventral and incisional hernias are increasingly managed with minimally invasive techniques when patient and defect characteristics are suitable **[1]**. Conventional intraperitoneal onlay mesh (IPOM) repair places the prosthesis within the peritoneal cavity, whereas extraperitoneal approaches seek to maintain mesh outside the abdominal cavity and restore the abdominal wall in a more anatomic plane **[2-4]**. The enhanced-view totally extraperitoneal (eTEP) technique expands the extraperitoneal working space and permits broad retromuscular mesh placement, but it is technically demanding and may increase operative time **[5, 6]**. Recent comparative studies and meta-analyses have reported lower short-term postoperative pain and, in some analyses, shorter hospital stay with eTEP than with IPOM/IPOM+, while complication and recurrence rates are generally similar. The preperitoneal/pretransversalis eTEP (PeTEP) modification preserves the retrorectus plane and enables preperitoneal mesh placement for selected ventral hernias with or without rectus diastasis **[7, 8]**. A cranial PeTEP approach has subsequently been described to facilitate top-down dissection, instrument triangulation and wide preperitoneal/pretransversalis mesh coverage for primary ventral and selected incisional hernias **[9]**. More recent multicenter data suggest that PeTEP can also be applied to midline and lateral incisional hernias with low early morbidity, although long-term evidence remains limited **[10]**. Longer follow-up from broader eTEP series supports the durability of extraperitoneal reconstruction but also underscores the importance of distinguishing surgical site occurrences from clinically important infection and recurrence **[11]**. A 2024 systematic review of robotic eTEP ventral hernia repairs reported low observed intraoperative complication rates but emphasized the need for more robust prospective evidence **[12]**. Therefore, it is of interest to evaluate the feasibility, perioperative outcomes and short-term safety of the cranial PeTEP approach in selected patients undergoing minimally invasive ventral and incisional hernia repair.

Materials and Methods:
A multicenter retrospective cohort study was conducted using a prospectively maintained database from two tertiary hospitals in Ratlam with experience in complex abdominal wall reconstruction. All adults who underwent totally endoscopic preperitoneal abdominal wall repair through a cranial PeTEP approach between May 2025 and January 2026 were screened. Eligible cases included primary ventral hernias (PVH), midline trocar-site incisional hernias (IHs) associated with rectus diastasis, small midline IHs (<4 cm) and small-to-moderate lateral IHs (<6 cm) considered suitable for minimally invasive repair. Exclusion criteria were symptomatic supraumbilical diastasis requiring complete linea alba plication after correction of an underlying cause such as obesity or pregnancy, extensive previous abdominal surgery limiting preperitoneal access (including xiphopubic scars), incisional hernias exceeding approximately 4-6 cm depending on location, previous large preperitoneal mesh repair, ostomy, active infection, severe comorbidity contraindicating surgery and age <18 years. The decision to use cranial PeTEP was made jointly by the patient and surgeon. Hernias were classified according to the European Hernia Society (EHS) system. Rectus diastasis was defined as separation of the rectus muscles by >2 cm and was assessed clinically and, when available, by ultrasonography or computed tomography. Reporting followed STROCSS and STROBE principles together with the International Classification of Abdominal Wall Planes (ICAP). Institutional Review Board approval was obtained before data analysis. Collected variables included patient demographics, comorbidities, hernia characteristics, operative details and surgical site events, length of stay, readmission and short-term follow-up outcomes.

Results:
A total of 24 patients underwent elective endoscopic hernia repair using a cranial PeTEP approach for PVH, midline IH associated with rectus diastasis, or lateral IH. Fifteen patients were male and nine were female; mean age was 59.17 ± 11.76 years and mean body mass index (BMI) was 27.89 ± 3.88 kg/m² **(Table 1).** Four patients (16.7%) had diabetes mellitus, three (12.5%) were immunosuppressed and three (12.5%) were active smokers. The cohort comprised 15 primary umbilical hernias (62.5%), seven midline incisional hernias (29.2%) and two lateral incisional hernias (8.3%). Eleven patients (45.8%) had a concomitant hernia and four had more than one associated defect; all identified defects were repaired during the index procedure. Polypropylene mesh was used in all cases and tailored to the dissected preperitoneal space after fascial closure; mean mesh area was 497.21 ± 202.71 cm². In one lateral hernia

with abdominal wall denervation, a 50 × 50 cm polypropylene mesh was tailored to cover both the defect and the surrounding denervated area. Mean operative time was 137 ± 47 minutes. Surgical site occurrence (SSO) was 8.3% (two patients), comprising one hematoma and one trocar-site wound dehiscence; no surgical site infections (SSIs) or SSOs requiring procedural intervention (SSOPIs) occurred. One kidney-transplant recipient developed acute renal insufficiency that was managed with fluid therapy. The patient with an L3 lateral incisional hernia had persistent postoperative bulging attributable to denervation on computed tomography with Valsalva maneuver, without hernia recurrence and reported improved functional status. Median hospital stay was 1 day, with no 30-day readmissions. At a mean follow-up of 5.3 months, no hernia recurrence, mesh infection, or chronic pain was recorded. **Table 1** cohort included 15 men and nine women, with mean age 59.17 ± 11.76 years and BMI 27.89 ± 3.88 kg/m². Primary umbilical defects represented 15/24 cases (62.5%), midline incisional defects 7/24 (29.2%) and lateral incisional defects 2/24 (8.3%). All 24 repairs used polypropylene mesh; mean mesh area was 497.21 ± 202.71 cm², and mean operative time was 137 ± 47 minutes. Two surgical site occurrences occurred (one hematoma and one trocar-site wound dehiscence), but no SSI or reintervention was recorded. The absence of recurrence during a mean 5.3-month follow-up is a short-term observation, not a long-term durability estimate.

Table 1: Clinical outcomes and patient demographics

Category	Parameter	Value/Result
Demographics	Gender (Male/Female)	15 / 9
	Mean Age (Years)	59.17 ± 11.76
	Mean BMI (kg/m²)	27.89 ± 3.88
Comorbidities	Diabetes Mellitus	4 (16.7%)
	Immunosuppression	3 (12.5%)
	Active Smokers	3 (12.5%)
Hernia Type	Primary Umbilical	15 (62.5%)
	Midline Incisional (IH)	7 (29.2%)
	Lateral Incisional (IH)	2 (8.3%)
	Concomitant Hernias	11 (45.8%)
Surgical Data	Mean Operative Time	137 ± 47 minutes
	Mean Mesh Size (cm²)	497.21 ± 202.71
	Median Hospital Stay	1 day
Complications	Surgical Site Infection (SSI)	**0 (0%)**
	Surgical Site Occurrence (SSO)	2 (8.3%)
	SSO Requiring Intervention (SSOPI)	0 (0%)
Follow-up	Mean Follow-up Duration	5.3 months
	Hernia Recurrence	0 (0%)
	Chronic Pain	0 (0%)

Discussion:

The present 24-patient series showed that cranial PeTEP could be completed with broad preperitoneal mesh placement, a median 1-day hospital stay, an SSO rate of 8.3% and no SSI, readmission, recurrence, mesh infection, or chronic pain during a mean follow-up of 5.3 months. These early outcomes are consistent with the initial PeTEP case series and robotic PeTEP experience, which demonstrated the feasibility of preperitoneal repair for small-to-moderate ventral hernias and rectus diastasis **[7, 8]**. They are also comparable with the cranial PeTEP series of Munoz-Rodriguez *et al*., which reported low early morbidity and no recurrence at short follow-up **[9]**. Evidence from eTEP-versus-IPOM/IPOM+ meta-analyses indicates that extraperitoneal repair may reduce early postoperative pain and can shorten hospital stay in some datasets, but usually requires longer operative time and has not shown a consistent reduction in overall complications or recurrence **[3, 4]**. In the present cohort, the mean operative time of 137 ± 47 minutes and median stay of 1 day therefore fall within the broader pattern reported for minimally invasive extraperitoneal reconstruction. The observed 8.3% SSO rate comprised one hematoma and one trocar-site wound dehiscence and should not be directly compared with series using different SSO definitions, defect complexity, or follow-up duration. This distinction is particularly relevant because a large 2026 robotic eTEP series reported low SSI and 2-year recurrence despite a higher overall SSO rate largely driven by seroma **[11]**. A 2026 multicenter PeTEP cohort involving midline and lateral incisional hernias similarly reported low short-term morbidity and no early recurrence, supporting continued evaluation of the technique in anatomically diverse defects **[10]**. The principal limitations of the present study are its retrospective design, small sample size, selected patient population, absence of a comparator group and short mean follow-up of 5.3 months. Accordingly, these findings should be considered preliminary and require confirmation in larger prospective comparative studies with standardized patient-reported outcomes and longer recurrence surveillance.

Conclusion:

We show the cranial PeTEP approach was feasible and permitted broad preperitoneal mesh placement with low short-term morbidity and no recorded recurrence during a mean follow-up of 5.3 months. Because the study was retrospective, involved a small sample and had limited follow-up, the findings should be interpreted as preliminary. Larger prospective comparative studies with longer follow-up are required to establish durability, recurrence risk and patient-reported benefits.

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Conflict of Interest: Nil

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