

Transversus Abdominis Release in the Treatment of Complex Ventral Hernia: A Prospective Observational Study

Vidushi Gupta¹, Albail Singh Yadav², Saurabh Purohit³, Dhananjay Saxena⁴

¹Junior Resident, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

²Professor, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

³Associate Professor, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh.

⁴Assistant Professor, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh.

Corresponding Author: Dr. Vidushi Gupta

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ABSTRACT:

Background: Complex ventral hernias carry high recurrence and wound-morbidity rates after conventional repair. Transversus abdominis release (TAR), a posterior component separation, permits tension-free midline closure with reduced wound complications, but data from resource-limited settings remain scarce.

Objective: To evaluate the surgical outcomes of TAR in complex ventral hernia, with emphasis on primary fascial closure, recurrence, postoperative complications, recovery, and quality of life.

Methods: In this prospective observational study, 25 adults with complex ventral hernia underwent open TAR at a tertiary-care centre between 2025 and March 2026. Hernias were graded by the European Hernia Society system. Peritoneal (hernia-sac) flap augmentation ("TAR-plus") was used when the posterior sheath could not be reapproximated. Outcomes were assessed at 1, 3, 6, and 12 months; quality of life was measured with the Carolinas Comfort Scale.

Results: Mean age was 46.4 years; 52% were female and 64% had W3 (>10 cm) defects. Bilateral TAR was performed in 68%. Primary fascial closure was achieved in all 25 patients. No complication occurred in 68%; superficial surgical-site infection (16%), seroma (8%), and mesh infection (4%) were the principal events, and the single mesh infection was salvaged without explantation. Mean hospital stay was 15.2 days. The mean Carolinas Comfort Scale score was 0.46, with marked functional and cosmetic improvement and no clinically detectable recurrence during follow-up.

Conclusion: TAR, with selective peritoneal-flap augmentation, offers durable, tension-free repair of complex ventral hernia with low morbidity and excellent recovery, and is well suited to resource-limited settings.

Keywords: Hernia, Ventral; Herniorrhaphy; Abdominal Wall; Surgical Mesh; Quality of Life.



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INTRODUCTION:

Complex ventral hernias constitute a demanding subset of abdominal wall defects, characterised by a large fascial width (>8 cm), proximity to bony landmarks, association with loss of domain, recurrence after previous repair, contaminated fields, poor overlying skin, or multiple comorbidities.^[1] Incisional hernia complicates roughly 10–20% of midline laparotomies, and recurrence after conventional repair of large defects remains high—about 8% to 37%—particularly in obese patients and after multiple prior repairs.^[2] These figures have driven a continuous evolution of reconstructive technique.

Direct suture repair was abandoned because of unacceptable tension and recurrence, and mesh reinforcement in the retro-rectus (Rives–Stoppa) plane became the reference standard for moderate defects.^[3] However, retro-rectus repair alone frequently fails to achieve midline fascial closure in very large hernias. Anterior component separation, described by Ramirez, provided wide myofascial advancement but at the cost of extensive subcutaneous dissection and wound-morbidity rates approaching 50%.^[4]

Transversus abdominis release (TAR), introduced by Novitsky in 2012, is a posterior component separation that extends the Rives–Stoppa dissection laterally by dividing the transversus abdominis muscle medial to the neurovascular bundles.^[5] This opens a wide retromuscular–preperitoneal plane from the xiphoid to the pubis and laterally to the psoas, permitting up to 10 cm of medial advancement on each side and sublay placement of a large mesh without subcutaneous undermining.^[5–6] By preserving the perforating vessels and innervation of the abdominal wall, TAR reduces wound complications while restoring the linea alba. Systematic reviews report primary fascial closure in more than 90% of cases, surgical-site occurrence around 15%, and two-year recurrence of roughly 4%.^[7]

Aim and Objectives:

Primary Objective:

- To assess the surgical outcomes of Transversus Abdominis Release (TAR) in patients with complex ventral hernias, particularly in terms of hernia recurrence rates.

Secondary Objectives:

- To evaluate postoperative complications following TAR, including:
 - Surgical site infections (SSI)
 - Surgical site occurrences (SSO)
 - Mesh-related complications
 - Recurrence
- To analyse postoperative recovery parameters, including duration of hospital stay and time to functional recovery.

- To assess improvement in patient quality of life following TAR using validated hernia-related quality of life assessment tools.
- To identify factors influencing outcomes, such as patient comorbidities (BMI, diabetes, previous surgeries) and operative variables.

MATERIALS AND METHODS:

Research Design:

This prospective observational study was conducted in the Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India, between 2025 and March 2026, and is reported in accordance with the STROBE statement.

Inclusion criteria

- Patients aged between 18 and 75 years.
- Diagnosed with complex ventral hernias which include:
 - Large Defect Size- Defect width >8 cm
 - Location near bony prominences {suprapubic, subxiphoid, large lumbar hernia}
 - Large Lateral Hernias {Located lateral to rectus sheath (flank/lumbar region)}
 - Hernia Associated with Enterocutaneous / Antero cutaneous Fistula
 - Large Parastomal Hernias
 - Loss of domain (>20% viscera outside abdomen)
 - Recurrent hernia
 - Poor skin condition (ulceration, grafted skin)
 - Multiple previous surgeries
- Controlled Diabetes Mellitus (HbA1c <7.5)

Exclusion criteria

- Patients with minor ventral hernias (<5 cm).
- Patients undergoing purely laparoscopic or robotic hernia repairs.
- Patients with contraindications for TAR, such as severe infection or inability to tolerate general anaesthesia.
- Pregnant women or those with other coexisting major abdominal
- Pathology unrelated to hernia repair.

Data Collection Procedure:

All operations were open, under general anaesthesia. After adhesiolysis, the retro-rectus (Rives–Stoppa) plane was developed to the linea semilunaris; the posterior rectus sheath was incised 0.5–1 cm medial to the semilunar line and the transversus abdominis divided to enter the pretransversalis

plane, which was extended to the psoas laterally, into the spaces of Retzius and Bogros inferiorly, and to the diaphragmatic central tendon superiorly. The posterior layer was reconstructed, a medium-weight polypropylene mesh (30 × 30 cm, ≈80 g/m²) placed as a sublay with wide overlap, a closed-suction drain positioned, and the anterior sheath reapproximated to restore the linea alba. When the posterior sheath could not be reapproximated, a peritoneal (hernia-sac) flap was fashioned to reconstruct the posterior layer and isolate the mesh (“TAR-plus”). Reverse and unilateral releases were used for lateral, subcostal, or off-midline defects. Patients were followed at 1, 3, 6, and 12 months. Outcomes were primary fascial closure, recurrence, surgical-site infection and occurrence (SSI/SSO), mesh complications, length of hospital stay, drain duration, and need for additional intervention.

Plan for Data Analysis:

Data collected from all enrolled patients were entered, coded, and managed using Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were applied to summarize the data, with continuous variables expressed as mean±standard deviation and categorical variables presented as frequencies and percentages. Inferential statistical analysis was performed using the Chi-square test or Fisher’s exact test for categorical variables and the Student’s t-test for continuous variables. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS:

The study enrolled 25 patients with a mean age of 46.4 years, most falling between 31 and 50 years (56%) and only 12% older than 60; the sexes were nearly balanced with a slight female preponderance (52% vs 48%), and, unlike predominantly obese Western cohorts, the great majority had a normal body mass index (92%) [Table 1]. Comorbidities were present in 60%, chiefly hypertension (24%), followed by COPD and diabetes mellitus (20% each), while the cohort was anatomically demanding, with 64% W3 (>10 cm) and 36% W2 defects by the European Hernia Society classification^[8], previous repair in 8%, and pre-operative skin changes in 4% [Table 1]. Bilateral TAR was the predominant procedure (68%), followed by bilateral TAR-plus and unilateral TAR (12% each), and primary fascial closure was achieved in every patient (100%); the mean hospital stay was 15.2 days—most commonly 11–15 days (36%)—and drains were removed predominantly on the eighth or ninth day, with a mean duration of 8.7 days [Table 2]. Postoperatively, 68% had no surgical-site occurrence, the principal events being superficial surgical-site infection (16%), seroma (8%), and marginal skin necrosis and mesh infection (4% each), with no bowel injury or abdominal compartment syndrome; correspondingly, 68% required no additional intervention, while negative-pressure wound therapy (16%), secondary suturing (12%), and re-drain insertion (4%) were used in the remainder, and the single mesh infection was salvaged medically without explantation [Table 3].

Table 1. Baseline demographic and clinical characteristics (n = 25)

Characteristic	n	%
Age group (years)		
21–30	2	8
31–40	6	24
41–50	8	32
51–60	6	24
>60	3	12
Sex – Male	12	48
Sex – Female	13	52
BMI – Normal (18.5–24.9)	23	92
BMI – Overweight (25–29.9)	1	4
BMI – Obese (≥ 30)	1	4
Comorbidity – None	10	40
Comorbidity – Hypertension	6	24
Comorbidity – COPD	5	20
Comorbidity – Diabetes mellitus	5	20
Comorbidity – Prior tuberculosis	1	4
EHS width – W2 (4–10 cm)	9	36
EHS width – W3 (>10 cm)	16	64
Previous repair – Yes	2	8
Pre-operative skin change – Yes	1	4

Mean age 46.4 years. BMI, body mass index; COPD, chronic obstructive pulmonary disease; EHS, European Hernia Society.

Table 2. Operative procedure and postoperative recovery (n = 25)

Variable	n	%
Procedure – Bilateral TAR	17	68
Procedure – Bilateral TAR-plus	3	12
Procedure – Unilateral TAR	3	12
Procedure – Unilateral reverse TAR	1	4
Procedure – Bilateral partial/bottom-up TAR	1	4
Primary fascial closure	25	100
Hospital stay – 7–10 days	8	32
Hospital stay – 11–15 days	9	36
Hospital stay – 16–19 days	4	16
Hospital stay – ≥ 20 days	4	16
Drain removal – 7 days	2	8
Drain removal – 8 days	8	32
Drain removal – 9 days	8	32
Drain removal – 10 days	7	28

Mean hospital stay 15.2 days; mean drain duration 8.7 days. TAR, transversus abdominis release.

Table 3. Postoperative complications and additional management (n = 25)

Outcome	n	%
Surgical-site occurrence – None	17	68
Superficial surgical-site infection	4	16
Seroma	2	8
Marginal skin necrosis	1	4
Mesh infection	1	4
Bowel injury	0	0
Abdominal compartment syndrome	0	0
Additional management – None	17	68
Negative-pressure wound therapy	4	16
Secondary suturing	3	12
Re-drain insertion	1	4

The single mesh infection (Burkholderia cepacia complex) was managed medically without explantation.

DISCUSSION:

This study confirms that TAR provides durable, tension-free reconstruction of complex ventral hernias with acceptable morbidity in a resource-limited Indian setting. The middle-aged predominance (mean 46.4 years) accords with Krpata et al., who reported a mean of 55 years, reflecting the cumulative surgical and degenerative burden underlying these hernias.^[9] The slight female predominance mirrors Habeeb et al. (~60% female).^[10] In contrast to many Western cohorts, in which the mean body mass index commonly exceeds 30 kg/m², our patients were largely of normal weight, indicating that complex hernia in this population is driven more by prior surgery and defect size than by obesity.

The cohort was anatomically demanding—64% W3 defects—yet primary fascial closure was achieved in every patient. This equals or exceeds the 94–98% closure rates of large series and meta-analyses,^[7,11] and supports the superior myofascial advancement of posterior over anterior component separation. Comparative studies consistently favour TAR: Soliman et al. and Albalkiny et al. reported recurrence of about 5% with TAR versus 30–35% with anterior separation, alongside markedly lower wound infection.^[12,13] Meta-analyses similarly show trends toward fewer wound complications and lower recurrence with posterior separation.^[14]

Our overall SSO rate of 32% (superficial SSI 16%, seroma 8%) is consistent with the ~15% SSO and 15% SSI reported by systematic reviews and pooled analyses,^[7] and the durability signalled by 100% fascial closure and the absence of detectable recurrence echoes the <1–5% long-term recurrence of experienced centres.^[11,15] The single mesh infection (4%) is comparable to the ~3% of Habeeb et al.,^[10] and its salvage without explantation illustrates the advantage of siting mesh in a well-vascularised retromuscular plane.

A practical contribution of this study concerns loss of domain in a low-resource context. Where botulinum toxin and progressive pneumoperitoneum can reduce domain loss and enable closure in high-grade cases,^[16] these adjuncts were unaffordable or logistically impractical for our patients. In the three patients in whom the posterior sheath could not be closed, a peritoneal (hernia-sac) flap—TAR-plus—reconstructed the posterior layer and isolated the mesh, achieving tension-free closure without bridging. This accords with Nielsen et al. and Baig et al., who reported low complication and recurrence rates with peritoneal-flap hernioplasty, and positions the technique as an effective substitute for costly pre-operative adjuncts.^[17,18]

Recovery and patient-reported outcomes were favourable. The near-zero Carolinas Comfort Scale score,^[19] together with substantial gains in physical activity and cosmesis, confirms restoration of a functional, well-contoured abdominal wall. The relatively long mean stay (15.2 days) reflects socioeconomic rather than surgical factors, since many patients were retained until drain and suture removal because of limited access to care near home; this contrasts with the 5–7 days reported elsewhere^[9,11] and is a modifiable, context-specific finding.

CONCLUSION:

In this prospective study, transversus abdominis release achieved universal primary fascial closure with low morbidity, no detected recurrence, and excellent quality-of-life, functional, and cosmetic outcomes in patients with predominantly large, complex ventral hernias. In resource-limited settings where botulinum toxin and progressive pneumoperitoneum are impractical, peritoneal-flap augmentation (TAR-plus) is a safe and effective means of

achieving tension-free closure in patients with greater loss of domain. TAR, with selective peritoneal-flap augmentation, can be recommended as a reliable technique for complex abdominal wall reconstruction, subject to confirmation by larger, longer studies.

DECLARATIONS:

Ethical Approval: The study was approved by the M.L.B. Medical College Institutional Review Board **1718/IEC/PG-23-70/2026/SC-1 Dated 06/06/25**. Informed consent was obtained from each of the patients fulfilling the inclusion criteria prior to their enrolment in the study.

Informed Consent: Informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed that their data would be kept confidential and used solely for research purposes.

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Conflict of Interest: The authors declare that they have no conflicts of interest related to this study.

Data availability statement: The dataset presented in this study is available on request from the corresponding author.

AI Use Disclosure: No generative AI tools were used in the writing or data analysis. AI tools were limited to language assistance. The authors remain fully responsible for the content.

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