

Original Research Article

AN OBSERVATIONAL STUDY ON THE RELEASE OF TRANSVERSUS ABDOMINIS IN THE REPAIR OF LARGE VENTRAL HERNIA

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ABSTRACT

Background: It seems that Transversus Abdominis Release (TAR) is not utilized despite its effectiveness. Expanding application of TAR to diverse patient populations and clinical settings could further validate its utility and establish evidence-based guidelines for its adoption. **Objective:** To evaluate effectiveness of TAR focusing on its impact on wound healing, recurrence rates, and nature of complications.

Materials and Methods: Prospective observational study was carried out among 25 eligible surgical inpatients presenting with large ventral hernias. TAR technique was performed as per the standardized protocol described by Novitsky et al. Data one Age, gender, BMI, comorbidities, Duration of hernia, associated symptoms, recurrence history, Duration of surgery, mesh size, intraoperative complications, Duration of hospital stay, Wound-related complications (e.g., seromas, surgical site infections), Quality of life (assessed using validated scoring systems). Patients were followed at 1 week, 4 weeks, and 3 months post-surgery for recurrence, complications, and quality of life assessments.

Results: Mean age was 45 years. Males were more than females. Previous hernia repair was most common comorbidity (60%). Mean operative time was 180min. Mean defect width was 12.3cm. Mean mesh size used was 280cm². Mean blood loss was 220ml. Mean duration of hospital stay was five days. Incidence of wound complications was 16% followed by seroma in 8%. Preoperative pain score was eight which reduced to two after surgery. Limited mobility was seen in 72% of cases before surgery which reduced to 20% after surgery. 80% were not satisfied cosmetically before surgery compared to 8% after surgery. At three months only one case had persistent pain with no other complications.

Conclusion: TAR procedure is a safe and effective technique for managing large ventral hernias.

Keywords: hernia, surgery, abdomen, morbidity.

INTRODUCTION

Hernia of size more than 10 cm wide are large ventral hernias. The abdominal domain is significantly lost. Such types challenge the skills of a surgeon. There is increased incidence of perioperative morbidity. The

recurrence rates are high. The quality of life of the patients is affected significantly.^[1] The new ideas are required for repair of such hernias. The repair should be durable. The objective should be good surgery outcome with zero recurrence rate and at the same time, avoiding any kind of complications. The large

ventral hernias are usually associated with physiological as well as anatomical problems. Conventional surgical techniques may not be sufficient to address these problems.^[2]

In this regard, the Rives-Stoppa repair technique is a well established surgical technique. It consists of mesh placement in the retrorectus plane. It has a very good success rate. It is very useful for repair of small size hernias. The principle of this technique is the tension-free repair with mesh reinforcement. But for large ventral hernia, it may not work. It fails to close the anterior fascia and due to that, the large mesh area under the skin is exposed. This increases the risk of surgical site infections. This can lead to recurrence in certain cases.^[4] Hence, in such cases, we need extra interventions. Thus, there is a need for much better surgical technique for patient satisfaction.

One such advancement is Component Separation Techniques (CSTs). It involves the reconstruction of the abdominal wall. One such technique under this is The anterior component separation technique (ACST). In this there is release of external oblique muscle. It can mobilize significantly larger portions of the wall of the abdomen. Thus, it facilitates the tension free closure. But, even this technique can have certain disadvantages like formation of the seroma, dehiscence of the wound. The recurrence rate is also high.^[2] This technique is more invasive in nature. Thus, we need one technique which is less invasive and should be associated with fewer or negligible complications. In this regard, we have one more effective technique called posterior component separation techniques (PCSTs). In PCSTs, the Transversus Abdominis Release (TAR) procedure, is considered good for the large ventral hernias. It was first described by Novitsky et al. (2012).^[5] There is release of TAR. It creates a retrorectus plane that is spacious. This facilitates the surgeons to place large size mesh in retromuscular sublay position. Thus, there is optimal reinforcement. There is reduced risk of surgical site infections and also the recurrence. The intra abdominal pressure is also reduced to a significant extent. Due to this there is good improvement in the respiration as well as perfusion. A study by Novitsky et al. (2012),^[5] found that it was very effective to the extent of 95%. The recurrence rate was only 4.7%. During follow up of over two years 24% developed the wound complication. Another study by Krpata et al. (2012),^[6] compared the PCST with that of ACST and found that the recurrence and wound complication rate was significantly lower in the earlier group compared to the later. Cornette et al. (2017),^[3] in their systematic review included 761 patients who underwent PCST. The recurrence rate was very low at 5.25%. Even the surgical site infection rate was also very low to the tune of 20.3%. Thus TAR is a preferred technique for the management of ventral hernia.

But it seems that the TAR is not utilized despite of its effectiveness. It may be due to the fact that it requires more skilled hands. Expanding the application of TAR to diverse patient populations and clinical

settings could further validate its utility and establish evidence-based guidelines for its adoption. This study aims to evaluate the effectiveness of TAR in a tertiary care setting, focusing on its impact on wound healing, recurrence rates, and the nature of complications.

MATERIALS AND METHODS

Study Design: This was a prospective observational study conducted to evaluate the clinical outcomes, complications, and recurrence rates associated with the Transversus Abdominis Release (TAR) technique in large ventral hernia repair.

Study Setting: The study was conducted at the Department of General Surgery, Malla Reddy Institute of Medical Sciences (MRIMS), Hyderabad, India. The institute has a well established surgical unit capable of handling complex abdominal wall reconstructions, including TAR.

Study Duration: The study spanned over 18 months, commencing from July 2023 and concluding in December 2024.

Study Population: The study population included all eligible surgical inpatients presenting with large ventral hernias at MRIMS during the study period. Patients were recruited based on the inclusion and exclusion criteria.

Sample Size: A total of 25 patients meeting the inclusion criteria were recruited for this study.

Inclusion Criteria

1. Patients with large ventral or incisional hernias characterized by: Defects >10 cm in width, Presence of loss of domain.
2. Patients with recurrent incisional hernias following failed intra-abdominal meshplasty.
3. Recurrence following anterior component separation (ACS).
4. Patients providing written informed consent for participation.

Exclusion Criteria

1. Patients with BMI >40 kg/m².
2. Recurrent hernias following Rives-Stoppa repair.
3. Patients with non-ventral hernias (e.g., inguinal or femoral hernias).
4. Patients unwilling to provide consent.

Ethical Considerations: Ethical clearance for the study has been obtained from the Institutional Ethics Committee (IEC) at MRIMS. Written informed consent was obtained from all participants in both English and the local language. Privacy and confidentiality was maintained throughout the study, adhering to ICMR ethical guidelines.

Surgical Technique

The Transversus Abdominis Release (TAR) technique was performed as per the standardized protocol described by Novitsky et al. (2012):

1. Incision and Exposure: A midline incision was made to access the hernia sac. The hernia sac was dissected free from the surrounding tissues.

2. **Posterior Sheath Dissection:** The posterior rectus sheath was incised longitudinally, approximately 1-2 cm medial to the lateral border of the rectus abdominis muscle.
3. **Transversus Abdominis Release:** The transversus abdominis muscle fibers were released laterally to create a retromuscular plane and achieve medial advancement of the abdominal wall.
4. **Mesh Placement:** A large uncoated polypropylene mesh was placed in the retromuscular/preperitoneal plane to reinforce the defect.
5. **Fascial Closure:** The posterior rectus sheath was closed with long-term absorbable sutures, followed by closure of the anterior fascia using running sutures.

Data Collection

Data was collected systematically using a pre-designed case proforma, which includes:

1. **Demographic Information:** Age, gender, BMI, and comorbidities.
2. **Clinical Presentation:** Duration of hernia, associated symptoms, and recurrence history.
3. **Intraoperative Details:** Duration of surgery, mesh size, and intraoperative complications.
4. **Postoperative Outcomes:** Duration of hospital stay. Wound-related complications (e.g., seromas, surgical site infections). Quality of life (assessed using validated scoring systems).

5. **Follow-Up:** Patients were followed at 1 week, 4 weeks, and 3 months post-surgery for recurrence, complications, and quality of life assessments.

Investigations

Preoperative investigations included

Complete Blood Picture (CBP): Hemoglobin, total and differential counts, platelet count, Renal Function Tests (RFT), Liver Function Tests (LFT), Blood Sugar Levels: Fasting, random, and HbA1c (if indicated). Ultrasound (USG) of the Abdomen and Pelvis. Contrast-Enhanced CT Scan of the abdomen to evaluate hernia size, domain loss, and adhesions.

Outcome Measures

1. **Primary Outcome:** Fascial closure success rate following TAR.
2. **Secondary Outcomes:** Incidence of wound complications (e.g., seromas, surgical site infections). Recurrence rate within the study period. Hospital stay duration. Quality of life improvements post-surgery.

Statistical Analysis: Data was analyzed using SPSS software. Continuous variables (e.g., hospital stay duration) was expressed as mean \pm standard deviation. Categorical variables (e.g., wound complications) was presented as proportions. Chi-square test was used for categorical data. P-value < 0.05 was considered statistically significant.

RESULTS

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameters		N (%) or mean \pm SD
Total patients		25 (100%)
Age (years)		45 \pm 12
gender	Male	18 (72%)
	Female	7 (28%)
BMI (kg/m ²)		32.5 \pm 3.4
Comorbidities	Hypertension	10 (40%)
	Diabetes	8 (32%)
	Smoking	7 (28%)
	Previous hernia repair	15 (60%)

The mean age of patients was 45 years. Males were most commonly affected than females due to heavy object lifting in males more common than females. The mean body mass index was high at 32.5 kg/m².

Previous hernia repair was the most common comorbidity in 60% of the cases followed by hypertension in 40%.

Table 2: Intraoperative characteristics

Parameters		N (%) or mean \pm SD
Operative time (min)		180 \pm 30
Defect width (cm)		12.3 \pm 1.8
Mesh size (cm ²)		280 \pm 50
Intraoperative complications	Serosal injury	1 (4%)
	Minor bleeding	1 (4%)
	Blood loss (ml)	220 \pm 40

The mean operative time was 180 min. The mean defect width was 12.3 cm. the mean mesh size used was 280 cm². The mean blood loss was 220 ml.

During operation, only one case had serosal injury and only one case had minor bleeding.

Table 3: Postoperative Outcomes

Parameters	N (%) or mean±SD
Hospital stay (days)	5±1.5
Wound complications	4 (16%)
Seroma	2 (8%)
Wound dehiscence	1 (4%)
Surgical site infections	1 (4%)
Recurrence at follow up	0

The mean duration of the hospital stay was five days. The incidence of wound complications was 16% followed by seroma in 8%. One case each had wound

dehiscence and surgical site infection. No case had recurrence.

Table 4: Quality of Life (QoL) Improvements Post-Surgery

Parameter	Preoperative Score n (%)	Postoperative Score n (%)
Pain (VAS 0-10)	8 ± 2 (100%)	2 ± 1 (100%)
Mobility	Limited in 18 (72%)	Normal in 20 (80%)
Cosmetic Satisfaction	Dissatisfied in 20 (80%)	Satisfied in 23 (92%)

The preoperative pain score was eight which reduced significantly to two after surgery. Limited mobility was seen in 72% of cases before surgery which

reduced significantly to only 20% after surgery. 80% were not satisfied cosmetically before surgery compared to only 8% after surgery.

Table 5: Follow-Up Outcomes at 3 Months

Parameter	N (%)
Recurrence	0
Persistent pain	1 (4%)
Functional impairment	0
Mesh related complications	0

At three months only one case had persistent pain. No one had any recurrence or functional impairment or mesh related complications.

DISCUSSION

We found that males were 72% and the females were 28%. The mean age was 45 years. Novitsky et al.^[5] also found that the males were majority i.e. 65%. In the present study the mean body mass index was 32.5 kg/m². Similar findings were noted by Slater et al.^[2] and Cobb et al.^[4] In the present study, most common comorbidity was recurrence of previous hernia in 60% of the cases followed by hypertension in 40% of the cases. Similar findings were also reported by Krpata et al. (2012).^[6]

Notably, 60% had a history of prior hernia repair, consistent with Cornette et al. (2017),^[3] who reported recurrence rates of 50–70% in re-operative cases undergoing component separation. The mean operative time was 180 ± 30 minutes, consistent with Novitsky et al. (2012),^[5] and Reinpold (2018),^[7] who reported durations of 150–200 minutes, highlighting TAR's technical demands. The average defect width was 12.3 ± 1.8 cm, confirming TAR's role in managing large hernias, similar to findings by Krpata et al. (2012).^[6] A mean mesh size of 280 ± 50 cm² was used, aligning with Petro et al. (2018),^[8] who emphasized mesh sizes of 250–300 cm² for optimal tension-free repair and recurrence prevention. Intraoperative complications occurred in 8% of cases, limited to minor serosal injuries (4%) and minor bleeding (4%), consistent with Reinpold's (2018),^[7]

(6–10% complication rate). Mean blood loss was 220 ± 40 mL, reflecting the precision of TAR. Minimally invasive dissection and avoidance of wide subcutaneous exposure contribute to the low intraoperative morbidity, as supported by Holihan et al. (2016).^[9] Consistent with Cornette et al. (2017),^[3] the cohort included high-risk patients with obesity, comorbidities, and prior repairs, underscoring TAR's utility in complex, recurrent cases. Operative times and defect sizes match data from Novitsky et al. (2012),^[5] and Krpata et al. (2012),^[6] confirming TAR's capacity for tension-free closure despite procedural complexity.

In the present study the rate of complication was 8%. Similar findings were reported by Cornette et al. (2017).^[3] Thus it proves that TAR is associated with minimal complications. We noted that the the mean hospital stay was 5 ± 1.5 days. Similar findings were reported by Krpata et al. (2012),^[6] who reported 4–6 days for posterior component separation, and Petro et al. (2018) 8, who documented a mean of 5.2 days. We observed that wound complications occurred in 16% of cases, including seroma (8%), wound dehiscence (4%), and surgical site infection (SSI) (4%). Similar findings were reported by Reinpold (2018),^[7] who reported 15–20% complication rates in TAR. Cornette et al. (2017),^[3] reported that the SSO rate was 20.3%. We report 8% of seroma incidence in the present study comparable to 8.5% as found by Novitsky et al. (2012).^[5] These low rates of complication may be due use of closed suction drains. Also due to posterior sheath closure. Literature shows that TAR is associated with 3-6% of wound dehiscence and in the present study we report it as

4%. Holihan et al. (2016),^[9] also found similar findings. We noted no recurrence during follow up of the patients. This demonstrates the effectiveness of TAR. Similar findings were reported by Krpata et al. (2012),^[6] and Novitsky et al. (2012),^[5] as 3.6% and 4.7% respectively. The zero recurrence in the present study can be due to use of large size of the mesh, providing wide overlap beyond the hernia defect and enhancing mechanical stability.

We noted that the pain score significantly reduced from eight before the surgery to two after the surgery. This is in accordance with the finding reported by Reinpold (2018),^[7] who reported similar pain relief following TAR. Before surgery in the present study only 28% of the cases were found out to be mobile which significantly increased to 80% after the surgery. This indicated that the pressure inside the abdomen has decreased remarkably. Similar findings were also noted by Petro et al. (2018).^[8] A satisfaction rate of 85% was reported by Cornette et al,^[3] and we also found that after surgery it was 92% compared to 20% before the surgery. This demonstrates the effectiveness of TAR.

This study reported a 16% overall complication rate, including seroma (8%), wound dehiscence (4%), and surgical site infection (4%), all of which were minor and managed conservatively. These rates are slightly lower than those reported by Novitsky et al. (2012),^[5] who observed complication rates of 20–25%, with seromas in 10% and SSIs in 5%. The reduced rates may be attributed to meticulous posterior sheath closure and refined surgical technique. Krpata et al. (2012),^[6] reported a 25.5% complication rate in posterior component separation, while ACS is associated with higher seroma rates (>15%) due to extensive dissection.

Present study was a single center study with limited sample size. The results may not be generalizable to

other settings. But, the results are consistent with literature as discussed earlier. The lack of a comparison group makes the findings more elusive and should be interpreted with caution.

CONCLUSION

This study concludes that the Transversus Abdominis Release (TAR) procedure is a safe and effective technique for managing large ventral hernias.

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