

# Comparative study of Posterior component separation technique – Transverse Abdominis Release in Large Incisional hernias with Onlay Mesh repair

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## Abstract:

**Background:** Conventional onlay mesh repair though found to be easier technique, it is associated with more postoperative wound morbidity and high recurrence rate in large ventral hernias. To overcome these complications, we use a technique of Transverse Abdominis muscle Release (TAR) which is not widely practised to repair large ventral hernias and compared it with onlay mesh repair technique(1).

**Materials and Methods:** We have performed TAR in 30 patients from Oct 2016 – Sep 2018 in Govt. Rajaji Hospital, Madurai. The patients presenting with large abdominal wall incisional or ventral hernias (defect >10 cm in width) were diagnosed on the basis of history, clinical examination and investigations such as USG / CT abdomen and pelvis. Patients with BMI >40 and nonventral hernias were excluded from the study. A midline laparotomy incision is made, the sac dissected and contents are reduced. The posterior rectus sheath is incised 1cm from the midline on either side and the retrorectus plane is developed.(2) The transversus abdominis is released medial to the linea semilunaris to expose a broad plane that extends from the central tendon of the diaphragm superiorly, to the space of Retzius inferiorly, and laterally to the retro-peritoneum. The posterior rectus sheath is reconstructed in the midline. Mesh is placed in a sublay fashion above the transversalis fascia. The linea alba is reconstructed, creating a functional abdominal wall with wide mesh reinforcement.

**Discussion:** All the patients were assessed for duration of surgery, duration of hospital stay, wound morbidities in both the techniques and found to have significant difference favouring TAR related to wound complications (flap necrosis – p value <0.02, wound debridement – p value <0.02) and intra-abdominal pressure (p value <0.001) whereas duration of surgery is high in TAR.

**Conclusion:** A clear knowledge of anterior abdominal wall anatomy is mandatory to perform TAR. In spite of being a complex surgical technique, TAR proves to be a preferred method for abdominal wall reconstruction in large ventral hernias.

**Key word:** Transverse Abdominis Release, Posterior component separation, onlay repair.

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## I. Introduction

Large / Giant hernia has been defined arbitrarily in the literature as greater than a diameter of 10 to 15 cm or an area of 170 to 200cm<sup>2</sup>. As the survival of complex trauma and abdominal catastrophe, patients has been increased, the frequency and complexity of repairing the giant ventral defect have increased. Obesity and loss of domain makes additional challenges.(3)

The ideal surgical approach to such difficult ventral hernia repair is still a matter of debate because of the high peri-operative morbidity (abdominal compartment syndrome(4), respiratory failure), frequent recurrences and poor quality of life. Closing such defects is a significant problem in obtaining a reliable, durable repair with low morbidity and recurrence rate. Open component separation technique comprising posterior component separation along with Transversus Abdominis Release (PCS-TAR) has overcome these difficulties.

This study aims at primarily finding the effect of Posterior component separation technique (PCS-TAR) in huge incisional hernias (defect >10cm) and comparing it with conventional Onlay mesh repair.

## II. Materials and Methods

**Design Of Study:** PROSPECTIVE RANDOMISED STUDY

**Study Location:** The study was done in a tertiary care teaching centre – Govt. Rajaji Hospital, Madurai, Tamilnadu in Department of General Surgery

**Duration Of Study:** 2 years

**Collaborating Department:** Nil

**Selection of study subjects:** All surgical in-patients of Govt. Rajaji Hospital during the study period satisfying the inclusion criteria were recruited for the study after obtaining valid consent.

**Sample size:** 60 patients were enrolled for the study after obtaining proper informed consent. The patients were randomly allotted to case and control groups.

Total sample size (n) = 60

No. Of Cases = 30

No. Of controls = 30

No. Of dropouts = NIL

**Data collection:** Patients presenting with large incisional hernia under the study group were subjected to PCS-TAR using standard technique and compared with Conventional Onlay mesh repair and the following parameters were analysed.

- Wound complications (wound discharge / gaping, flap necrosis)
- Intra-abdominal pressure
- Duration of hospital stay
- Quality of life
- Recurrence rate

**Ethical Clearance:** Obtained

**Conflict Of Interest:** None

**Financial Support:** NIL FROM THE INSTITUTION

**Participants:** Patients from surgical OPD or casualty presenting with large incisional hernia in GRH, Madurai.

**Follow Up:** Upto 1 year

**Inclusion criteria:**

1. Any patient with large abdominal wall incisional or ventral hernia (defects larger than 10 cm in width, loss of domain);
2. Recurrent incisional hernias after intra-abdominal mesh plasty;
3. Recurrences after anterior component separation;
4. Patients consented for inclusion in the study according to designated proforma

**Exclusion criteria:**

1. BMI > 40
2. Recurrent hernia after Rives- stoppa repair
3. Non ventral hernias
4. Patients not consented for inclusion in the study

**Procedure:**

- A vertical midline incision is made and extended both above and below the hernia defect.
- Hernial sac dissected, contents reduced and peritoneal cavity entered.
- After a complete lysis of adhesions a towel is placed intraperitoneally to protect the underlying viscera.
- The posterior rectus sheath is divided vertically 1 cm or less from the edge of the linea alba and the division continues 5 cm cephalad to the hernia defect edge and 5 cm caudal to it.(2)
- The posterior rectus sheath is reflected posteriorly under tension and the rectus muscle is gently dissected off the ventral aspect of the sheath
- A similar dissection is performed on the contralateral side.
- The dissection is carried to the lateral most extent of the rectus sheath. With a Richardson retractor reflecting the rectus laterally at this lateral extent, a subtle ridge will become evident. This ridge is formed by the rolled over anterior leaf of the internal oblique aponeurosis as it fuses with the transverses abdominis aponeurosis to form the posterior rectus sheath
- By incising the fascia 1 to 2 mm medial to this ridge, the interparietal plane between internal oblique and transversus abdominis muscle will be accessed, and the incision is continued for the entire length of the skin incision and beyond.
- The interparietal plane is dissected far out laterally. This dissection disconnects the transversus abdominis muscle from the anterior components, allowing medial advancement of the posterior rectus sheath for complete peritoneal closure as well as medial rectus advancement for total abdominal wall reconstruction.(5)

- The protective towel, which was placed intraperitoneally, is removed now and the posterior rectus sheath is re-approximated in the midline with a slow-absorbing monofilament suture.
- The synthetic mesh is placed in the retromuscular space and fixated with full thickness permanent transabdominal sutures utilizing the Reverdin needle
- The anterior sheath is closed in the midline ventral to the mesh utilizing a slow absorbing monofilament suture utilizing a 4:1 suture to wound length ratio.



Fig.1: Huge incisional hernia

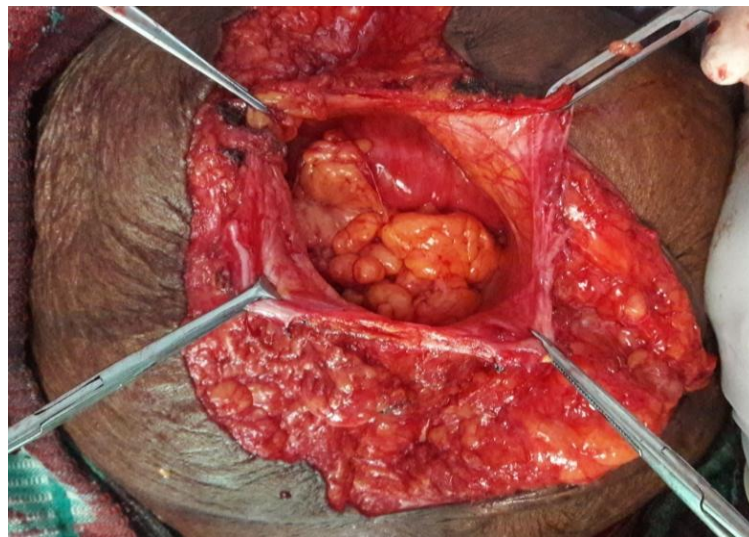


Fig.2: contents reduced; sac excised; defect of size 12\*10cm



Fig.3: Preservation of neurovascular bundle after creating a plane between rectus muscle and posterior sheath (medial to linea semilunaris)



Fig.4: Release of TA from its attachment to posterior rectus sheath

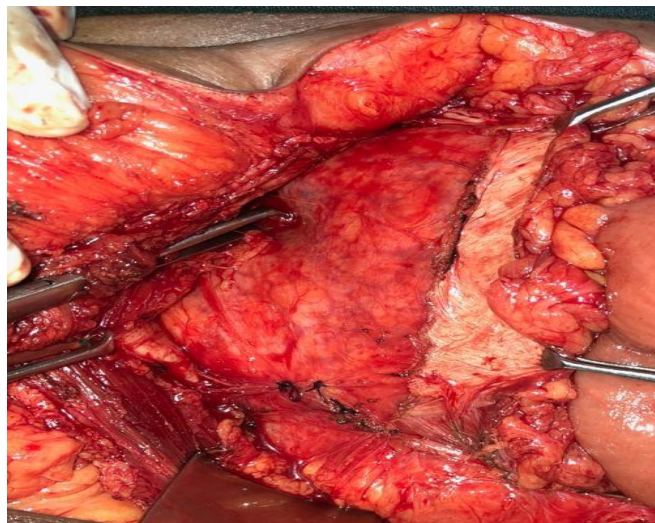


Fig.5: Creating plane for sublay mesh placement after releasing TA

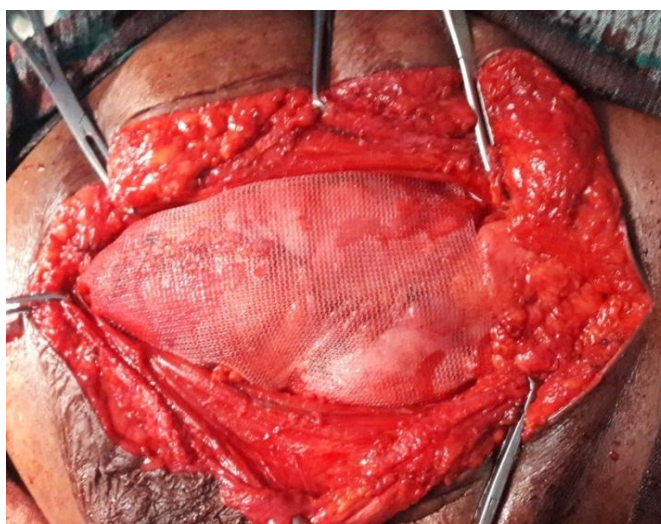


Fig.6: PCS-TAR and Mesh placement

In our study, posterior component separation technique is compared with conventional onlay mesh repair which involves the placement of mesh over Anterior rectus sheath after reducing the contents and closure of midline.

#### **Postoperative Management:**

- Standard postoperative care is instituted in these patients with loss of domain. If there are concerns over elevated intraperitoneal pressures after abdominal wall closure, consideration may be given to maintaining endotracheal intubation with muscle paralysis for several days to allow the patient to recover.
- Standard thromboembolic chemoprophylaxis is resumed postoperatively.
- Supplemental oxygen therapy is administered as needed and incentive spirometry is strongly encouraged.
- Early ambulation is important, and a diet is begun as soon as the patient regains bowel activity.

#### **Intra-Abdominal Pressure:**

- Increased IAP in the postoperative period can serve as an early indicator of postoperative morbidity.
- Optimization of intra-abdominal pressure in the postoperative period thereby can prevent rectus dehiscence, have a positive effect on wound healing, thereby improving the outcome.
- Normal range 5-7 mmHg in critically ill patients
- Intra-Abdominal hypertension (IAH) – sustained or repeated pathological elevation of IAP  $\geq 12$  mmHg
- Reference standard for intermittent IAP measurements is via bladder with maximal instillation of 25 ml of sterile saline.(6)



Fig.7: Measurement of IAP - Saline manometer technique

**Statistical analysis:** The data were analysed using statistical software SPSS ver. 20.0, Microsoft Excel 2010. Chi Square test was used to analyse the correlation between the incidence of complications in cases and controls. Also individual complications were assessed and p-value for each of them was computed. The P-value of 0.05 was considered as significant.

### III. Result

The details of the patient and the nature of surgery were recorded for all the subjects of the study. The patients were randomly assigned into case and control groups and the pre-operative, intra-operative and post-operative findings were noted.

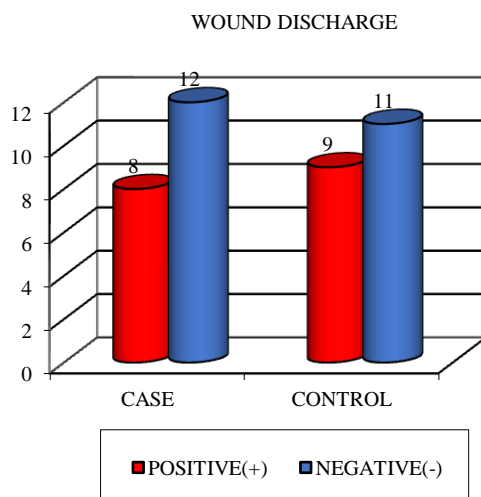
**Table 1:** Correlation of pre-op and per-op factors and its significance

Parameters	PCS-TAR	Conventional onlay repair	P value
Age	49.55	48.95	0.851
Sex			1.0
Male	3	4	
Female	17	16	
Duration of surgery	122.00 mins	95.25 mins	<0.001 (significant)

The statistical analysis shows that the case and control groups are comparable in terms of age and gender. The duration of surgery found to be significantly more in doing PCS-TAR because of meticulous dissection.

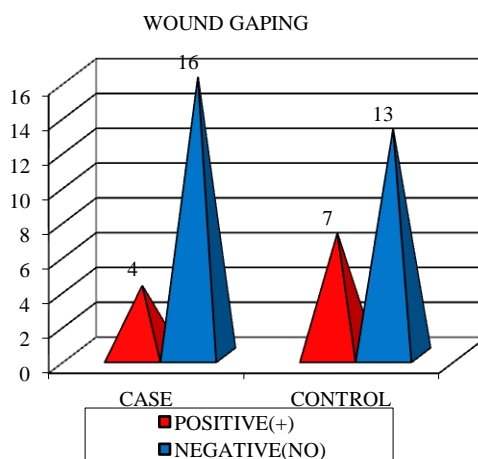
**Table 2:** Shows comparison of wound discharge rate in both cases and control groups. 40% in case groups and 45% in control groups had wound discharge and p value (1.0) is not statistically significant.

WOUND DISCHARGE	CASE		CONTROL	
	Nos	%	Nos	%
POSITIVE (+)	8	40	9	45
NEGATIVE (-)	12	60	11	55
TOTAL	20	100	20	100
P value	1.0 Not significant			



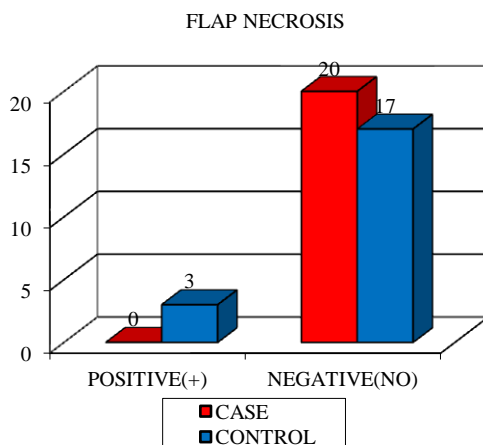
**Table 3:** Shows comparison of wound gaping in cases and control groups. 20% in cases and 35% in control groups had wound gaping and it has no statistically significant p value (0.479).

WOUND GAPING	CASE		CONTROL	
	Nos	%	Nos	%
POSITIVE (+)	4	20	7	35
NEGATIVE (-)	16	80	13	65
TOTAL	20	100	20	100
P value	0.479 Not significant			



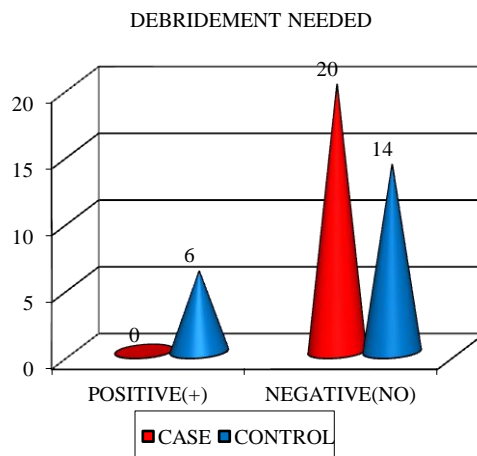
**Table 4:** Shows comparison of flap necrosis in cases and control groups. 30% control groups had flap necrosis whereas no patients in cases were found to have it resulting in significant p value (0.02)

FLAP NECROSIS	CASE		CONTROL	
	Nos	%	Nos	%
POSITIVE (+)	0	0	6	30
NEGATIVE (-)	20	100	14	70
TOTAL	20	100	20	100
P value	0.02 significant			



**Table 5:** Shows comparison of debridement requirement in cases and control groups. 30% of control groups required debridement whereas none of the cases needed it. p value (0.02) is statistically significant

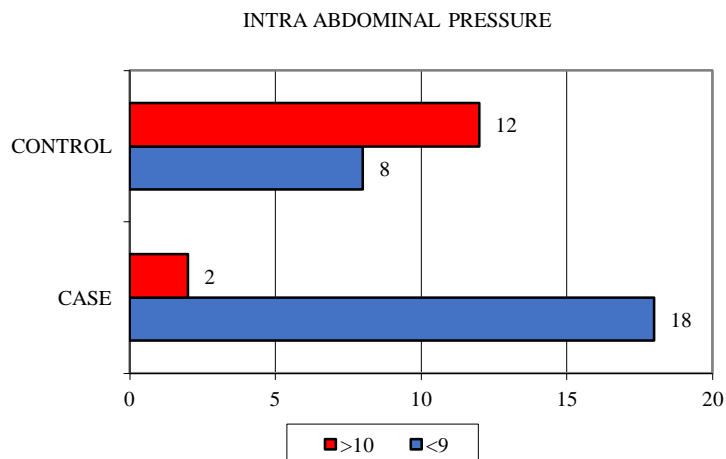
DEBRIDEMENT NEEDED	CASE		CONTROL	
	Nos	%	Nos	%
POSITIVE (+)	0	0	6	30
NEGATIVE (-)	20	100	14	70
TOTAL	20	100	20	100
P value	0.02 Significant			



**Table 6:** Shows the comparison of Intra-Abdominal pressure (IAP) in both cases and control groups. Totally 10% of cases and 60% of patients in control groups had raised IAP resulting in significant p value (0.001).

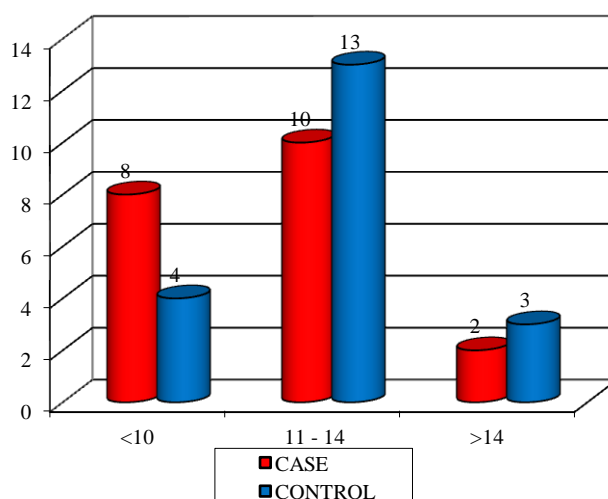
INTRA-ABDOMINAL PRESSURE	CASE		CONTROL	
	Nos	%	Nos	%
≤9	18	90	8	40
>10	2	10	12	60
TOTAL	20	100	20	100
Mean	7.25		9.95	
SD	1.333		1.669	
P value	<0.001 significant			





**Table 7:** Shows the comparison of total number of post op hospital stay in both groups.

DURATION OF POST OP HOSPITAL STAY (DAYS)	CASE		CONTROL	
	Nos	%	Nos	%
≤10	8	40	4	20
11 - 14	10	50	13	65
>14	2	10	3	15
TOTAL	20	100	20	100
Mean	11.20		12.65	
SD	1.989		1.95	
P value	0.025 Significant			



#### IV. Discussion

Incisional hernias are the most common complication after laparotomy and the most common indication for reoperation after laparotomy. Recent advancements in mesh technology and technical refinements in the methods of hernioraphy have dramatically changed the way open hernia surgery is conducted.

Still, the traditional methods of hernia repair have unacceptably high recurrence rates. In this study, we address the posterior component separation, a medial fascial advancement technique to aid in abdominal wall reconstruction for huge incisional hernias.

The factors assessed were

- hernia defect closure,
- abdominal wall reconstruction
- postoperative outcome

**Table 8:** Correlation of post-op factors in cases and controls

Parameters	PCS-TAR	Conventional onlay repair	P value
Wound discharge	8	9	1.0
Wound gaping	4	7	0.479
Flap necrosis	0	3	0.02 (significant)
Intra-abdominal pressure ≤9 mm Hg	18	8	< 0.001 (significant)
>10 mm Hg	2	12	
Duration of hospital stay	11.20 days	12.65 days	0.025 (significant)

The statistics shows that there is no significant difference in the wound complications when comparing wound discharge and gaping whereas there is statistically significant difference in terms of wound debridement and flap necrosis rate in PCS-TAR. The IAP and duration of post-op hospital stay found to be much less in PCS-TAR which indicates there is definite benefit of doing PCS-TAR in huge incisional hernias.

**Limitations of the study:**

- \* The sample size is comparatively small because of the rarity of study subjects.
- \* The duration of follow up is limited to 1 year.

**V. Conclusion**

This is a comparative study to analyse the effect of PCS-TAR in large incisional hernia and its outcome. The study comprised totally 60 subjects and was carried out over a period of one year and the following advantages were observed in the reconstruction of complex defects.

1. the retro-rectus space is an easily dissected potential space;
2. it is a well vascularized compartment with a more efficient collagen deposition and mesh integration;
3. Posterior component separation results in significant reduction in
  - Flap necrosis
  - Wound debridement
  - Intra-abdominal pressure
  - Post op hospital stay

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