

OUTCOMES OF POSTERIOR COMPONENT SEPARATION TECHNIQUE WITH AND WITHOUT TRANSVERSE ABDOMINUS RELEASE IN THE MANAGEMENT OF COMPLEX ABDOMINAL WALL HERNIAS

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INTRODUCTION

Ventral hernia accounts for 15 to 20% of all cases presenting to the surgical OPD.¹ Most cases are incisional hernias with an estimated 2 to 11% incidence.² Obesity, smoking, COPD, poor surgical technique and wound infection all contribute to hernia formation and delay in treatment leads to a progressive increase in the size of the defect.³ Treating complex hernia has always posed a management dilemma for the surgeon, with a 30 to 50% recurrence rate if managed inappropriately. Rives-Stopppa's use of prosthetic mesh in preperitoneal space (subway) resulted in a strong tension-free closure.^{4,5,6,7} However, this repair's loss of abdominal wall flexibility has been the foremost reason for recurrence.^{8,9} Anterior component separation

ABSTRACT

OBJECTIVES

To evaluate and compare the outcomes of the Posterior Component Separation (PCS) technique with and without Transversus Abdominis Release (TAR) in the management of complex abdominal hernias, focusing on recurrence rates, complications, and overall surgical effectiveness.

METHODOLOGY

This retrospective cohort study was conducted at Hayatabad Medical Complex, Peshawar, from January 2020 to April 2023. A total of 87 patients with complex midline and lateral hernias were included. Complex hernias had defects >8 cm, >20% abdominal domain loss, multiple defects, or recurrence. Lateral hernias were post-open cholecystectomy incisional hernias. Data on demographics, comorbidities, and surgical details were analysed using SPSS v20. Chi-square and Fisher's exact tests were applied for categorical variables, and an independent t-test was used for continuous variables ($p < 0.05$ considered significant).

RESULTS

Of 87 patients, 42 (48.3%) underwent PCS-TAR, while 45 (51.7%) had PCS without TAR. The mean operative time was 120 ± 10.6 minutes. Complications occurred in 24 (27.6%) patients, significantly higher in the TAR group (38.1% vs. 17.8%, $p = 0.034$). Recurrence was observed in 7 (8%) patients. Seroma formation was more common in the TAR group (16.7% vs. 2.2%, $p = 0.009$). Mortality occurred in one patient due to pulmonary embolism.

CONCLUSION

Posterior component separation technique with or without transversus abdominis release is a neoteric surgical procedure for managing large complex hernias. It has an excellent outcome with minimal complications, resulting in improved quality of life for the patients.

KEYWORDS: Obesity, Abdominal Muscles, Procedure, Management, Hernia

technique devised by Ramirez et al. also had limited usage due to its various wound complications like skin flap necrosis and inability to cover the hernias that are too lateral or over the bony prominences.^{10,11} The classic posterior component separation technique was introduced by Carbonell et al. by incising the posterior rectus sheath, allowing access to the plane between the internal oblique and transversus abdominis muscle.¹² Adverse outcomes were noted due to the division of the neurovascular bundle.¹¹ In 2012, Novitsky et al. modified the posterior component separation technique by releasing transverses of the abdominus muscle and isolation/preservations of the nerves. This technique allows huge lateral intramuscular space extending to the retroperitoneum and psoas muscle, facilitating the repair of large complex hernias with minimal

morbidity, making it the most suitable option for treating complex hernias.¹³ It is also preferred in patients with multiple recurrent hernias, non-compliant abdominal walls, parastomal hernias, and compromised vascularity.¹⁴ This innovative technique, though having excellent outcomes, lacks adequate data and research. Studies need to be done to compare its outcome and analyse its versatility. In our study, we intend to share our experience of the posterior component separation technique with and without transverse abdominus muscle release.

METHODOLOGY

This retrospective cohort study was conducted in the surgical —CI unit of Hayatabad Medical Complex, Peshawar, from January 2020 to April 2023. A total of 87 patients with complex and lateral abdominal wall hernia were included in the study. Complex hernia patients either had a defect of more than 8cm, >20% loss of abdominal domain, had multiple defects, or were recurrent. Lateral hernia patients were incisional hernias that developed post-open cholecystectomy. Immunocompromised patients or ASA 4 patients were excluded from the study. A single surgeon performed surgery to exclude operator bias. All the patients were admitted through the outpatient department. Routine laboratory tests and physical examinations were performed on all patients. Preoperative ultrasonography and computed tomography (CT) were used to measure all patients' defect size, abdominal wall anatomy, and hernia content. Age, sex, body mass index (BMI), comorbidities, and American Society of Anesthesiology (ASA) score were collected. The SPSS version 20 software was used for statistical analysis of all data. The ethical committee of Hayatabad Medical Complex has approved the study protocol. Preoperative antibiotic prophylaxis was done by administering ceftriaxone injection 30 minutes before surgery. Deep venous thrombosis prophylaxis (DVT) was done by injecting enoxaparin subcutaneously during induction. The patient was placed in a supine position with both arms abducted. A nasogastric tube and per urethral catheterisation were placed after general anaesthesia induction. After preparing the skin, a midline incision was given in midline ventral hernias. The whole scar was excised in an incisional hernia. The hernial sac was cautiously separated from the scar tissue. The peritoneal cavity entered through the virgin part of the incision, avoiding the hernia opening. Hernia contents were reduced, and where needed, adhenolysis was done. Retro rectus space was accessed by giving a longitudinal incision over the medial border of the rectus muscle at the virgin area. Retro-rectus muscle dissection was done until the neurovascular bundle was

on linea semilunaris. In most of the patients in whom transversus abdominis muscle release (TAR) was done, the internal oblique aponeurosis was divided carefully from medial to Linea semilunaris to access the transversus abdominis muscle (TAM). Muscle fibres were divided with cautery and bluntly swiped laterally to create space between TAM and transversalis fascia. Dissection was performed upward and downward to create enough space for mesh overlap and tension-free closure of the posterior sheath. The same dissection was done on the contralateral side. After complete posterior component separation with TAR on both sides, the posterior sheath was reconstructed with vicryl 2/0, creating a functional physiological abdominal wall. Defects were created accidentally, while dissection was also primarily repaired. This area was washed with normal saline. Gloves were changed by the operating surgeon as well as the first assistant. A large monofilament, multiporous (mostly 30 to 30cm) prolene mesh was applied according to the size of the defect. This mesh was handled only by the operating surgeon throughout the procedure. It was laid flat over the reconstructed posterior sheath with an overlap of at least 5 cm from the defect to prevent a recurrence. Mesh was fixed cautiously with Vicryl 2/0 or Prolene 2/0. Hemostasis was secured, and a suction drain was placed. Single drains were used in small hernias, while bilateral drains were used in large hernias. The anterior rectus sheath was closed using Vicryl 1 or Prolene 1. The skin was closed with horizontal mattress sutures using prolene2/0, and an aseptic dressing was applied. Postoperatively, patients were started on broad-spectrum I.V. antibiotics and analgesics. Patients were mobilised and orally allowed as soon as possible using the ERAS protocol. Abdominal binders were applied to all patients at discharge. The wound was examined daily for infection, seroma and hematoma formation. A daily drain output record was maintained, and drains were removed once they were dry or had an output of less than 50ml/ 24 hours. Patients were kept admitted for 5 ±2 days. Follow-up visits were planned on the 7th day, 2 weeks, 6 weeks, 3 months and 6 months. During the COVID-19 era, most of the follow-ups were done telephonically, and only patients requiring further investigations and interventions were called in. The Wound was examined, and further investigations were done as needed.

RESULTS

Eighty-seven patients were studied: 42 (48.3%) patients undergoing PCS with TAR and 45 (51.7%) without TAR. The average age of patients was 43.1 ± 11.0 years, and most were males (n=57, 65.5%). Table 1 compares the socio-demographic features of patients

who underwent PCS with or without TAR. The two groups did not differ based on age ($p=0.345$) and gender ($p=0.116$).

Table 1: Comparison of Socio-Demographic Features among Two Study Groups (n=87)

Variables	Total n(%)	With TAR n(%)	Without TAR n(%)	P-Value
Age (in years)#	43.1 ± 11.0	42.4 ± 10.3	43.8 ± 11.7	0.345
Age groups				
<40 years	34(39.1)	18(42.9)	16(35.6)	0.486
≥40 years	53(60.9)	24(57.1)	29(64.4)	
Gender				
Male	57(65.5)	31(73.8)	26(57.8)	0.116
Female	30(34.5)	11(26.2)	19(42.2)	

#: Numerical variables are presented as mean ± standard deviation

Overall, 79 (90.8%) patients had defect sizes >10 cm, whereas the remaining had defect sizes of 8-10 cm. The mean operative time in this study was 120 ± 10.6 minutes. 9.2% of the patients had a defect of 8-10cm, while 90.8% had a defect size of more than 10cms. 8% of the patients had a primary hernia, while a secondary hernia was seen in 92% of patients. Amongst the secondary hernia group, 79.3% had previously undergone exploratory laparotomy, while 12.6% of the patients were post-open cholecystectomy.

Table 2: Comparison of Clinical Features among Two Study Groups (n=87)

Variables	Total n(%)	With n(%)	Without TAR n(%)	P-Value
Operative time (in minutes)#	121.3 ± 11.0	122.2 ± 10.3	120.4 ± 10.9	0.701
Defect size				
8-10 cm	8(9.2)	02(4.8)	6(13.3)	†0.268
>10 cm	79(90.8)	40(95.2)	39(86.7)	
Type of Hernia				
Primary	07(8)	01(2.4)	06(13.3)	†***<0.001
Secondary				
1. Post laparotomy	69(79.3)	41(97.6)	28(62.2)	
2. Open cholecystectomy	11(12.6)	0(0)	11(24.4)	

#: Numerical variables is presented as mean ± standard deviation,

†: Fisher-exact test is reported

Table 3 shows the various complications encountered by our patients. During the study, 24 (27.6%) patients developed complications, 16(38.1%) patients developed complications in the TAR group and 8(17.8%) complications were seen in groups not managed with TAR, and the difference was statistically significant ($p=0.034$). Our primary outcome was recurrence, which was reported in 7 (8%) patients. Seroma formation occurred in 8 (9.2%) of the patients. It was significantly higher in patients who underwent TAR, i.e., 7(16.7%) patients, compared to only 1 (2.2%) patients without

TAR. Among these eight patients, three were managed conservatively, while five required aspiration under LA. Other uncommon complications developed during the study were SAIO ($p=1.000$), wound infection ($p=0.495$), chronic abdominal pain ($p=1.000$) and abdominal wall deformity ($p=0.483$), which were not statistically significant. 3(3.4%) patients had hematoma formation and managed conservatively. None of our patients reported wound dehiscence or skin flap necrosis. One of our patients died of a pulmonary embolism on the 7th POD.

Table 3: Outcome of the Study (N=87)

Variables	Total n(%)	With TAR n(%)	Without TAR n(%)	P-Value
Overall complications	24(27.6)	16(38.1)	08(17.8)	0.034
Recurrence	07(8)	03(7.1)	04(8.9)	†1.000
Seroma formation	08(9.2)	07(16.7)	01(2.2)	*0.026f
Hematoma formation	03(3.4)	0(0)	03(6.7)	†0.242
SAIO	02(2.3)	01(2.4)	01(2.2)	†1.000
Wound infection	02(2.3)	0(0)	02(4.4)	†0.495
Chronic abdominal pain	02(2.3)	01(2.4)	01(2.2)	†1.000
Abdominal wall deformity	01(1.1)	01(2.4)	0(0)	†0.483

†: Fisher-exact test is reported, *Significant at 5% level of significance

DISCUSSION

A dynamic and intact abdominal wall is vital for protecting and supporting the abdominal viscera. Many essential body functions, like micturition, defecation parturition, etc., depend on their integrity to perform efficiently. Disruption of this barrier leads to ventral hernia, causing significant physical as well as mental distress for the patient and, if not treated on time, leads to a progressive increase in size and, hence, morbidity. An estimated 10% of ventral hernias end up incarcerated.¹⁵ A study by Chatzimavrodus et al. described the criteria for categorising hernia as complex based on size, location, soft tissue condition, and patient risk factors. Hernial defects of >10 cm, >20% loss of domain, hernia on a bony prominence, burst abdomen, and multiple hernial defects were included as complex hernias.¹ Although small hernias i.e <2.5 cm can be repaired with primary tissue repair, and moderate hernias (2-8 cm) can be managed using laparoscopic/open mesh repair utilising the Rives-Stoppa technique, managing complex hernias has always posed a challenge for the surgeons. Perioperative risks and complications proportionately increase with the complexity of the hernia.¹ Different procedures have been devised to deal with these

hernias, all having pros and cons. The preposition of posterior component separation and its modification, i.e., the TAR technique, has enabled surgeons to treat large complex hernias with minimal complications and recurrences.¹⁶ Our sample consisted of 87 patients over 2 years. Compromised healthcare in third-world countries like ours results in patients' exposure to substandard suture usage, poor surgical technique and undertrained surgical staff, causing increased rates of patients presenting with incisional hernias to the tertiary care hospital. The mean operative time for the surgery was 121.3 ± 10.6 minutes, which is comparable to the study performed by Punjani et al., wherein they reported an estimated time of 131.8 ± 25.2 min. Literature records a recurrence rate of 1.1%-7.3% for patients undergoing PCS with or without TAR.⁽¹⁷⁾ Oprea et al., in their presenting paper for PCS performed on 42 patients, recorded a recurrence rate of 4.7% (2 patients) in a mean follow-up of 2 yrs.¹⁸ Similarly, Gandhi et al., in their case series of 20 patients undergoing PCS-TAR, reported recurrence in 5% (1) of the patients.¹⁹ In another study conducted by Ramana et al., 3.7% of the patients undergoing PCS were reported to have recurrence.²⁰ These studies are comparable to our study, wherein we recorded a recurrence rate of 8%. 14.9% of our patients had various wound complications like seroma, hematoma formation and wound infection, which is statistically comparable to other studies. In a review by Majumder et al., they reported a wound complication rate of 3.4-31%.²¹ We recorded a wound complication rate of 6.2%. In another review, a complication rate of 20.3% was observed.²⁰ Similarly, Majumder et al., in their series, had a wound complication rate of 18.7%, of which 9% suffered from SSI.²¹

LIMITATIONS

Despite its informative findings, our study has limitations, including its retrospective design, relatively small sample size, and single-centre setting. Future research should consider more extensive multicenter studies with prospective designs to address these limitations and validate and extend our findings.

CONCLUSIONS

Posterior component separation technique with or without transversus abdominis release is a neoteric surgical procedure for managing large complex hernias. It has an excellent outcome with minimal complications, resulting in improved quality of life for the patients. Further studies need to be performed to understand the procedure better and make it one of the essential parts of the surgical armamentarium.

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REFERENCES

1. Chatzimavroudis G, Kotoreni G, Kostakis I, Voloudakis N, Christoforidis E, Papaziogas B. Outcomes of posterior component separation with transversus abdominis release (TAR) in large and other complex ventral hernias: a single-surgeon experience. *Hernia*. 2021;26(5):1275-83. doi: 10.1007/s10029-021-02520-7.
2. Christoffersen MW, Westen M, Rosenberg J, Helgstrand F, Bisgaard T. Closure of the fascial defect during laparoscopic umbilical hernia repair: a randomized clinical trial. *British Journal of Surgery*. 2020;107(3):200-8. doi: 10.1002/bjs.11490.
3. Sadava EE, Peña ME, Schlottmann F. Should We Routinely Close the Fascial Defect in Laparoscopic Ventral and Incisional Hernia Repair? *Journal of Laparoendoscopic & Advanced Surgical Techniques*. 2019;29(6):856-9. doi: 10.1089/lap.2019.0088.
4. Elhage KW, Marturano MN, Prasad T, Colavita PD, Kercher KH, Augenstein VA, et al. Impact of perforator sparing on anterior component separation outcomes in open abdominal wall reconstruction. *Surgical Endoscopy*. 2020;35(8):4624-31. doi: 10.1007/s00464-020-07888-8.
5. Wegdam JA, Thoolen JMM, Nienhuijs SW, de Bouvy N, de Vries Reilingh TS. Systematic review of transversus abdominis release in complex abdominal wall reconstruction. *Hernia*. 2018;23(1):5-15. doi: 10.1007/s10029-018-1870-5.
6. Kordestani SS. Wound Classification. *Atlas of Wound Healing*: Elsevier; 2019. p. 49-50.
7. Khansa I, Janis JE. The 4 Principles of Complex Abdominal Wall Reconstruction. *Plast Reconstr Surg Glob Open*. 2019;7(12):e2549-e. doi: 10.1097/GOX.0000000000002549. PubMed PMID: 32042542.
8. Ibrahim R, Abounozha S, Kheder A, Alshahri T. Incidence of seroma in sublay versus onlay mesh repair of incisional hernia. *Ann Med Surg (Lond)*. 2020;61:155-7. doi: 10.1016/j.amsu.2020.12.029. PubMed PMID: 33425349.
9. Siegal SR, Pauli EM. New perspectives in abdominal wall reconstruction: posterior component separation/transversus abdominis release. *Plastic and Aesthetic Research*. 2019;2019. doi: 10.20517/2347-9264.2019.35.
10. Alimi Y, Merle C, Sosin M, Mahan M, Bhanot P. Mesh and plane selection: a summary of options and outcomes. *Plastic and Aesthetic Research*. 2020;2020. doi: 10.20517/2347-9264.2019.39.
11. Kumar S, Edmunds RW, Dowdy C, Chang Y-WW, King R, Roth JS. Anterior versus Posterior Component Separation: Which Is Better? *Plastic & Reconstructive Surgery*. 2018;142(3S):47S-53S. doi: 10.1097/prs.0000000000004852.
12. Sánchez-Arteaga A, Tallón-Aguilar L, Tinoco-González J, Perea del-Pozo E, Navas-Cuellar A, Padillo-Ruiz J. Use of polyvinylidene fluoride (PVDF) meshes for ventral hernia repair in emergency surgery. *Hernia*. 2020;25(1):99-106. doi: 10.1007/s10029-020-02209-3.
13. Roth JS, Anthone GJ, Selzer DJ, Poulouse BK, Pierce RA, Bittner JG, et al. Prospective, multicenter study of P4HB (Phasix™) mesh for hernia repair in cohort at risk for complications: 3-Year follow-up. *Ann Med Surg (Lond)*. 2020;61:1-7. doi: 10.1016/j.amsu.2020.12.002. PubMed PMID: 33363718.
14. Gandhi JA, Gajjar AP, Shinde PH, Chaudhari S. Posterior Component Separation Technique-Original Transversus Abdominis Release (TAR) Technique. *J Abdom Wall Surg*. 2024;3:12542-. doi: 10.3389/jaws.2024.12542. PubMed PMID: 39234002.

15. Nielsen MF, de Beaux A, Tulloh B. Peritoneal Flap Hernioplasty for Reconstruction of Large Ventral Hernias: Long-Term Outcome in 251 Patients. *World Journal of Surgery*. 2019;43(9):2157-63. doi: 10.1007/s00268-019-05011-0.
16. Riediger H, Holzner P, Kundel L, Gröger C, Adam U, Adolf D, et al. Laparoscopic transversus abdominis release for complex ventral hernia repair: technique and initial findings. *Hernia*. 2023;28(3):761-7. doi: 10.1007/s10029-023-02860-6.
17. Punjani R, Arora E, Mankeshwar R, Gala J. An early experience with transversus abdominis release for complex ventral hernias: a retrospective review of 100 cases. *Hernia*. 2020;25(2):353-64. doi: 10.1007/s10029-020-02202-w.
18. Oprea V, Mardale S, Buia F, Gheorghescu D, Nica R, Zdroba S, et al. The influence of Transversus Abdominis Muscle Release (TAR) for complex incisional hernia repair on the intraabdominal pressure and pulmonary function. *Hernia*. 2021;25(6):1601-9. Epub 2021/03/22. doi: 10.1007/s10029-021-02395-8. PubMed PMID: 33751278.
19. Gandhi J, Shinde P, Chaudhari S, Banker A, Deshmukh V. Decalogue of Transversus Abdominis Release Repair- Technical Details and Lessons Learnt. *Polish Journal of Surgery*. 2021;93(2):16-25. doi: 10.5604/01.3001.0014.7989.
20. Ramana B, Arora E, Belyansky I. Signs and landmarks in eTEP Rives-Stoppa repair of ventral hernias. *Hernia*. 2020;25(2):545-50. doi: 10.1007/s10029-020-02216-4.
21. Majumder A, Martin-del-Campo LA, Miller HJ, Podolsky D, Soltanian H, Novitsky YW. Evaluation of anterior versus posterior component separation for hernia repair in a cadaveric model. *Surgical Endoscopy*. 2019;34(6):2682-9. doi: 10.1007/s00464-019-07046-9.

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