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A COMPARATIVE STUDY BETWEEN ANTERIOR COMPONENT SEPARATION AND POSTERIOR COMPONENT SEPARATION IN VENTRAL HERNIA REPAIR

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Abstract

Background: Component separation techniques are established methods for repairing large ventral abdominal hernias. Among them, anterior component separation (ACS) and posterior component separation with transversus abdominis release (PCS-TAR) are widely practiced. This study aimed to compare ACS and PCS-TAR in terms of operative parameters, postoperative complications, and recurrence.

Methods: A prospective comparative study was conducted on 40 patients with large midline ventral hernia (defect surface area 300–600 cm², width >10 cm) admitted between September 2019 and November 2021. Patients were randomized into two groups: ACS (n=20) and PCS-TAR (n=20). Preoperative, intraoperative, and postoperative variables were compared.

Results: Both groups were comparable in demographics. Mean operative time was longer in PCS-TAR (148 vs. 140 min, p=0.12). Wound-related complications (seroma, infection) were significantly higher in ACS (40% vs. 10%, p<0.001). Drain removal was earlier in PCS-TAR (13.6 vs. 14.9 days). Recurrence at 12 months was significantly lower in PCS-TAR (0% vs. 10%, p=0.02).

Conclusion: PCS-TAR offers superior outcomes in terms of wound morbidity and recurrence, though with slightly longer operative time. It should be considered the preferred option for large midline ventral hernia repair.

Keywords: Ventral hernia, component separation, transversus abdominis release, abdominal wall reconstruction, recurrence

INTRODUCTION

Incisional and ventral hernias are common complications after abdominal surgery, with an estimated incidence of 10–20% following laparotomies [1]. Large or complex ventral hernias remain a significant surgical challenge due to their high recurrence rates and the morbidity associated with conventional repair techniques [2]. Traditional suture closure or bridging mesh repair often results in excessive tension, impaired wound healing, and long-term complications [3].

The introduction of component separation techniques has revolutionized abdominal wall reconstruction. These procedures allow for medial advancement of the rectus muscles, enabling closure of large midline defects without tension [4]. The anterior component separation (ACS) method, first described by Ramirez et al. in 1990, involves releasing the external oblique aponeurosis to achieve significant medialization of the rectus complex [5]. While effective, ACS requires wide subcutaneous dissection, which predisposes patients to skin necrosis, seroma, and wound infections [6].

To overcome these limitations, posterior component separation with transversus abdominis release (PCS-TAR) was introduced by Novitsky et al. in 2012 [7]. This technique develops the retromuscular plane laterally, avoids extensive subcutaneous flaps, and provides a well-vascularized space for mesh placement. Several comparative studies and systematic reviews have demonstrated that PCS-TAR offers reduced wound morbidity and lower recurrence compared to ACS, making it increasingly favored among reconstructive surgeons [8].

However, Indian data evaluating the outcomes of these two techniques are limited. This study was therefore undertaken to compare ACS and PCS-TAR in patients with large midline ventral hernias, focusing on operative outcomes, postoperative morbidity, and recurrence.

MATERIALS AND METHODS

Study Design and Setting:

This was a prospective comparative study conducted at the Department of General Surgery, Saveetha Medical College and Hospitals, SIMATS, Chennai, between September 2019 and November 2021.

Sample Size:

40 patients with midline ventral hernia were enrolled and randomized into two equal groups (20 ACS, 20 PCS-TAR).

Inclusion Criteria:

- Age >18 years
- Primary or recurrent midline ventral hernia
- Defect size 300–600 cm^2, width >10 cm

Exclusion Criteria:

- Loss of domain
- Defect <300 cm^2 or >600 cm^2
- Previous component separation
- Patients with stoma or contamination

Randomization:

Patients were randomized using the sealed envelope method.

Surgical Technique:

- ACS: External oblique release lateral to linea semilunaris, rectus advancement, sublay mesh placement.
- PCS-TAR: Posterior rectus sheath and transversus abdominis muscle release, retromuscular mesh placement.

Follow-up:

Patients were followed at 2 weeks, 1 month, 3 months, 6 months, and 12 months with clinical exam and CT to assess recurrence.

Data Collection:

Collected variables included demographics, BMI, comorbidities, operative time, blood loss, complications (seroma, infection), drain removal, hospital stay, VAS pain scores, and recurrence.

Statistical Analysis:

SPSS v26 was used. Continuous variables were analyzed with Student's t test; categorical variables with Chi-square/Fisher's exact test. $p<0.05$ was significant.

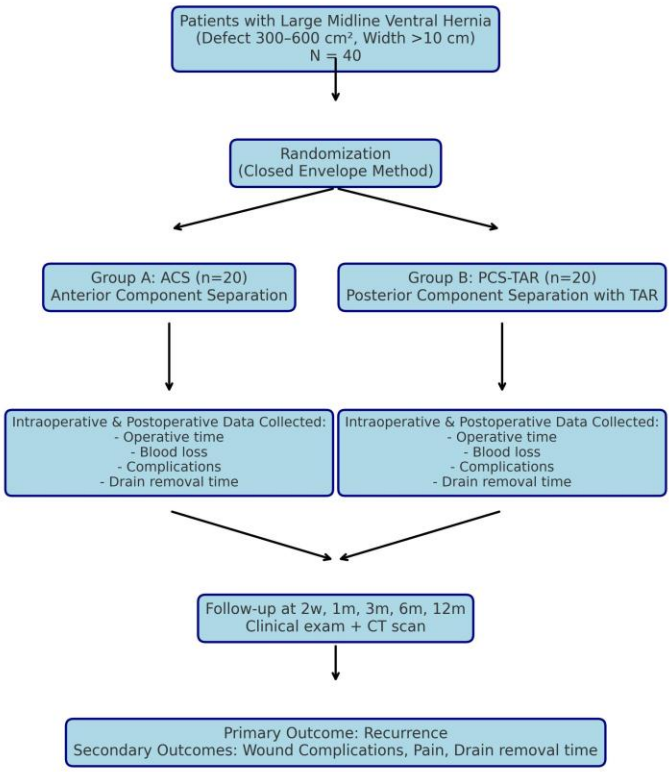

Figure 1. Study methodology flowchart.

RESULTS

Baseline Characteristics

The demographic profile of both groups was comparable (Table 1). The mean age was 42.3 ± 10.3 years in the ACS group and 44.5 ± 7.9 years in the PCS-TAR group ($p = 0.44$). Male predominance was seen in both groups (50% vs. 65%, $p = 0.33$). Mean BMI was 32.5 ± 3.7 in ACS and 33.5 ± 2.8 in PCS-TAR ($p = 0.32$). Mean defect surface area was 398.5 ± 63.2 cm² in ACS compared with 428 ± 67.1 cm² in PCS-TAR ($p = 0.16$). Thus, both groups were well matched preoperatively without statistical differences.

Operative Data

The mean operative time was slightly shorter in ACS (140.1 min) compared with PCS-TAR (148.0 min), though not statistically significant ($p = 0.12$). The blood loss was also similar between groups. One case of intraoperative bowel injury occurred in PCS-TAR, which was repaired primarily without sequelae.

Postoperative Outcomes

Wound-related complications were significantly more common in ACS (40%) compared with PCS-TAR (10%) ($p < 0.001$). Specifically, seroma formation and superficial surgical site infection were higher in ACS. The mean time for drain removal was significantly longer in ACS (14.9 days) versus PCS-TAR (13.6 days). Mean hospital stay was comparable between groups (3.6 vs. 3.8 days). Postoperative pain scores (VAS) were similar (4.6 vs. 4.3, p = NS).

Recurrence

At one-year follow-up, recurrence occurred in 2 patients (10%) in ACS, while no recurrence was noted in PCS-TAR ($p = 0.02$). This highlights the durability of PCS-TAR over ACS in preventing long-term failure

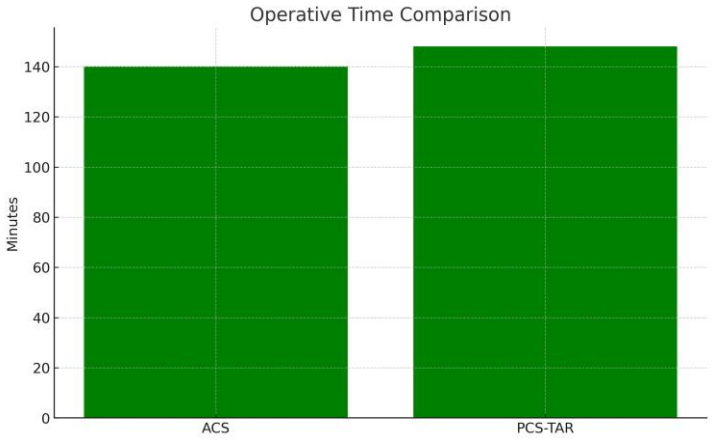

Figure 2. Comparison of operative time (minutes).

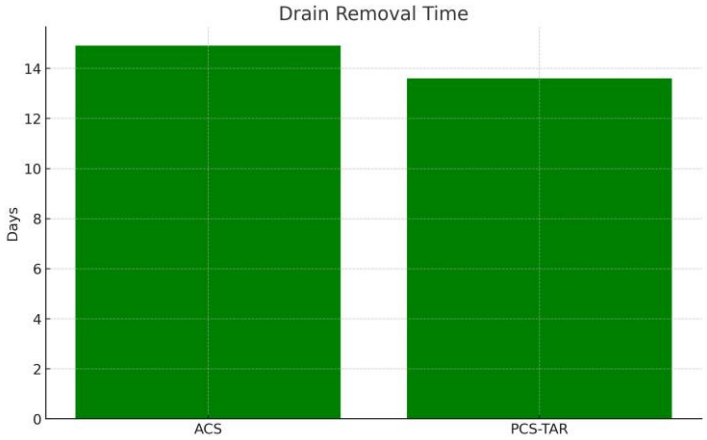

Figure 3. Comparison of drain removal time (days).

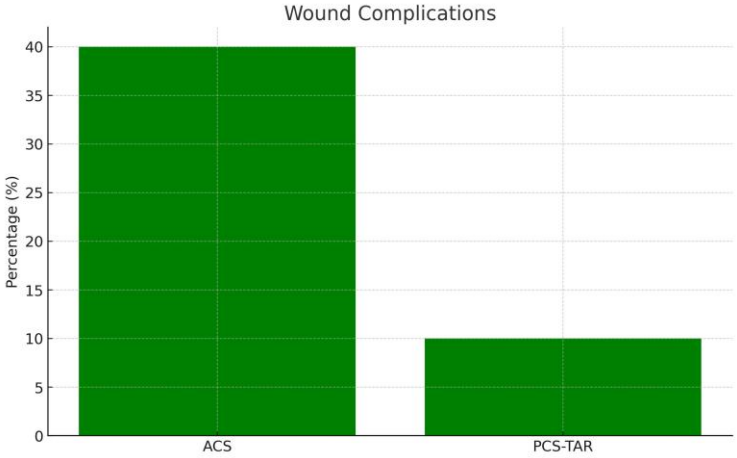

Figure 4. Wound complications rate (%).

DISCUSSION

The findings of our study highlight the advantages of posterior component separation with TAR over anterior component separation in the repair of large midline ventral hernias. Although the mean operative time was slightly longer in PCS-TAR, this difference was not statistically significant, and the benefits in terms of reduced wound morbidity and recurrence clearly outweighed this drawback.

Our results are consistent with those reported in the literature. Krpata et al. [9] demonstrated higher wound complication rates with ACS due to the need for wide subcutaneous dissection, which predisposes to flap necrosis, seroma, and infection. Similarly, Albalkiny and Helmy [10] reported significantly lower wound morbidity with PCS-TAR. The present study reinforces these findings, with wound complications observed in 40% of ACS cases compared to only 10% in PCS-TAR.

The recurrence rate in our ACS group (10%) was notably higher than PCS-TAR (0%). Novitsky et al. [7] and later Novitsky et al. [11] demonstrated recurrence rates of less than 5% in TAR patients with extended follow-up, underscoring the durability of this approach. In comparison, recurrence rates after ACS have been variably reported between 15–30% [12,13], consistent with our findings. Cobb et al. [14] also reported significantly improved recurrence rates with retromuscular repairs compared to anterior separations.

One of the principal advantages of PCS-TAR is that it avoids extensive flap creation, thereby preserving perforating vessels and maintaining vascular integrity [15]. This vascular preservation reduces the risk of ischemia-related complications, which are commonly seen in ACS. Cornette et al. [16], in a systematic review, confirmed the superior wound outcomes with PCS-TAR compared to ACS in large hernia repairs.

Although PCS-TAR required a slightly longer operative time in our series, this is explained by the learning curve associated with the technique. With increasing surgeon experience, operative times have been shown to approximate those of ACS [10]. Importantly, there were no significant differences in intraoperative blood loss or hospital stay, suggesting that both techniques are safe and feasible in experienced hands.

The limitations of our study include the small sample size and relatively short follow-up of 12 months. Larger multicenter studies with longer follow-up are needed to establish long-term durability and to validate our findings in broader populations.

In summary, PCS-TAR provides superior outcomes in terms of wound morbidity and recurrence compared to ACS. Given its anatomical and functional advantages, it should be considered the preferred surgical technique for large midline ventral hernia repairs in modern practice.

CONCLUSION

The repair of large midline ventral hernias remains a formidable challenge for surgeons, demanding techniques that ensure durable closure while minimizing complications. In our comparative study, posterior component separation with transversus abdominis release (PCS-TAR) demonstrated clear advantages over anterior component separation (ACS). While PCS-TAR required slightly longer operative time, it was associated with significantly lower wound complications, earlier drain removal, and a markedly reduced recurrence rate at one year. These findings are in agreement with international literature, which consistently highlights the anatomical and functional superiority of PCS-TAR. By avoiding extensive subcutaneous dissection and preserving vascular integrity, PCS-TAR provides a safer and more reliable approach for abdominal wall reconstruction. Although our study was limited by its modest sample size and short follow-up, the results strongly support PCS-TAR as the preferred technique for managing large midline ventral hernias in contemporary surgical practice.

REFERENCES

1) Booth JH, Garvey PB, Baumann DP, Selber JC, Nguyen AT, Clemens MW, et al. Primary fascial closure with mesh reinforcement is superior to bridged mesh repair for abdominal wall reconstruction. J Am Coll Surg. 2013;217(6):999–1009. doi:10.1016/j.jamcollsurg.2013.08.006
2) Ammar S. Management of giant ventral hernia by polypropylene mesh and host tissue barrier: trial of simplification. J Clin Med Res. 2009;1(4):226–229. doi:10.4021/jocmr2009.08.1253
3) Stoppa R, Petit J, Henry X, Duclaye C. Original procedure of groin hernia repair: interposition without fixation of Dacron tulle prosthesis by subperitoneal median approach. Chirurgie. 1973;99:119–123. PMID: 4201471
4) Ramirez OM, Ruas E, Dellon AL. Components separation method for closure of abdominal-wall defects: an anatomic and clinical study. Plast Reconstr Surg. 1990;86(3):519–526. doi:10.1097/00006534-199009000-00023
5) Torregrosa-Gallud A, Sancho Muriel J, Bueno-Lledó J, García Pastor P, Iserte-Hernandez J, Bonafé-Diana S, et al. Modified components separation technique: experience treating large, complex ventral hernias at a University Hospital. Hernia. 2017;21(4):601–608. doi:10.1007/s10029-017-1624-2

6) Rosen MJ, Jin J, McGee MF, Williams C, Marks J, Ponsky JL. Laparoscopic component separation in the single-stage treatment of infected abdominal wall prosthetic removal. Hernia. 2007;11(5):435–440. doi:10.1007/s10029-007-0239-6
7) Novitsky YW, Elliott HL, Orenstein SB, Rosen MJ. Transversus abdominis muscle release: a novel approach to posterior component separation during complex abdominal wall reconstruction. Am J Surg. 2012;204(5):709–716. doi:10.1016/j.amjsurg.2012.02.008
8) Novitsky YW, Fayezizadeh M, Majumder A, Neupane R, Elliott HL, Orenstein SB. Outcomes of posterior component separation with transversus abdominis release and synthetic mesh sublay reinforcement. Ann Surg. 2016;264(2):226–232. doi:10.1097/SLA.0000000000001683
9) Cornette B, De Bacquer D, Berrevoet F. Component separation technique for giant incisional hernia: a systematic review. Am J Surg. 2018;215(4):719–726. doi:10.1016/j.amjsurg.2018.01.011
10) Haefeli M, Elfering A. Pain assessment. Eur Spine J. 2006;15 Suppl 1:S17–24. doi:10.1007/s00586-005-1044-x
11) Flament JB, Rives JP. Major incisional hernia. In: Chevrel JP, editor. Hernia and Surgery of the Abdominal Wall. New York: Springer; 1995. p. 116–144. doi:10.1007/978-3-642-78797-5_14
12) Cassar K, Munro A. Surgical treatment of incisional hernia. Br J Surg. 2002;89(5):534–545. doi:10.1046/j.0007-1323.2002.02083.x
13) Albalkiny S, Helmy M. Anterior component separation versus posterior component separation with transversus abdominus release in abdominal wall reconstruction for incisional hernia. Egypt J Surg. 2018;37(3):335–342. doi:10.4103/ejs.ejs_20_18
14) Krpata DM, Blatnik JA, Novitsky YW, Rosen MJ. Posterior and open anterior components separations: a comparative analysis. Am J Surg. 2012;203(3):318–322. doi:10.1016/j.amjsurg.2011.01.018
15) Cobb WS, Warren JA, Ewing JA, Burnikel A, Merchant M, Carbonell AM. Open retromuscular mesh repair of complex incisional hernia: predictors of wound events and recurrence. J Am Coll Surg. 2015;220(4):606–613. doi:10.1016/j.jamcollsurg.2014.12.037
16) Belyansky I, Reza Zahiri H, Sanford Z, Weltz AS, Park A. Posterior component separation via transversus abdominis release: technique, utility, and outcomes in complex abdominal wall reconstruction. Plast Reconstr Surg. 2016;138(4 Suppl):156S–168S. doi:10.1097/PRS.0000000000002696
17) Atema JJ, Furnée EJ, Maeda Y, Warusavitarne J, Tanis PJ. Major complex abdominal wall repair in contaminated fields with biological mesh: a systematic review and meta-analysis. Surgery. 2016;160(2):371–383. doi:10.1016/j.surg.2016.02.028
18) Parker SG, Halligan S, Blackburn S, Jairam A, Smart NJ. What exactly is meant by “loss of domain” for ventral hernia? Systematic review of definitions. World J Surg. 2019;43(2):396–404. doi:10.1007/s00268-018-4780-5
19) Atema JJ, Furnée EJ, Maeda Y, van Rooijen MM, de Vries FE, et al. Long-term outcomes after surgical treatment of giant ventral hernia: a systematic review. Hernia. 2019;23(3):489–498. doi:10.1007/s10029-018-1852-7
20) Slater NJ, Montgomery A, Berrevoet F, Carbonell AM, Chang A, Franklin M, et al. Criteria for definition of a complex abdominal wall hernia. Hernia. 2014;18(1):7–17. doi:10.1007/s10029-013-1168-6
21) Holihan JL, Nguyen DH, Nguyen MT, Mo J, Kao LS, Liang MK. Mesh location in open ventral hernia repair: a systematic review and network meta-analysis. World J Surg. 2016;40(1):89–99. doi:10.1007/s00268-015-3252-9
22) Atema JJ, de Vries FEE, Boermeester MA. Systematic review and meta-analysis of the repair of potentially contaminated and contaminated abdominal wall defects. Am J Surg. 2016;212(5):982–995. doi:10.1016/j.amjsurg.2016.08.013
23) Petro CC, Novitsky YW. Classification of ventral hernia: need for a new paradigm. Plast Reconstr Surg. 2016;138(3 Suppl):15S–21S. doi:10.1097/PRS.0000000000002693.