

## Comparative Analysis of Anterior and Posterior Component Separation Techniques for Treating Large Ventral Hernias

Nishi Kumari<sup>1</sup>, Anil Kumar<sup>2</sup>, Priyanka<sup>3</sup>

<sup>1</sup>Senior Resident, Department of General Surgery, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

<sup>2</sup>Professor & HOD, Department of General Surgery, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

<sup>3</sup>Junior Resident, Department of General Surgery, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 20-04-2024

Corresponding Author: Dr. Nishi Kumari

Conflict of interest: Nil

### Abstract:

**Background:** Large ventral hernia surgery is difficult. This study evaluates the ACS to the PCS in hernia surgeries involving transversus abdominis release.

**Methods:** At Darbhanga Medical College & Hospital, 60 hernia patients were studied prospectively and were assigned to ACS or PCS. We tracked operating time, postoperative complications, hospital stay, and hernia recurrence for one year.

**Results:** PCS had a slightly longer operative time (260 vs. 240 minutes) but resulted in shorter drain removal time (6 vs. 22 days), reduced hospital stay (10 vs. 14 days), fewer complications, and no recurrences, unlike ACS, which had two recurrences.

**Conclusion:** PCS proves to be more effective for managing large ventral hernias, offering quicker recovery and fewer complications, making it preferable for complex cases. Further research is needed to confirm these findings.

**Keywords:** Ventral Hernia Repair, Component Separation Technique, Transversus Abdominis Release, Surgical Outcomes

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Suboptimal abdominal surgeries can lead to the development of large ventral hernias, and this can have significant consequences if not properly addressed. [1] It is of utmost importance to address these hernias to preserve the integrity of the abdominal wall and enhance the patient's quality of life. CST is well-known for its ability to achieve a closure of these defects that is both tension-free and thorough. [2]

CST involves two primary strategies: anterior and posterior component separation. Various techniques employ distinctive anatomical routes to mobilize the muscles and fascia of the abdominal wall, facilitating the necessary movement to close the hernial opening. [3] Developed in the early 1990s, the anterior component separation method requires making an incision along the lateral edge of the rectus abdominis muscle. This incision allows for the separation of the oblique aponeuroses, enabling the rectus muscle to move medially and effectively address central abdominal deformities. [4]

Conversely, the posterior component separation, or transversus abdominis release (TAR), corrects limitations of the anterior method such as wound issues and inadequate lateral defect closure. Releasing the transversus abdominis muscle via a posterior incision allows for medial movement of abdominal components without damaging the muscles, making it particularly effective for complex hernias and reducing wound complications. [5]

Both CST methods aim to restore abdominal wall functionality and prevent hernia recurrence. The choice between them often depends on the hernia's characteristics, the patient's past surgical experiences, and the surgeon's proficiency. This study compares these methods to understand their outcomes, complications, and best practices better. A thorough grasp of these techniques will help surgeons make well-informed decisions for treating large ventral hernias, thereby enhancing patient results. [6]

## Material and Methodology

This study was conducted at Darbhanga Medical College & Hospital, a well-known tertiary care center with a reputable general surgery department. Carried out between October 2021 and September 2023, the study sought to assess the efficacy of anterior and posterior separation of components techniques in the surgical treatment of sizable ventral hernias.

The study included a sample of 60 adult patients, aged 18 to 65 years, who were diagnosed with significant ventral hernias requiring surgical intervention. The participants were selected based on specific criteria and divided into two groups. Group A underwent the anterior component separation technique, while Group B went through the posterior component separation technique, especially the transverse abdominis release procedure.

A comprehensive preoperative assessment was performed for each participant, collecting detailed demographic information, hernia characteristics such as size and location, prior surgical history, and the intended type of anesthesia. Throughout the surgeries, detailed records were kept of various intraoperative factors, including the length of the procedure, any complications that arose, and the specific type of anesthesia administered. During the postoperative phase, extensive monitoring was conducted to gather information on recovery times, duration of hospital stays, any complications that arose after the surgery, and the likelihood of hernia recurrence. To ensure an unbiased comparison and reduce any potential bias in patient selection, the distribution of patients to either Group A or Group B was randomized using a computer-generated sequence. The study utilized a single-blind design, ensuring that the patients remained unaware of the surgical technique employed. However, the surgeons and research staff were fully informed throughout the process.

Data collection encompassed preoperative, intraoperative, and postoperative stages, and the statistical analysis was conducted using SPSS software. The chi-square test was used for categorical variables, and the t-test for continuous variables, with a p-value of less than 0.05 deemed significant, underlining the robustness of the study's findings.

Ethical approval for the study was granted by the Institutional Review Board of Darbhanga Medical College & Hospital. All participants provided informed consent after being thoroughly briefed about the study's objectives, the involved surgical procedures, and their right to withdraw at any time

without affecting their standard of care, ensuring ethical adherence throughout the research process.

## Results

In this comparative study of anterior and posterior component separation techniques for repairing large ventral hernias, both groups presented with similar demographic and preoperative characteristics, such as age, sex distribution, BMI, and comorbid conditions, ensuring a balanced foundation for comparison. Notably, patients in Group B, who underwent the posterior technique, exhibited larger hernias in both width and area and a higher incidence of loss of domain, potentially increasing the complexity of the surgeries and influencing the outcomes.

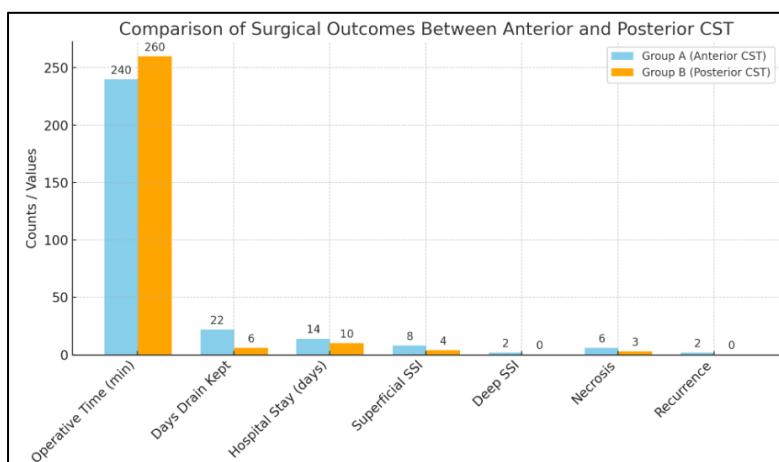
Surgical data revealed that Group B had a longer average operative time, 260 minutes, compared to 240 minutes for Group A, likely due to the more technically demanding nature of the posterior technique. A significant difference emerged in the duration for which surgical drains were required; Group A needed drains for an average of 22 days, indicating possibly more extensive dissection or fluid accumulation, whereas Group B only needed drains for 6 days. Furthermore, the average hospital stay was shorter for Group B, 10 days compared to 14 days for Group A, suggesting quicker recoveries possibly due to the less invasive approach or fewer complications in the posterior technique.

Regarding complications, Group A encountered higher rates of both superficial and deep surgical site infections, as well as instances of skin and soft tissue necrosis, which may be attributed to the larger dissections and associated wound-healing challenges of the anterior method. In contrast, Group B had a slightly higher occurrence of seroma and wound serous discharge, which are generally less severe complications compared to infections or necrosis. Notably, there were two instances of hernia recurrence in Group A, whereas Group B reported none, highlighting the posterior technique's effectiveness in achieving more durable repairs.

Overall, the posterior component separation (Group B) demonstrated several advantages over the anterior component separation (Group A), including shorter operative times, less need for postoperative drainage, shorter hospital stays, and lower rates of serious complications such as infections and hernia recurrence. These findings suggest that the posterior technique may be a more favorable option for surgical recovery and long-term outcomes, especially in patients with larger or more complex hernias.

**Table 1: This table provides a comprehensive overview of the clinical and demographic characteristics, operative details, and postoperative outcomes for each group.**

| Parameter                               | Group A (Anterior CST) | Group B (Posterior CST) |
|---|------------------------|-------------------------|
| Age (years, average)                    | 55.4                   | 53.6                    |
| Sex (male: female)                      | 5:25                   | 8:22                    |
| BMI (average, kg/m <sup>2</sup> )       | 30.4                   | 29.6                    |
| <b>Co-morbidities:</b>                  |                        |                         |
| - Obese (BMI>30)                        | 21                     | 19                      |
| - DM                                    | 6                      | 8                       |
| - COPD                                  | 2                      | 1                       |
| - HTN                                   | 12                     | 11                      |
| - IHD                                   | 0                      | 0                       |
| - Cerebrovascular disease               | 0                      | 1                       |
| ASA class (average)                     | 2                      | 2                       |
| Defect width (cm, average)              | 9.83                   | 10.31                   |
| Defect area (cm <sup>2</sup> , average) | 122.4                  | 129.8                   |
| Multiple defects                        | 7                      | 8                       |
| <b>Presenting symptoms:</b>             |                        |                         |
| - Painless bulge                        | 26                     | 26                      |
| - Painful swelling                      | 3                      | 4                       |
| - Sub acute obstruction                 | 1                      | 0                       |
| <b>Symptom duration (months):</b>       |                        |                         |
| - <20                                   | 15                     | 15                      |
| - 20-60                                 | 10                     | 12                      |
| - >60                                   | 5                      | 3                       |
| Irreducible                             | 4                      | 4                       |
| Loss of domain                          | 2                      | 6                       |
| Operative time (minutes, average)       | 240                    | 260                     |
| Days drain kept in situ (average)       | 22                     | 6                       |
| Hospital stay (days, average)           | 14                     | 10                      |
| <b>Postoperative complications:</b>     |                        |                         |
| - Superficial SSI                       | 8                      | 4                       |
| - Deep SSI                              | 2                      | 0                       |
| - Wound cellulitis                      | 2                      | 1                       |
| - Skin/soft tissue necrosis             | 6                      | 3                       |
| - Stitch abscess                        | 2                      | 0                       |
| - Seroma                                | 0                      | 2                       |
| - Wound serous discharge                | 0                      | 3                       |
| - Exposed mesh                          | 3                      | 1                       |
| Recurrence                              | 2                      | 0                       |



**Figure 1: The graph compares surgical outcomes between the anterior and posterior component separation techniques (Group A and Group B, respectively). It visually displays key metrics like operative time, drain duration, hospital stay length, and complication rates including surgical site infections, tissue**

**necrosis, and recurrences. This visualization clearly shows that the posterior CST typically yields better postoperative results and fewer complications compared to the anterior CST.**

### Discussion

The Darbhanga Medical College & Hospital study offers an in-depth analysis of two surgical techniques for large ventral hernia treatment: the anterior component separation technique (ACS) and the posterior component separation technique (PCS), specifically using transversus abdominis release. This discussion interprets these findings, examines their implications, and contextualizes them within existing research. [7]

Key differences between ACS and PCS were noted in operative times, complications, and recovery metrics such as hospital stays and drain removal duration. PCS had a slightly longer average operative time of 260 minutes compared to 240 minutes for ACS, but this was offset by benefits like reduced complications and shorter recovery times. [8] PCS patients experienced shorter durations for drain removal and hospital stays, likely due to fewer intraoperative complications and better postoperative healing, which might result from the less extensive dissection required by PCS. Furthermore, PCS had a lower incidence of surgical site infections and no recorded cases of hernia recurrence, unlike ACS which saw two recurrences and higher rates of skin and soft tissue necrosis, possibly due to more extensive tissue manipulation. [9]

Despite PCS's marginally longer operative time, it seems to provide superior outcomes for patients with large ventral hernias, especially those with complex or extensive defects. The lower rates of complications and hernia recurrences associated with PCS are significant, as these issues can impact patient quality of life and increase healthcare costs. [10]

These findings align with prior research, such as a systematic review by Smith et al., which also noted the lower recurrence and complication rates with PCS. However, the study faces limitations such as a relatively small sample size and a 12-month follow-up period, which may not fully capture long-term outcomes or rare complications. Also, being a single-center study may limit the generalizability of the results. [11]

Further research is recommended in larger, multicenter trials with longer follow-up periods to validate these findings. Future studies should also explore patient-centered outcomes like pain, functional status post-recovery, and overall quality of life to fully assess the advantages and disadvantages of each surgical technique. [12]

Overall, this study significantly supports the use of PCS over ACS in managing large ventral hernias, suggesting that surgeons might favor PCS due to its

lower complication rates and better postoperative outcomes, leading to enhanced patient care and more efficient resource utilization in surgical settings. [13,14]

### Conclusion

In this study, the effectiveness of two techniques for treating large ventral hernias was compared. The results showed that PCS, which involves transversus abdominis release, had better outcomes than the anterior component separation (ACS). In this study, the PCS technique demonstrated several advantages including shorter drainage periods and hospital stays, lower rates of surgical site infections, and no hernia recurrences. Although the operative time was slightly longer, the benefits of PCS outweighed this drawback. Based on these advantages, it seems that PCS could potentially offer a more efficient and safer method for addressing large ventral hernias, especially in complex situations. This approach not only improves patient recovery but also has the potential to lower healthcare expenses.

### References

1. Slater NJ, van Goor H, Bleichrodt RP. Large and complex ventral hernia repair using the "components separation technique" without mesh results in a high recurrence rate. *The American Journal of Surgery*. 2015 Jan 1;209(1):170-9.
2. Parshikov VV, Loginov VI. Components separation technique in treatment of patients with ventral and incisional hernias. *Современные технологии в медицине*. 2016;8(1 (eng)):183-92.
3. Kesicioglu T, Yildirim K, Yuruker S, Karabicak I, Koc Z, Erzurumlu K, Malazgirt Z. Three-year outcome after anterior component separation repair of giant ventral hernias: A retrospective analysis of the original technique without mesh. *Asian Journal of Surgery*. 2022 May 1;45(5):1117-21.
4. Ahmed MK, Mohamed HA, Hossam SA, Hesham MO. Comparative Study between Posterior Component Separation with Transversus Abdominis Release and Anterior Component Separation in Management of Large Ventral Abdominal Hernia. *The Medical Journal of Cairo University*. 2023 Mar 1;91(03):75-81.
5. Afaque MY, Rizvi AA. Comparison between transversus abdominis release and anterior component separation technique in complex ventral hernia. *International Journal of Abdominal Wall and Hernia Surgery*. 2020 Jul 1 ;3(3):81-6.

6. Hodgkinson JD, Leo CA, Maeda Y, Bassett P, Oke SM, Vaizey CJ, Warusavitarne J. A meta-analysis comparing open anterior component separation with posterior component separation and transversus abdominis release in the repair of midline ventral hernias. *Hernia*. 2018 Aug;22:617-26.
7. Cornette B, De Bacquer D, Berrevoet F. Component separation technique for giant incisional hernia: a systematic review. *The American Journal of Surgery*. 2018 Apr 1;215(4):719-26.
8. Holihan JL, Askenasy EP, Greenberg JA, Keith JN, Martindale RG, Roth JS, Mo J, Ko TC, Kao LS, Liang MK, Ventral Hernia Outcome Collaboration Writing Group. Component separation vs. bridged repair for large ventral hernias: a multi-institutional risk-adjusted comparison, systematic review, and meta-analysis. *Surgical infections*. 2016 Feb 1;17(1):17-26.
9. Gala J, Nichat P, Bhandarwar A, Dhimole N, Bhat R, Muley G. Single institute experiences in anterior and posterior component separation technique for the large ventral hernia: A retrospective review. *Asian Journal of Surgery*. 2022 Mar 1;45(3):854-9.
10. Balla A, Alarcon I, Morales-Conde S. Minimally invasive component separation technique for large ventral hernia: which is the best choice? A systematic literature review. *Surgical Endoscopy*. 2020 Jan;34:14-30.
11. Oprea V, Toma M, Grad O, Bucuri C, Pavel P, Chiorescu S, Moga D. The outcomes of open anterior component separation versus posterior component separation with transversus abdominis release for complex incisional hernias: a systematic review and meta-analysis. *Hernia*. 2023 Jun;27(3):503-17.
12. Sneider D, de Smet GH, den Hartog F, Verstoep L, Menon AG, Muysoms FE, Kleinrensink GJ, Lange JF. Medialization after combined anterior and posterior component separation in giant incisional hernia surgery, an anatomical study. *Surgery*. 2021 Dec 1;170(6):1749-57.
13. Feretis M, Orchard P. Minimally invasive component separation techniques in complex ventral abdominal hernia repair: a systematic review of the literature. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*. 2015 Apr 1;25(2):100-5.
14. Jensen KK, Henriksen NA, Jorgensen LN. Endoscopic component separation for ventral hernia causes fewer wound complications compared to open components separation: a systematic review and meta-analysis. *Surgical endoscopy*. 2014 Nov;28:3046-52.