The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume3, Issue 6, 2025

POSTOPERATIVE COMPLICATIONS OF COMPONENT SEPARATION PROCEDURE IN PATIENTS UNDERGOING INCISIONAL HERNIA SURGERY

Dr. Saad[*1], Dr Rashid Aslam[2], Dr Sajid Ur Rehman[3], Dr Ahsan Saleem[4], Dr Ibrahim[5]

*[*1,34]Post Graduate Trainee Department of General Surgery, MTI-Hayatabad Medical Complex, Peshawar, Pakistan*
[2]Professor, Department of General Surgery, MTI-Hayatabad Medical Complex, Peshawar, Pakistan
[5]Trainee Registrar, Bannu General surgery

[*1]saadafridi7@yahoo.com

DOI: https://doi.org/10.5281/zenodo.22916230

Keywords
Abdominal Wall; Hernia, Ventral; Postoperative Complications; Seroma; Surgical Wound Infection.

Article History
Received: 05 February 2025
Accepted: 20 May 2025
Published: 30 June 2025

Copyright @Author
Corresponding Author: *
Dr. Saad

Abstract

Objective: *To determine the frequency of postoperative complications after component separation for incisional hernia and assess associations with selected baseline characteristics.*

Study Design: *Descriptive cross-sectional study.*

Place and Duration of the Study: *Department of General Surgery, MTI-Hayatabad Medical Complex, Peshawar, Pakistan, from 3 August 2024 to 1st February 2025.*

Methodology: *We included 109 consecutive patients aged 18-60 years undergoing incisional hernia repair with component separation. Patients with uncontrolled diabetes mellitus, advanced cardiovascular disease, or chronic kidney disease were excluded. Seroma, surgical wound infection, and haematoma were assessed clinically on postoperative day 15 using prespecified definitions. Data were analysed using IBM SPSS Statistics, version 25.0. Continuous variables were summarised as mean ± standard deviation and categorical variables as frequency and percentage. Complication frequencies were reported with 95% Wilson confidence intervals; associations were tested using Pearson chi-square or two-sided Fisher exact test.*

Results: *Mean age was 39.98 ± 12.74 years and mean body mass index was 27.61 ± 4.88 kg/m². Seroma occurred in 26 (23.9%; 95% CI: 16.8-32.7%) patients, surgical wound infection in 11 (10.1%; 95% CI: 5.7-17.2%), and haematoma in 4 (3.7%; 95% CI: 1.4-9.1%). Seroma was more frequent in rural than urban residents [17 (33.3%) versus 9 (15.5%); p=0.029]. Surgical wound infection was associated with age group (p=0.020) and occupation (p=0.024); haematoma showed no significant association.*

Conclusion: *Seroma and surgical wound infection were the most frequent postoperative complications. Seroma was associated with residence, while surgical wound infection was associated with age group and occupation; haematoma was uncommon.*

INTRODUCTION

An incisional hernia is a defect of the abdominal wall at, or close to, a previous operative incision through which intra-abdominal contents may protrude. Its clinical spectrum ranges from an asymptomatic bulge to pain, functional limitation, bowel obstruction, or strangulation. Contemporary European Hernia Society guidance emphasizes clear anatomical description, optimization of modifiable risk factors, and restoration of the abdominal wall whenever feasible.[1-4]

Large or complex incisional hernias may not permit tension-free midline closure by conventional repair. The component separation procedure was developed to mobilize the myofascial layers of the abdominal wall and facilitate medial advancement while preserving functional tissue.[5] Both anterior and posterior approaches are used in current practice. Although these procedures can achieve durable reconstruction, the extent of dissection and the complexity of the underlying hernia expose patients to wound-related morbidity, particularly seroma, surgical site infection, and haematoma.[6-8] Recent pooled evidence shows that postoperative wound outcomes vary according to component separation approach, patient selection, operative technique, and outcome definitions.[6,7] Long-term data support the reconstructive value of component separation, but short-term complications remain clinically important because they may prolong treatment and compromise recovery.[9] Evidence from Hayatabad Medical Complex has also demonstrated measurable postoperative morbidity after component separation for complex abdominal wall hernias.[10] However, institution-specific data describing the frequency of early complications and their distribution across patient characteristics remain limited. The objective of this study was to determine the frequency of postoperative complications of component separation procedure in patients undergoing incisional hernia surgery at Hayatabad Medical Complex, Peshawar, and to assess their associations with selected baseline characteristics.

Methodology

This descriptive cross-sectional study was conducted in the Department of General Surgery, Medical Teaching Institution-Hayatabad Medical Complex, Peshawar, from 3 August 2024 to 1st February 2025. The research synopsis was approved by the College of Physicians and Surgeons Pakistan (CPSP; Ref. No. CPSP/REU/SGR-2022-021-14281, dated 3 August 2024). Ethical approval was obtained from the Hospital Research and Ethical Committee of MTI-Hayatabad Medical Complex before data collection (Approval No. 1896, dated 27 June 2024). Written informed consent was obtained from every participant.

The sample size was calculated with the World Health Organization sample-size calculator using an anticipated postoperative hematoma frequency of 6.1%,[8] a 95% confidence level, and a 4.5% margin of error; the required sample was 109. Participants were recruited through non-probability consecutive sampling. Men and women aged 18-60 years who had an incisional hernia according to the approved operational definition and were scheduled for repair using component separation were eligible. Patients with uncontrolled diabetes mellitus, advanced cardiovascular disease, chronic kidney disease, or another serious condition precluding the planned operation were excluded.

Data were recorded on the approved proforma. Baseline variables comprised age, sex, height, weight, body mass index (BMI), socioeconomic status, occupation, education, and residence. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). Component separation was performed under general anesthesia by the operating surgical team according to the institutional standard operating procedure. No comparative intervention or treatment group was assigned.

The postoperative outcomes were assessed clinically at the scheduled 15-day evaluation using the approved operational definitions. Seroma was recorded when the patient had pain of at least 3 on the visual analogue scale and local tenderness, with a swollen lump discharging clear fluid from the procedure site. Surgical wound infection was

recorded when swelling, redness, pain of at least 4 on the visual analogue scale, and purulent discharge from the wound were present. Haematoma was recorded when a swollen, tender operative-site area with ecchymosis attributable to a collection of blood beneath the skin was identified. Each outcome was entered as present or absent.

Data were analyzed using IBM SPSS Statistics, version 25.0. Distributional assumptions for continuous variables were assessed with the Shapiro-Wilk test. Age, height, weight, and BMI were summarized as mean ± standard deviation. The categorical variables were age group, BMI category, sex, socioeconomic status, occupation, education, residence, seroma, surgical wound infection, and haematoma; these were reported as frequencies and percentages. Wilson 95% CIs were calculated for the three complication frequencies. Age was stratified as <40 and ≥40 years, and BMI as <25 and ≥25 kg/m². Associations of seroma, surgical wound infection, and haematoma with age group, BMI category, occupation, education, and residence were assessed. Pearson chi-square test was used when expected cell counts were adequate; otherwise, a two-sided Fisher exact test was applied. A p-value ≤0.05 was considered statistically significant.

Results

All 109 enrolled patients were included in the analysis, and there were no missing values for the analyzed variables. The mean age was 39.98 ± 12.74 years, mean height was 1.66 ± 0.09 m, mean weight was 75.39 ± 11.16 kg, and mean BMI was 27.61 ± 4.88 kg/m². There were 62 (56.9%) women and 47 (43.1%) men. Fifty-six (51.4%) participants were aged ≥40 years, 75 (68.8%) had BMI ≥25 kg/m², 55 (50.5%) were employed, 55 (50.5%) were uneducated, and 58 (53.2%) lived in urban areas. Seroma occurred in 26 (23.9%; 95% CI: 16.8-32.7%) patients, surgical wound infection in 11 (10.1%; 95% CI: 5.7-17.2%), and haematoma in 4 (3.7%; 95% CI: 1.4-9.1%) (Table I).

Table I: Baseline characteristics and postoperative complications (n=109)

Characteristic	Value
Age (years)	39.98 ± 12.74
Height (m)	1.66 ± 0.09
Weight (kg)	75.39 ± 11.16
BMI (kg/m²)	27.61 ± 4.88
Age group	
<40 years	53 (48.6)
≥40 years	56 (51.4)
BMI category	
<25 kg/m²	34 (31.2)
≥25 kg/m²	75 (68.8)
Sex	
Female	62 (56.9)
Male	47 (43.1)
Socioeconomic status	

Characteristic	Value
Lower	37 (33.9)
Middle	31 (28.4)
Upper	41 (37.6)
Occupation	
Employed	55 (50.5)
Unemployed	54 (49.5)
Education	
Educated	54 (49.5)
Uneducated	55 (50.5)
Residence	
Rural	51 (46.8)
Urban	58 (53.2)
Postoperative complication	
Seroma	26 (23.9)
Surgical wound infection	11 (10.1)
Haematoma	4 (3.7)

Continuous variables are presented as mean ± standard deviation; categorical variables as n (%).

IEER
Institute for Excellence in Education & Research

Seroma showed no significant association with age group (p=0.872), BMI category (p=0.590), occupation (p=0.341), or education (p=0.957). A significant association was observed with residence: seroma occurred in 17 (33.3%) rural residents compared with 9 (15.5%) urban residents (p=0.029; Table II).

Table II: Association of seroma with baseline characteristics (n=109)

Characteristic	Category	Seroma present n (%)	Seroma absent n (%)	p-value
Age group	<40 years	13 (24.5)	40 (75.5)	0.872[a]
	≥40 years	13 (23.2)	43 (76.8)	
BMI category	<25 kg/m²	7 (20.6)	27 (79.4)	0.590[a]
	≥25 kg/m²	19 (25.3)	56 (74.7)	
Occupation	Employed	11 (20.0)	44 (80.0)	0.341[a]
	Unemployed	15 (27.8)	39 (72.2)	
Education	Educated	13 (24.1)	41 (75.9)	0.957[a]
	Uneducated	13 (23.6)	42 (76.4)	

Characteristic	Category	Seroma present n (%)	Seroma absent n (%)	p-value
Residence	Rural	17 (33.3)	34 (66.7)	0.029[a]
	Urban	9 (15.5)	49 (84.5)	

a Pearson chi-square test.

Surgical wound infection occurred in 9 (17.0%) patients aged <40 years and 2 (3.6%) patients aged ≥40 years (p=0.020). It was also more frequent among unemployed than employed participants [9 (16.7%) versus 2 (3.6%); p=0.024]. There was no significant association with BMI category (p=1.000), education (p=0.324), or residence (p=0.925). Haematoma was uncommon and showed no significant association with age group (p=0.354), BMI category (p=0.307), occupation (p=0.618), education (p=0.363), or residence (p=0.621; Table III).

Table III: Associations of surgical wound infection and haematoma with baseline characteristics (n=109)

Characteristic	Category	Surgical wound infection			Haematoma		
		Present n (%)	Absent n (%)	p-value	Present n (%)	Absent n (%)	p-value
Age group	<40 years	9 (17.0)	44 (83.0)	0.020[a]	3 (5.7)	50 (94.3)	0.354[b]
	≥40 years	2 (3.6)	54 (96.4)		1 (1.8)	55 (98.2)	
BMI category	<25 kg/m²	3 (8.8)	31 (91.2)	1.000[b]	0 (0.0)	34 (100.0)	0.307[b]
	≥25 kg/m²	8 (10.7)	67 (89.3)		4 (5.3)	71 (94.7)	
Occupation	Employed	2 (3.6)	53 (96.4)	0.024[a]	3 (5.5)	52 (94.5)	0.618[b]
	Unemployed	9 (16.7)	45 (83.3)		1 (1.9)	53 (98.1)	
Education	Educated	7 (13.0)	47 (87.0)	0.324[a]	3 (5.6)	51 (94.4)	0.363[b]
	Uneducated	4 (7.3)	51 (92.7)		1 (1.8)	54 (98.2)	
Residence	Rural	5 (9.8)	46 (90.2)	0.925[a]	1 (2.0)	50 (98.0)	0.621[b]
	Urban	6 (10.3)	52 (89.7)		3 (5.2)	55 (94.8)	

a Pearson chi-square test; b two-sided Fisher exact test.

Discussion

This study quantified three prespecified postoperative complications after component separation in 109 patients. Seroma was documented in 26 (23.9%), surgical wound infection in 11 (10.1%), and haematoma in 4 (3.7%) patients. Seroma was associated with residence, and surgical wound infection was associated with age group and occupation. No evaluated characteristic was associated with haematoma. These were unadjusted subgroup associations and should not be interpreted as independent predictors.

Seroma was the most frequent complication. A 2023 systematic review and meta-analysis of 3,412 patients reported a pooled seroma rate of 9.75% after component separation, while a newer meta-analysis reported rates of approximately 16-17% across anterior and posterior approaches.[6,7] A local cohort from Hayatabad Medical Complex reported seroma in 16.7% of patients who underwent posterior component separation with

transversus abdominis release and in 2.2% of those treated without that release.[10] Component separation creates broad tissue planes and may disrupt lymphatic channels, so differences in dissection, drain use, mesh position, surveillance, and the operational definition of seroma can materially affect reported frequency. Local experience has also confirmed the feasibility of component separation in complex incisional hernia repair, although study designs and follow-up periods differ.[11]

The higher seroma proportion among rural residents [17 (33.3%) versus 9 (15.5%)] is an exploratory finding. Residence may reflect differences in access to postoperative review, travel burden, wound-care resources, or unmeasured socioeconomic and clinical factors. These variables were not captured in sufficient detail, and the analysis was not adjusted for confounding. Consequently, the result establishes an association within this sample but does not support a causal explanation.

The surgical wound infection frequency of 11 (10.1%) was close to the pooled 10.6% surgical site infection rate reported by Oprea et al.[6] The Spanish EVEREG registry likewise demonstrated clinically relevant wound morbidity after both anterior and posterior component separation.[8] Series of posterior component separation with transversus abdominis release have reported surgical site infection rates ranging from approximately 9% to 16%, depending on case complexity and follow-up.[13,14,20] Comparative studies indicate that extensive open anterior dissection may increase wound complications, whereas posterior or minimally invasive approaches can reduce subcutaneous tissue disruption.[16-19] Because the present dataset did not distinguish component separation subtype or other operative details, technique-specific comparisons were not possible.

Surgical wound infection was more frequent among patients aged <40 years and among unemployed participants. The direction of the age association was not anticipated from conventional surgical risk profiles and may be influenced by the small number of infection events, residual confounding, or chance arising from multiple subgroup tests. Occupation may similarly act as a proxy for nutritional, economic, hygiene, or follow-up differences that were not directly measured. The results therefore warrant cautious interpretation and should not be presented as causal risk estimates.

Haematoma was identified in 4 (3.7%) patients, closely matching the pooled rate of 3.83% reported in the 2023 meta-analysis.[6] BMI category was not significantly associated with any of the three early outcomes in this sample. This finding does not exclude an effect of obesity on other endpoints: larger component-separation cohorts have linked BMI above 30 kg/m² and surgical site infection with recurrence.[12] Contemporary evidence also indicates that perioperative technique, reconstructive approach, and wound-management strategies may modify morbidity.[15,18-20]

The study strengths included a prespecified protocol, consecutive recruitment, complete data for all 109 participants, and reconciliation of manuscript values with both the raw SPSS dataset and the complete output. Important limitations were the single-center design, lack of a comparison group, assessment limited to the early 15-day postoperative period, and absence of variables describing hernia dimensions, component separation subtype, mesh plane, drain use, comorbidities beyond the exclusion criteria, and perioperative wound-management practices. Only 11 infections and 4 haematomas occurred, which limited statistical precision. Multiple unadjusted subgroup analyses were performed without multivariable modelling or multiplicity correction; significant associations should therefore be considered exploratory. Longer follow-up would be required to assess recurrence, function, and quality of life, outcomes that are central to contemporary component separation research.[9,13]

Conclusion

Seroma and surgical wound infection were the most frequent early postoperative complications after component separation procedure, whereas haematoma was uncommon. Seroma was associated with residence, and surgical wound

infection was associated with age group and occupation. No significant association was observed between haematoma and the evaluated baseline characteristics. These subgroup findings were unadjusted and should be interpreted as exploratory.

Ethical Approval:
Ethical approval was obtained from the Hospital Research and Ethical Committee, MTI-Hayatabad Medical Complex, Peshawar (Approval No. 1896; dated 27 June 2024), before data collection.

Patients' Consent:
Written informed consent was obtained from all participants before enrolment and data collection.

Disclosure:
This article is based on a CPSP-approved research synopsis (Ref. No. CPSP/REU/SGR-2022-021-14281; dated 3 August 2024).

Competing Interest:
The authors declared no conflict of interest.

Funding:
No external funding was received.

Authors' Contribution:
Conception and design of the study, data acquisition, data analysis and interpretation, drafting of the manuscript, and final approval of the version to be published. RA: Supervision of the study, interpretation of data, critical revision for important intellectual content, and final approval of the version to be published. Both authors agreed to be accountable for all aspects of the work.

REFERENCES

Sanders DL, Pawlak MM, Simons MP, Aufenacker T, Balla A, Berger C, et al. Midline incisional hernia guidelines: the European Hernia Society. Br J Surg 2023;**110**(12):1732-1768. doi:10.1093/bjs/znad284.

Deerenberg EB, Henriksen NA, Antoniou GA, Antoniou SA, Bramer WM, Fischer JP, et al. Updated guideline for closure of abdominal wall incisions from the European and American Hernia Societies. Br J Surg 2022;**109**(12):1239-1250. doi:10.1093/bjs/znac302.

Muysoms FE, Miserez M, Berrevoet F, Campanelli G, Champault GG, Chelala E, et al. Classification of primary and incisional abdominal wall hernias. Hernia 2009;**13**(4):407-414. doi:10.1007/s10029-009-0518-x.

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.

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.

Oprea V, Toma M, Grad O, Bucuri C, Pavel P, Chiorescu S, et al. 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;**27**(3):503-517. doi:10.1007/s10029-023-02745-8.

Mohamedahmed AY, Issa MT, Zaman S, Mohammed S, Mohamedahmed MY, Hamid M, et al. Outcomes of anterior component separation versus posterior component separation with transversus abdominis muscle release for large incisional hernias: a systematic review and meta-analysis. Hernia 2025;**29**(1):289. doi:10.1007/s10029-025-03487-5.

Pereira-Rodriguez JA, Bravo-Salva A, Montcusi-Ventura B, Hernandez-Granados P, Rodrigues-Goncalves V, Lopez-Cano M. Early outcomes of component separation techniques: an analysis of the Spanish registry of incisional hernia (EVEREG). Hernia 2021;**25**(6):1573-1580. doi:10.1007/s10029-021-02449-x.

Fry BT, Schoel LJ, Howard RA, Thumma JR, Kappelman AL, Hallway AK, et al. Long-term outcomes of component separation for abdominal wall hernia repair. JAMA Surg 2025;**160**(1):10-18. doi:10.1001/jamasurg.2024.5091.

Ahmad S, Muhammad S, Iftikhar M, Alam M, Aslam R, Khan MB. Outcomes of posterior component separation technique with and without transverse abdominus release in the management of complex abdominal wall hernias. J Gandhara Med Dent Sci 2025;**12**(2):64-68. doi:10.37762/jgmds.12-2.638.

Faraz A, Gul A, Bangash A, Naseer S, Khan SJ, Rehman AU. Early versus late repair of incisional hernia following laparostomy for enterocutaneous fistulas using component separation technique and onlay placement of polypropylene mesh. J Khyber Coll Dent 2023;**13**(1):28-34. doi:10.33279/jkcd.v13i1.55.

Bueno-Lledo J, Bonafe-Diana S, Carbonell-Tatay F, Torregrosa-Gallud A, Pous-Serrano S. Component separation and large incisional hernia: predictive factors of recurrence. Hernia 2021;**25**(6):1593-1600. doi:10.1007/s10029-021-02489-3.

Sadava EE, Pena ME, Bras Harriott C, Casas MA, Schlottmann F, Laxague F. Long-term outcomes and quality of life assessment after posterior component separation with transversus abdominis muscle release. Surg Endosc 2022;**36**(2):1278-1283. doi:10.1007/s00464-021-08402-4.

Chatzimavroudis G, Kotoreni G, Kostakis I, Voloudakis N, Christoforidis E, Papaziogas B. Outcomes of posterior component separation with transversus abdominis release in large and other complex ventral hernias: a single-surgeon experience. Hernia 2022;**26**(5):1275-1283. doi:10.1007/s10029-021-02520-7.

Guo C, Cheng T, Li J. Prophylactic negative pressure wound therapy for closed laparotomy incisions after ventral hernia repair: a systematic review and meta-analysis. Int J Surg 2022;**97**:106216. doi:10.1016/j.ijsu.2021.106216.

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. Surg Endosc 2020;**34**(1):14-30. doi:10.1007/s00464-019-07156-4.

Maloney SR, Schlosser KA, Prasad T, Colavita PD, Kercher KW, Augenstein VA, et al. The impact of component separation technique versus no component separation technique on complications and quality of life in the repair of large ventral hernias. Surg Endosc 2020;**34**(2):981-987. doi:10.1007/s00464-019-06892-x.

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 2019;**23**(1):5-15. doi:10.1007/s10029-018-1870-5.

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.2011.10.009.

Novitsky YW, Fayezizadeh M, Majumder A, Neupane R, Elliott HL, Orenstein SB. Outcomes of posterior component separation with transversus abdominis muscle release and synthetic mesh sublay reinforcement. Ann Surg 2016;**264**(2):226-232. doi:10.1097/SLA.0000000000001673.