



Outcome of Bilateral V-Y Advancement Flap for Management of Gluteal Pressure Injury in Spinal Cord Injured Patients at National Orthopaedic Hospital Dala Kano Nigeria

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Abstract

Background: Pressure injuries are a common and devastating complication in spinal cord injured patients, leading to prolonged hospitalization and significant morbidity. Surgical reconstruction with flaps provides durable, vascularized tissue coverage over bony prominences. This study evaluated the outcomes of bilateral V-Y advancement flaps for gluteal pressure injuries, including patient satisfaction and quality of life, in spinal cord injured patients at a Nigerian tertiary centre. **Methods:** A retrospective cohort study of 63 patients who underwent bilateral V-Y advancement flap reconstruction for gluteal and sacral pressure injuries at the National Orthopaedic Hospital Dala, Kano, from January 2019 to June 2025 was conducted. Outcomes assessed included flap survival, wound healing, complications, recurrence, patient satisfaction, and quality of life (SF-36). Multivariate logistic regression identified predictors of good outcome. **Results:** Complete flap survival was achieved in 61 patients (96.8%). Primary healing occurred in 48 patients (76.2%). Complications occurred in 15 patients (23.8%): dehiscence (9.5%), seroma (6.3%), infection (4.8%), and partial necrosis (3.2%). Recurrence occurred in 7 patients (11.1%) during follow-up. Patient satisfaction was high, with 82.5% reporting satisfaction with surgical outcomes. Quality of life significantly improved across phys-

ical ($p < 0.001$) and emotional ($p < 0.001$) domains. Independent predictors of good outcome included: age < 50 years (adjusted OR 3.2, 95% CI: 1.4 - 7.3), absence of diabetes mellitus (OR 2.8, 95% CI: 1.2 - 6.5), and adequate postoperative pressure off-loading (OR 4.1, 95% CI: 1.6 - 10.5). **Conclusions:** Bilateral V-Y advancement flap is an effective technique for gluteal pressure injury reconstruction, with high flap survival, acceptable complication rates, and significant improvements in patient satisfaction and quality of life. Younger age, absence of diabetes, and adequate postoperative off-loading are significant predictors of successful outcomes.

Subject Areas

Global Health

Keywords

Pressure Injury, Gluteal Pressure Sore, V-Y Advancement Flap, Spinal Cord Injury, Patient Satisfaction, Nigeria

1. Introduction

Pressure injuries (PIs), also known as pressure ulcers or bedsores, are a common and devastating complication in patients with spinal cord injury (SCI), occurring in up to 30% - 40% of individuals during their lifetime [1]. The development of pressure sores in the course of managing a paraplegic represents a major setback that not only delays rehabilitation but also prolongs hospital stay [1]. These injuries result from prolonged pressure over bony prominences, leading to tissue ischemia, necrosis, and deep tissue destruction [2].

The sacral and gluteal regions are among the most commonly affected sites in spinal cord injured patients due to prolonged sitting and supine positioning [3]. Advanced stage III and IV pressure injuries require surgical intervention to provide durable, vascularized tissue coverage and to prevent recurrence [4]. Several flap options have been described for gluteal pressure sore reconstruction, including gluteus maximus myocutaneous flaps, tensor fascia lata flaps, and fasciocutaneous advancement flaps [4].

The V-Y advancement flap, particularly the bilateral gluteal V-Y advancement flap, has gained popularity due to its reliability, ease of execution, and ability to provide tension-free closure of large defects [5]. A study of 14 patients who underwent interdigitating fasciocutaneous gluteal V-Y advancement flaps for sacral pressure sores reported complete flap survival and no recurrences during 6 - 16 months of follow-up [6]. Bilateral fasciocutaneous V-Y advancement flaps have been shown to provide durable reconstruction and effective redistribution of tension, even in patients with challenging comorbidities [4].

Beyond surgical success, patient satisfaction and quality of life are increasingly recognised as critical outcome measures. Studies have demonstrated that surgical

closure of pressure ulcers significantly improves quality of life, with patients reporting better physical, emotional, and social functioning [7]. Bundled care interventions that include psychological support and patient education have been shown to further enhance quality of life and nursing satisfaction [8]. However, specific data on patient satisfaction and quality of life following bilateral V-Y advancement flaps for gluteal pressure injuries in Nigeria are lacking.

This study aimed to evaluate the outcomes of bilateral V-Y advancement flap reconstruction for gluteal pressure injuries in spinal cord injured patients at the National Orthopaedic Hospital Dala, Kano, including patient satisfaction and quality of life, and to identify predictors of good outcome.

2. Methodology

2.1. Study Design and Setting

This was a retrospective cohort study conducted at the National Orthopaedic Hospital Dala, Kano, Nigeria- a 250-bed tertiary orthopaedic referral centre serving northern Nigeria. The study covered the period from 1 January 2019 to 30 June 2025. Ethical approval was obtained from the institutional research ethics committee and individual patient consent was waived due to the retrospective nature.

2.2. Participants and Selection Flow

All consecutive patients with spinal cord injury who underwent bilateral V-Y advancement flap reconstruction for gluteal or sacral pressure injuries during the study period were assessed for eligibility. Patient selection flow: A total of 89 patients with spinal cord injury and pressure injuries were screened. Of these, 16 were excluded: 9 had incomplete medical records, 5 were lost to follow-up before 6 months, and 2 had undergone alternative flap procedures. The final analytic sample comprised 63 patients: 51 male (81.0%) and 12 female (19.0%).

2.3. Anatomical Terminology

This study included pressure injuries located in the gluteal and sacral regions. All patients had stage III or IV pressure injuries (NPUAP classification) involving the gluteal musculature or sacral prominence. The term “gluteal pressure injury” is used throughout to describe injuries in the gluteal region, which may also extend to the sacral area.

2.4. Surgical Technique

All patients underwent bilateral V-Y advancement flap reconstruction under general or spinal anaesthesia. The procedure involved radical debridement of the pressure injury, including excision of all necrotic tissue, bursa, and any underlying osteomyelitic bone; wound bed preparation with irrigation and haemostasis; design of bilateral V-Y fasciocutaneous flaps based on the gluteal region; advancement of the flaps into the defect and closure in a Y-shaped configuration; and placement of suction drains and layered closure. Interdigitation of the flaps was

used to break the midline vertical scar and reduce tension, as described by Ay *et al.* [6]. **Figure 1** and **Figure 2** showed the Pre and Post-op image of the technique.



Figure 1. Pre-operative.



Figure 2. Post operative.

2.5. Data Collection

Data were extracted from patient case files, operative notes, and follow-up records. Variables collected included: age, sex, duration of SCI, level of injury, ASIA Impairment Scale grade, comorbidities (diabetes mellitus, hypertension), nutritional status (albumin), ulcer characteristics (size, stage, duration, presence of infection/osteomyelitis), and flap dimensions.

Definition of Adequate Postoperative Pressure Off-Loading

Adequate postoperative pressure off-loading was defined as adherence to a structured off-loading protocol comprising: 1) use of an air-fluidized or low-air-loss therapy bed for a minimum of 14 days postoperatively; 2) strict prohibition of sitting or lying directly on the surgical site for 6 weeks; 3) repositioning every 2 hours using a turning schedule; and 4) use of a specialized cushion (gel cushion) when sitting was resumed. Adherence was assessed by the ward nursing team and documented in the patient's daily nursing records. The off-loading protocol was initiated immediately postoperatively and continued for 6 weeks. Data on off-loading were obtained from nursing chart documentation and physiotherapy records.

Patient Satisfaction and Quality of Life Assessment

Patient satisfaction was assessed using a structured questionnaire administered at final follow-up (mean 18.4 ± 6.8 months). The questionnaire comprised 5 items rated on a 5-point Likert scale (1 = very dissatisfied to 5 = very satisfied). Overall satisfaction was defined as a mean score ≥ 4 (satisfied or very satisfied). The questionnaire was administered to 57 patients (90.5%) who were available for follow-up; 6 patients could not be contacted.

Quality of life was evaluated using the Short Form-36 (SF-36) questionnaire [9], administered preoperatively and at 12-month follow-up. Of the 63 patients, 57 (90.5%) completed both preoperative and postoperative SF-36 assessments; 6 patients were lost to follow-up or had incomplete questionnaires. Paired analysis included only patients with both preoperative and postoperative scores ($n = 57$). The SF-36 measures eight domains: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. Higher scores indicate better quality of life.

Outcome Measures

- Flap survival: Complete survival, partial necrosis, or total necrosis.
- Primary healing: Wound healing without complications.
- Complications: Dehiscence, seroma, infection, haematoma.
- Recurrence: Development of a new pressure injury at the same site.
- Good outcome: Defined as complete flap survival with primary healing and no recurrence.
- Patient satisfaction: Self-reported satisfaction with surgical outcomes.
- Quality of life: SF-36 scores preoperatively and at follow-up.

2.6. Statistical Analysis

Data were analysed using SPSS version 26. Continuous variables are presented as mean $\pm$ SD, categorical as frequencies (%). Paired t-tests compared pre- and post-operative SF-36 scores. Univariate and multivariate logistic regression identified independent predictors of good outcome. Variables with $p < 0.10$ in univariate analysis were entered into the multivariate model. Given 48 patients with good outcome (complete flap survival, primary healing, no recurrence), the final model retained 3 predictors (age < 50 years, absence of diabetes mellitus, adequate post-operative pressure off-loading) to maintain a stable events-per-variable ratio (>10 events per predictor) [10]. Adjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Patient Characteristics

A total of 63 patients were included. The mean age was 42.6 ± 14.8 years (range 18 - 72). Males constituted 81.0% (51/63). The mean duration of spinal cord injury was 4.2 ± 2.8 years. The most common level of injury was thoracic (54.0%), followed by lumbar (28.6%) and cervical (17.5%). Comorbidities included diabetes

mellitus (22.2%) and hypertension (28.6%). **Table 1** presents the baseline characteristics.

Table 1. Baseline characteristics of 63 patients characteristic, category value.

Age (years) Mean $\pm$ SD	42.6 $\pm$ 14.8
Sex	
Male	51 (81.0)
Female	12 (19.0)
Duration of SCI (years) Mean $\pm$ SD	4.2 $\pm$ 2.8
Level of injury	
Cervical	11 (17.5)
Thoracic	34 (54.0)
Lumbar	18 (28.6)
ASIA grade	
A (complete)	47 (74.6)
B - D (incomplete)	16 (25.4)
Comorbidities	
Diabetes mellitus	14 (22.2)
Hypertension	18 (28.6)

3.2. Outcomes

Table 2 presents the outcomes. Complete flap survival was achieved in 61 patients (96.8%). Partial necrosis occurred in 2 patients (3.2%), and total necrosis in 0 patients. Primary healing occurred in 48 patients (76.2%). Complications occurred in 15 patients (23.8%): dehiscence (9.5%), seroma (6.3%), infection (4.8%), and partial necrosis (3.2%). Recurrence occurred in 7 patients (11.1%) during a mean follow-up of 18.4 ± 6.8 months. Good outcome (complete flap survival, primary healing, no recurrence) was achieved in 48 patients (76.2%).

Table 2. Outcomes.

Outcome	n	%
Flap survival		
Complete survival	61	96.8
Partial necrosis	2	3.2
Total necrosis	0	0
Primary healing	48	76.2
Good outcome	48	76.2
Complications	15	23.8

Continued

Dehiscence	6	9.5
Seroma	4	6.3
Infection	3	4.8
Partial necrosis	2	3.2
Recurrence	7	11.1

3.3. Quality of Life

Table 3 presents the SF-36 quality of life scores. Significant improvements were observed across all domains, with the greatest improvements in physical functioning (38.4 ± 12.6 to 62.8 ± 14.2 , $p < 0.001$), role-physical (22.6 ± 10.8 to 48.4 ± 14.6 , $p < 0.001$), and bodily pain (31.2 ± 11.4 to 58.6 ± 13.8 , $p < 0.001$). Paired analysis included 57 patients with both preoperative and postoperative scores.

Table 3. SF-36 quality of life scores (Paired analysis, $n = 57$).

Domain	Preoperative	Postoperative (12 months)	p-value
Physical functioning	38.4 ± 12.6	62.8 ± 14.2	<0.001
Role-physical	22.6 ± 10.8	48.4 ± 14.6	<0.001
Bodily pain	31.2 ± 11.4	58.6 ± 13.8	<0.001
General health	42.8 ± 13.2	54.6 ± 12.4	<0.001
Vitality	35.6 ± 12.8	52.4 ± 13.6	<0.001
Social functioning	28.4 ± 11.6	56.2 ± 14.8	<0.001
Role-emotional	24.8 ± 10.2	46.8 ± 15.2	<0.001
Mental health	40.2 ± 12.4	58.4 ± 13.2	<0.001

3.4. Predictors of Good Outcome

Univariate analysis (**Table 4**) identified age < 50 years (OR 2.8, 95% CI: 1.3 - 6.2), absence of diabetes mellitus (OR 2.5, 95% CI: 1.1 - 5.8), adequate postoperative pressure off-loading (OR 3.8, 95% CI: 1.5 - 9.6), and hypertension (OR 1.8, 95% CI: 0.8 - 4.1) as factors associated with good outcome ($p < 0.10$). Multivariate logistic regression (**Table 5**) retained three independent predictors:

Table 4. Univariable estimates for predictors of good outcome.

Predictor	OR (95% CI)	p-value
Age < 50 years	2.8 (1.3 - 6.2)	0.008
Absence of diabetes mellitus	2.5 (1.1 - 5.8)	0.03
Adequate postoperative pressure off-loading	3.8 (1.5 - 9.6)	0.004
Hypertension	1.8 (0.8 - 4.1)	0.14
Preoperative albumin ≥ 3.5 g/dL	1.4 (0.6 - 3.2)	0.42

Table 5. Multivariate logistic regression-predictors of good outcome.

Predictor	Adjusted OR	95% CI	p-value
Age < 50 years	3.2	1.4 - 7.3	0.006
Absence of diabetes mellitus	2.8	1.2 - 6.5	0.02
Adequate postoperative pressure off-loading	4.1	1.6 - 10.5	0.003
Hypertension	1.6	0.7 - 3.7	0.28

- Age < 50 years: adjusted OR 3.2 (95% CI: 1.4 - 7.3), $p = 0.006$
- Absence of diabetes mellitus: adjusted OR 2.8 (95% CI: 1.2 - 6.5), $p = 0.02$
- Adequate postoperative pressure off-loading: adjusted OR 4.1 (95% CI: 1.6 - 10.5), $p = 0.003$

The final model was based on 48 outcome events (good outcome) and 63 complete records, with 3 predictors retained to maintain a stable events-per-variable ratio (>10 events per predictor).

3.5. Patient Satisfaction Survey

The patient satisfaction survey is shown in **Table 6**. Patient satisfaction was assessed in 57 patients (90.5%) available for follow-up. Overall, 47 patients (82.5% of those assessed, 74.6% of total cohort) reported satisfaction with their surgical outcomes. The most commonly cited reasons for satisfaction were improved sitting tolerance (78.7%), reduced wound care burden (72.3%), and regained independence in daily activities (61.7%). Among those dissatisfied ($n = 10$, 17.5%), reasons included persistent pain (60.0%) and recurrence (30.0%).

Table 6. Patient satisfaction survey results.

Item	Satisfied/Very Satisfied (%)
Overall satisfaction with surgery	82.5
Improved sitting tolerance	78.7
Reduced wound care burden	72.3
Regained independence in daily activities	61.7
Would recommend surgery to others	78.9

4. Discussion

This study evaluated the outcomes of bilateral V-Y advancement flap reconstruction for gluteal pressure injuries in spinal cord injured patients, including patient satisfaction and quality of life. The findings demonstrate that this technique is effective and reliable, with complete flap survival of 96.8% (61/63 patients), primary healing in 76.2% of patients, and high patient satisfaction (82.5%). The V-Y advancement flap is particularly suited for gluteal and sacral defects, as it provides adequate padding, has a reliable blood supply, and avoids the donor-site morbid-

ity associated with muscle flaps [6].

The complete flap survival rate of 96.8% in our cohort is comparable to the 100% survival reported in a study of 14 patients who underwent interdigitating fasciocutaneous gluteal V-Y advancement flaps for sacral defects, with no major complications [8]. A study of 40 patients with stage IV pressure injuries and spinal cord injury using a simplified V-Y fasciocutaneous flap technique reported no cases of partial or total necrosis, with a complication rate of 35% [3]. Our complication rate of 23.8% is consistent with the 19% - 58% range reported in the literature [3] [11]. The most common complication in our series was dehiscence (9.5%), which can be attributed to tension along the midline closure, a known challenge in V-Y advancement flaps [12].

The recurrence rate of 11.1% at 18 months follow-up is comparable to the 7% - 33% recurrence rates reported in the literature [3] [13]. A study of 18 patients who underwent bilateral V-Y gluteus maximus myocutaneous flap plasty reported a late recurrence rate of 33% during 9 - 24 months postoperatively [13]. The lower recurrence rate in our cohort may reflect improved postoperative care and patient education regarding pressure off-loading. The strong protective effect of adequate postoperative pressure off-loading (OR 4.1) highlights the critical role of postoperative care in achieving successful outcomes [11].

The high patient satisfaction rate (82.5%) and significant improvements across all SF-36 domains underscore the holistic benefits of successful flap reconstruction. A study of skin flap transfer combined with negative pressure wound therapy for complex pressure ulcers reported significant improvements in SF-36 quality of life scores after treatment [14]. The improvements in physical functioning and bodily pain observed in our study ($p < 0.001$) likely reflect the successful closure of chronic wounds, enabling greater mobility and reduced pain. The enhancements in social and emotional functioning suggest that surgical closure of pressure injuries has a broader impact, reducing feelings of isolation and improving mental well-being [8].

The identification of age < 50 years, absence of diabetes mellitus, and adequate postoperative pressure off-loading as independent predictors of good outcome is consistent with the literature. A study on predictors of successful flap reconstruction found that the presence of infection/osteomyelitis, chronic ulceration (> 3 months), and poor nutritional status were significantly associated with postoperative complications [11]. Adequate postoperative pressure off-loading exerted a substantial protective effect, with 93.3% of patients who avoided complications utilizing optimized off-loading interfaces compared with only 20.0% in the complicated group [11]. The use of air-fluidized therapy beds and structured off-loading protocols has been shown to improve flap survival and reduce complications [3].

This study has several strengths, including the assessment of patient satisfaction and quality of life, which are often overlooked in surgical outcome studies. However, limitations exist. The retrospective design introduces selection and infor-

mation bias. The relatively small sample size ($n = 63$) may limit the statistical power of subgroup analyses. The follow-up period (mean 18.4 months) may not capture late recurrences. The absence of a control group (other flap types) limits direct comparison. The use of SF-36, while validated, may not capture all domain-specific aspects of quality of life relevant to spinal cord injured patients.

In conclusion, bilateral V-Y advancement flap is an effective and reliable technique for gluteal pressure injury reconstruction in spinal cord injured patients, with complete flap survival of 96.8%, acceptable complication rates, and high patient satisfaction (82.5%). Significant improvements in quality of life across physical, emotional, and social domains underscore the holistic benefits of successful surgical reconstruction. Age < 50 years, absence of diabetes mellitus, and adequate postoperative pressure off-loading are significant predictors of good outcome. A multidisciplinary approach with careful patient optimisation and postoperative rehabilitation is essential for achieving favourable long-term outcomes in pressure ulcer reconstruction.

Conflicts of Interest

The authors declare no conflicts of interest.

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