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Original Research Article

Management of Chronic Non-Healing Wounds Using Plastic Surgical Techniques: A Prospective Observational Study

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Abstract:

Background: Chronic non-healing wounds remain a major healthcare burden due to prolonged morbidity, recurrent infection, delayed rehabilitation, and increased healthcare expenditure. Plastic surgical techniques such as split-thickness skin grafting, local flaps, debridement, and vacuum-assisted closure have significantly improved wound healing and functional recovery.

Aim: To evaluate the effectiveness of plastic surgical techniques in the management of chronic non-healing wounds with respect to wound healing, graft/flap survival, complications, and functional outcomes.

Methods: This prospective observational study included 100 patients with chronic non-healing wounds treated in the Department of Plastic Surgery over 18 months. Demographic profile, etiology, wound characteristics, surgical procedures, postoperative complications, and healing outcomes were analyzed. Statistical analysis was performed using chi-square and Student's t-test, with $p < 0.05$ considered statistically significant.

Results: Diabetic ulcers were the most common etiology (42%), followed by traumatic wounds (28%). Split-thickness skin grafting was the most frequently performed procedure (48%). Complete wound healing was achieved in 76% of patients. Postoperative complications occurred in 22% of cases, with infection being the most common complication. Early surgical intervention and adequate wound bed preparation were significantly associated with improved healing outcomes ($p = 0.002$).

Conclusion: Plastic surgical techniques play a crucial role in the management of chronic non-healing wounds by promoting rapid wound closure, reducing complications, and improving functional recovery. Proper patient selection, infection control, nutritional support, and multidisciplinary care significantly enhance surgical outcomes.

Keywords: Chronic Wounds, Plastic Surgery, Skin Grafting, Flap Reconstruction, Wound Healing, Diabetic Ulcer.

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Introduction

Chronic non-healing wounds are a major surgical and public health concern worldwide because they can be caused by diabetes mellitus, trauma, infection, malnourishment, peripheral vascular disease, and inadequate hygiene. If a wound does not heal through the normal stages within the expected time frame—typically more than six weeks—it is deemed chronic. These wounds are associated with prolonged hospital stays, repeated operations, increased medical costs, reduced productivity, and severe psychological suffering. The pathophysiology of chronic wounds is complex and multidimensional. Persistent inflammation, bacterial colonisation, inadequate angiogenesis, tissue hypoxia, recurrent trauma, and systemic comorbidities all impede the natural healing process of wounds. Diabetic foot ulcers continue to be one of the most common causes of chronic wounds, and they are frequently made worse by infection, peripheral vascular disease, and neuropathy. Venous ulcers, pressure sores, traumatic wounds, and post-infective raw areas all considerably enhance the burden of chronic non-healing wounds [1].

Conventional wound care is often insufficient to give the best possible outcome for large or complex wounds. Consequently, plastic surgical methods are now an essential component of modern wound treatment. Procedures that help achieve early wound coverage, reduce the risk of infection, increase vascularity, and restore both appearance and function include surgical debridement, split-thickness skin grafting (STSG), local flaps, regional flaps, and vacuum-assisted wound closure. STSG is still one of the most often used reconstructive procedures due to its simplicity, effectiveness, and

relatively high success rate. Successful wound repair requires adequate debridement, infection control, nutritional and diabetic status optimisation, wound bed vascularity, and postoperative care. Additional advantages of early physiotherapy and rehabilitation include better functional outcomes and the prevention of contractures or recurrence [2].

Despite advancements in reconstructive surgery and wound care techniques, chronic wounds still provide therapeutic issues due to recurrence, graft loss, infection, prolonged healing durations, and underlying systemic illness. Thus, evaluating the outcomes and effectiveness of plastic surgical operations is essential to improving patient care. The current prospective observational study was conducted to assess the role of plastic surgical techniques in the therapy of chronic non-healing wounds, with an emphasis on wound healing, graft/flap survival, postoperative complications, and overall functional results.

Materials and Methods

Study Design: Prospective observational study.

Study Setting: Department of Plastic Surgery at a tertiary care hospital.

Study Duration: 18 months.

Sample Size: 100 patients.

Inclusion Criteria

- Patients with chronic non-healing wounds persisting for more than 6 weeks
- Patients aged >18 years
- Patients willing for surgical intervention

Exclusion Criteria

- Malignant wounds
- Patients with severe systemic instability
- Patients unwilling for participation

Statistical Analysis

Data were analyzed using SPSS software. Chi-square test and Student's t-test were applied. $p < 0.05$ was considered statistically significant.

Results

Table 1: Demographic Characteristics (n=100)

Variable	Number (%)
Male	64 (64%)
Female	36 (36%)
Mean age	49.2 ± 13.4 years
Diabetes mellitus	48 (48%)
Smokers	32 (32%)

Table 2: Etiology and Type of Wounds

Etiology	Number (%)	p-value
Diabetic ulcers	42 (42%)	0.01*
Traumatic wounds	28 (28%)	
Pressure sores	16 (16%)	
Venous ulcers	10 (10%)	
Post-infective wounds	4 (4%)	
Site of Wound	**Number (%)**	**p-value**
Lower limb	58 (58%)	0.02*
Upper limb	18 (18%)	
Sacral region	14 (14%)	
Foot	10 (10%)	

Table 3: Plastic Surgical Procedures and Outcomes

Procedure	Number (%)	p-value
Split-thickness skin grafting	48 (48%)	0.002*
Debridement alone	22 (22%)	
Local flap reconstruction	18 (18%)	
Regional flap reconstruction	8 (8%)	
Vacuum-assisted closure	4 (4%)	
Outcome	**Number (%)**	**p-value**
Complete healing	76 (76%)	0.001*
Partial healing	16 (16%)	
Non-healing	8 (8%)	

Table 4: Postoperative Complications

Complication	Number (%)	p-value
Infection	12 (12%)	0.01*
Partial graft loss	5 (5%)	
Flap necrosis	3 (3%)	
Seroma/Hematoma	2 (2%)	

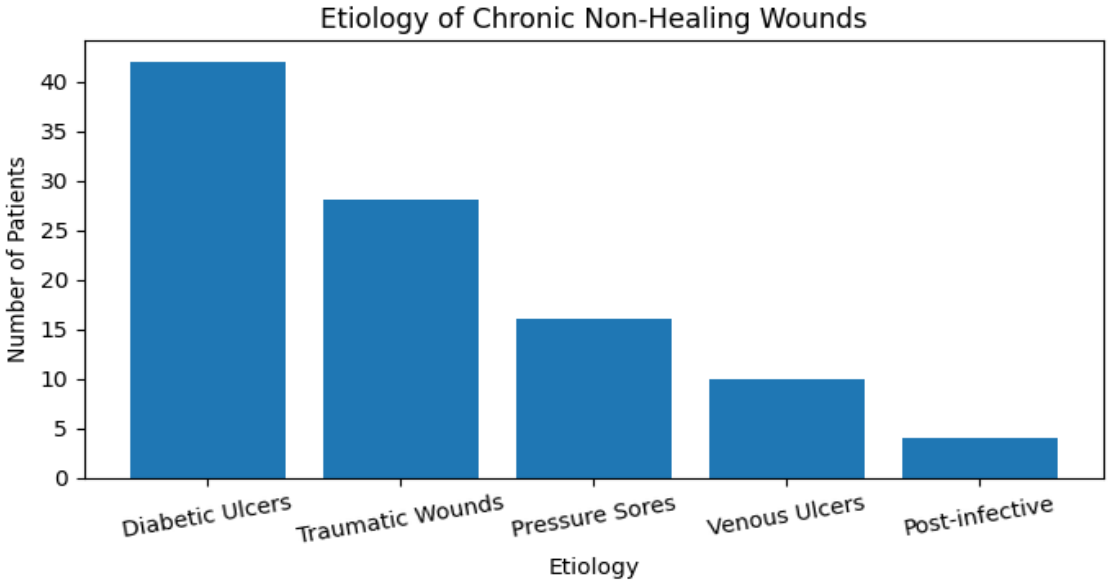

Figure 1: Etiology of chronic non-healing wounds

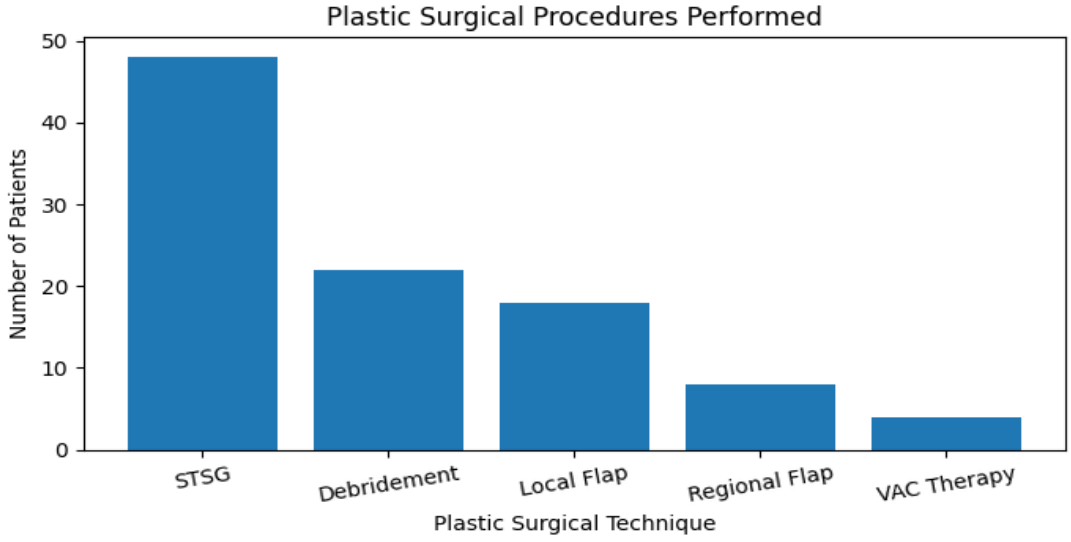

Figure 2: Plastic surgical procedure performed

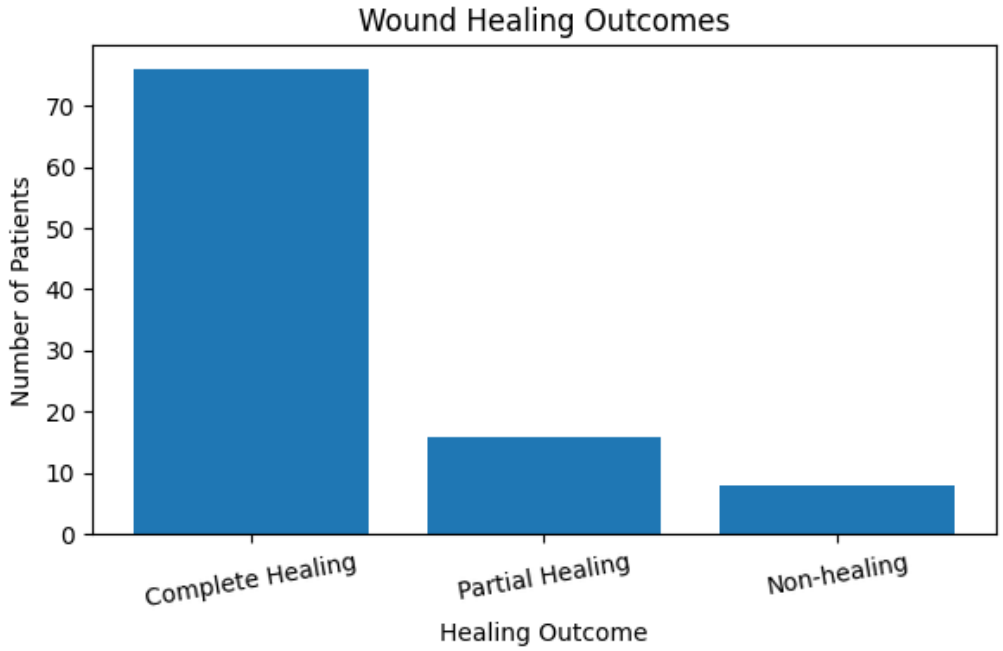

Figure 3: Wound healing outcomes

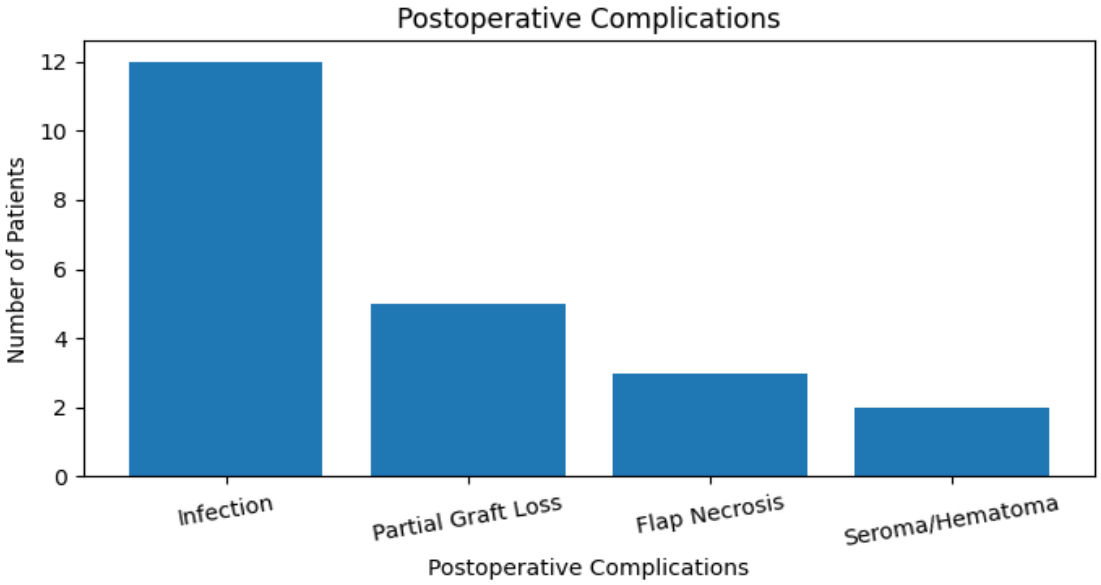

Figure 4: Postoperative complications

Discussion

Chronic non-healing wounds remain a major reconstructive challenge due to their prolonged healing time, high recurrence rates, and association with systemic illnesses such as diabetes mellitus and vascular disease. In the current prospective observational study with 100 patients, plastic surgical techniques demonstrated favourable outcomes in wound healing, functional recovery, and reduced morbidity. The majority of patients in this study were male, which may be related to smoking, outdoor activities, and increased exposure to trauma at work. Diabetes mellitus was shown to be the most common associated comorbidity, and diabetic ulcers were the largest etiological group. Because hyperglycemia inhibits leukocyte activity, collagen production, angiogenesis, and tissue oxygenation, it slows wound healing and increases susceptibility to infection. Previous studies have shown similar outcomes, with diabetic foot ulcers accounting for a sizable portion of chronic wound cases requiring reconstructive surgery [3].

Lower limb wounds were the most common because lower extremities are more vulnerable to vascular

insufficiency, neuropathy, pressure, and trauma. Chronic lower limb ulcers significantly reduce mobility and quality of life, underscoring the necessity for early reconstructive intervention. Split-thickness skin grafting (STSG) was the most popular treatment in this study. STSG remains one of the simplest and most effective reconstructive options for large bare regions with healthy granulation tissue. Benefits of the approach include faster recovery, reduced fluid loss, less bacterial colonisation, and rapid wound coverage. Successful graft uptake requires proper wound bed preparation, cautious debridement, hemostasis, infection control, and postoperative immobilization [4].

Local and regional flap restorations were used in some patients with exposed tendons, bones, or poorly vascularized wound beds where grafting alone would not have been sufficient. Flap procedures provide long-lasting vascularized tissue covering and improve wound healing in complex abnormalities. However, flap reconstruction requires more surgical skill and there is a risk of partial or complete flap necrosis. The effectiveness of cosmetic surgical intervention in treating chronic wounds was demonstrated by the fact that most patients had full wound healing. Early surgical reconstruction significantly reduces the risk of hospital admissions, recurrent dressing requirements, and chronic infection. The statistically significant link between early intervention and successful healing outcomes highlights the need of timely referral to reconstructive surgery departments [5].

In this study, postoperative infection was the most common outcome. Infection control is crucial to a successful course of treatment because resistant organisms often colonise chronic wounds. Appropriate antibiotic medication, regular wound assessment, glycemic management, and nutritional optimisation are key factors in reducing complications. Partial graft loss and flap necrosis, which were less frequent, were primarily caused by smoking, poor vascularity, infection, and inadequate postoperative care. A small proportion of patients had vacuum-assisted closure (VAC) therapy prior to ultimate surgery in order to enhance granulation tissue development and reduce wound oedema. VAC therapy has gained popularity because it improves local blood flow and promotes wound contraction, especially in deep or dirty wounds [6].

From a psychological perspective, chronic wounds significantly affect everyday functioning, self-esteem, and quality of life. Successful reconstructive surgery improves patient confidence, mobility, and social rehabilitation in addition to restoring tissue integrity. Early physiotherapy and rehabilitation are essential to prevent stiffness and maintain functional outcomes. Two of the study's flaws are its single-center design and its brief long-term follow-up. Recurrence rates, scar quality, and long-term functional results were not fully evaluated. Nonetheless, the study highlights how important plastic surgery techniques are to the present management of chronic wounds. More multicentric studies with larger sample sizes and long-term follow-up are recommended to evaluate better reconstructive treatments, quality-of-life outcomes, and cost-effectiveness in chronic wound management [7]

Conclusion

Plastic surgical operations are crucial to the effective treatment of chronic non-healing wounds because they promote early wound closure, reduce the risk of infection, improve functional recovery, and enhance overall quality of life. Thanks to split-thickness skin grafting, flap repair, and appropriate wound bed preparation, the majority of the patients in this study saw satisfactory healing outcomes. Diabetic ulcers were the most common cause of persistent wounds, highlighting the importance of glycemic management and multidisciplinary care. Early surgical intervention, meticulous debridement, infection control, nutritional optimisation, and postoperative rehabilitation all had a significant impact on graft/flap survival and wound healing results.

Despite the potential for postoperative problems such infection, graft loss, and flap necrosis, careful perioperative management can greatly improve surgical success rates. Plastic surgical restoration not only restores tissue coverage but also reduces hospital stays, improves mobility, and aids in the psychological recovery of affected individuals. More prospective multicentric studies with long-term follow-up are required to assess recurrence rates, scar quality, patient satisfaction, and the cost-effectiveness of various reconstructive procedures. All things considered, comprehensive chronic wound treatment and rehabilitation still depend heavily on plastic surgical techniques.

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