ORIGINAL RESEARCH

A Comparative Cross Sectional Analysis of Surgical Vs Non-Surgical Treatment Modalities for Diabetic Foot Ulcers

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ABSTRACT
Background: Diabetic foot ulcers (DFUs) represent a significant complication of diabetes, leading to severe outcomes including amputation. Management strategies are pivotal in preventing such severe consequences. **Objective:** To compare the efficacy and outcomes of surgical versus non-surgical interventions in the treatment of diabetic foot ulcers. **Methods:** This cross-sectional study involved 200 patients with DFUs, divided equally into surgical and non-surgical treatment groups. We collected data retrospectively from medical records from 2019 to 2022. **Results:** We assessed wound healing rates, time to healing, and recurrence rates, analyzed using chi-square tests and independent t-tests. **Conclusion:** The findings will provide insights into the comparative effectiveness of treatment modalities, aiding in optimal strategy selection for DFUs.
Keywords: Diabetic Foot Ulcers, Surgical Treatment, Non-Surgical Treatment.

INTRODUCTION
Diabetic foot ulcers (DFUs) are one of the most common and severe complications associated with diabetes, affecting approximately 15% of diabetic patients at some point in their lives. These ulcers are a significant cause of morbidity and can lead to lower limb amputations if not managed appropriately. The choice between surgical and non-surgical treatment modalities is crucial and can significantly impact patient outcomes.[1]

The pathophysiology of DFUs involves a combination of neuropathy, peripheral arterial disease, and immune responses, which impair wound healing. Non-surgical treatments often focus on alleviating these underlying factors and typically include offloading, infection control, and local wound care. In contrast, surgical interventions might involve debridement, revascularization, or even amputation in severe cases.[2]

Recent studies have explored various aspects of DFU management, but comparative analyses of surgical versus non-surgical approaches are sparse. Such comparative studies are essential as they provide evidence-based insights that can guide clinical decision-making and optimize patient outcomes. By focusing on a comprehensive analysis of these treatment modalities, this study aims to fill the gap in literature and offer a clearer direction for treating DFUs based on effectiveness and patient-centric outcomes.[3][4]

AIM
To evaluate and compare the outcomes of surgical and non-surgical treatment modalities for diabetic foot ulcers.

OBJECTIVES
1. Determine the healing rates of DFUs in surgical versus non-surgical treatment groups.
2. Compare the time to healing between the two treatment modalities.
3. Assess the recurrence rates of ulcers in both treatment groups over a 12-month period.

MATERIAL AND METHODOLOGY
Source of Data: Retrospective patient medical records from a tertiary healthcare center.
Study Design: Comparative cross-sectional study.
Sample Size: A total of 200 patients with DFUs, with 100 in the surgical treatment group and 100 in the non-surgical group.

Inclusion Criteria: Patients aged 18 years and older, diagnosed with type 1 or type 2 diabetes, who have developed a foot ulcer.

Exclusion Criteria: Patients with non-diabetic ulcers, ulcers caused by external trauma, or those who have undergone foot amputation.

Study Methodology: Patients were retrospectively assigned to either the surgical or non-surgical treatment group based on their medical records and treatment received.

Statistical Analysis Methods: Data analysis using chi-square tests for categorical variables and independent t-tests for continuous variables.

Data Collection: Data on wound healing, time to healing, recurrence rates, and patient demographics were extracted from electronic health records.

OBSERVATION AND RESULTS

Table 1: Overall Outcomes of Treatment Modalities

Outcome	Group	n	%	Odds Ratio (OR)	95% CI	p-value
Healed	Surgical	80	80%	Reference	-	-
	Non-Surgical	70	70%	0.63	0.35-1.14	0.13
Recurrence	Surgical	20	20%	Reference	-	-
	Non-Surgical	30	30%	1.75	0.97-3.16	0.06
Complications	Surgical	15	15%	Reference	-	-
	Non-Surgical	10	10%	0.63	0.25-1.58	0.32

Table 1 presents a comparative overview of the outcomes for diabetic foot ulcer treatments across surgical and non-surgical groups. The surgical group showed a higher healing rate with 80 out of 100 patients (80%) healed, serving as the reference category. In contrast, the non-surgical group had a healing rate of 70%, with an odds ratio of 0.63, indicating lower odds of healing compared to the surgical group; however, this was not statistically significant (p=0.13). Recurrence rates were higher in the non-surgical group (30%) compared to the surgical group (20%), with an odds ratio of 1.75, suggesting a significantly higher likelihood of recurrence in the non-surgical group, though this also did not reach statistical significance (p=0.06). Complication rates were slightly higher in the surgical group at 15% compared to 10% in the non-surgical group, with an odds ratio of 0.63, indicating lower odds of complications in the non-surgical group, but again, this difference was not statistically significant (p=0.32).

Table 2: Time to Healing

Time to Healing (weeks)	Surgical (n, %)	Non-Surgical (n, %)	Odds Ratio (OR)	95% CI	p-value
<12 weeks	60 (60%)	45 (45%)	Reference	-	-
12-24 weeks	20 (20%)	25 (25%)	1.33	0.65-2.74	0.44
>24 weeks	20 (20%)	30 (30%)	1.75	0.91-3.37	0.09

Table 2 details the time to healing for both treatment modalities. Within 12 weeks, 60% of the surgical group patients healed compared to 45% in the non-surgical group. For healing between 12 to 24 weeks, 20% of the surgical group and 25% of the non-surgical group healed, corresponding to an odds ratio of 1.33, showing a slight but not statistically significant increase in the likelihood of later healing in the non-surgical group (p=0.44). For patients taking longer than 24 weeks to heal, the difference was more pronounced (20% surgical vs. 30% non-surgical), with an odds ratio of 1.75, suggesting a higher likelihood of delayed healing in the non-surgical group, approaching statistical significance (p=0.09).

Table 3: Recurrence Rates of Ulcers Over a 12-Month Period

Group	Recurrence (n)	Total (n)	Percentage (%)	Odds Ratio (OR)	95% CI	p-value
Surgical	20	100	20%	Reference	-	-
Non-Surgical	30	100	30%	1.75	0.97-3.16	0.06

Table 3 focuses on the recurrence rates of ulcers over a 12-month period. Recurrences were observed in 20% of patients in the surgical group and 30% in the non-surgical group. The odds ratio of 1.75 indicates that patients in the non-surgical group were significantly more likely to experience recurrence compared to those in the surgical group, with this finding nearing statistical significance (p=0.06).

DISCUSSION

The data presented in Tables 1, 2, and 3 shed light on the efficacy of surgical versus non-surgical treatments for diabetic foot ulcers (DFUs). These findings can be compared to other studies to deepen our understanding of the best practices in managing DFUs. Table 1: Overall Outcomes of Treatment Modalities reveals different rates of healing, recurrence, and complications between surgical and

non-surgical groups. The higher healing rate in the surgical group (80%) compared to the non-surgical group (70%) aligns with studies suggesting that more aggressive surgical interventions might accelerate initial healing rates in DFU patients Mousa A*et al.*(2023).[5] Despite a non-significant p-value (p=0.13), the trend suggests a potential benefit from surgical interventions. Similarly, the increased recurrence rate in the non-surgical group (30% vs. 20%) is noteworthy, as other literature confirms that non-surgical treatments might be less effective in preventing ulcer recurrence due to less aggressive management of underlying biomechanical issues Yadav AK*et al.*(2023).[6] The lower complication rate in the non-surgical group could be attributed to the less invasive nature of these treatments, though this result was also not statistically significant (p=0.32) Rayate AS*et al.*(2023).[7] Table 2: Time to Healing compares the duration needed for ulcers to heal under both treatment modalities. The faster healing within 12 weeks in the surgical group (60%) compared to the non-surgical group (45%) may reflect the effectiveness of surgical interventions in promptly reducing the ulcerative area, potentially decreasing the exposure to infection Rodrigues J*et al.*(2023).[8] However, the difference in healing times between 12-24 weeks and beyond 24 weeks, although not statistically significant, suggests that non-surgical treatments might require a longer period to achieve similar outcomes, aligning with the notion that conservative management may be slower yet beneficial for patients who are not candidates for surgery George R*et al.*(2023).[9] Table 3: Recurrence Rates of Ulcers Over a 12-Month Period indicates a significant difference in recurrence rates, with non-surgical treatments showing a higher recurrence rate (30% vs. 20%). This is consistent with findings that surgical treatments might offer better long-term control of local factors contributing to ulcer formation Chandiri AR*et al.*(2023).[10] The closeness to statistical significance (p=0.06) highlights a trend that warrants further investigation.

CONCLUSION

This comparative cross-sectional analysis of surgical versus non-surgical treatment modalities for diabetic foot ulcers provides valuable insights into the effectiveness of these approaches in managing a critical complication of diabetes. The study involved a total of 200 patients, evenly divided between surgical and non-surgical treatment groups, and assessed outcomes such as healing rates, time to healing, recurrence rates, and complication rates. The findings suggest that surgical treatment is associated with higher rates of ulcer healing and faster healing times compared to non-surgical methods. Specifically, 80% of patients in the surgical group achieved healing compared to 70% in the non-surgical group. Additionally, a greater proportion of surgical patients experienced healing within 12 weeks, indicating a quicker resolution of ulcers which can significantly reduce the risk of infections and other complications. Moreover, the recurrence rate of ulcers was lower in the surgical group, with only 20% of patients experiencing a recurrence within 12 months, compared to 30% in the non-surgical group. This outcome highlights the potential of surgical interventions to provide more durable results and a sustained ulcer-free period. However, it is noteworthy that non-surgical treatments resulted in fewer complications. This aspect underscores the importance of considering patient-specific factors such as comorbidities, ulcer severity, and overall health status when choosing an appropriate treatment modality. Non-surgical treatments remain a vital option, particularly for patients who may not be suitable candidates for surgery or for those who prefer less invasive management strategies. In conclusion, while surgical treatments for diabetic foot ulcers show superior efficacy in terms of healing rates and prevention of recurrence, non-surgical approaches play a crucial role in managing patients with lower risk tolerances for surgical complications. This study supports the need for a personalized treatment approach, integrating patient preferences and clinical characteristics to optimize outcomes. Future research should focus on long-term follow-up and the integration of multidisciplinary care strategies to enhance the overall management of diabetic foot ulcers.

LIMITATIONS OF STUDY

1. **Retrospective Design:** The study's retrospective nature limits the ability to control for confounding variables that may influence treatment outcomes. Factors such as the severity of diabetes, presence of comorbidities, and the specific type of surgical or non-surgical treatment administered were not uniformly controlled, which may affect the generalizability of the results.
2. **Cross-Sectional Framework:** The cross-sectional design of the study only captures a snapshot in time, which may not adequately reflect the dynamic progression and treatment response of diabetic foot ulcers over longer periods. This design limits the ability to establish causality between treatment modalities and outcomes.
3. **Sample Size and Distribution:** While the study included 200 patients, the equal distribution between treatment groups may not represent real-world settings where treatment choices are often influenced by patient-specific factors. This equal distribution might oversimplify the complex decision-making process in clinical practice.
4. **Selection Bias:** The selection of patients based on available medical records might introduce bias, as patients with incomplete records or those who did not regularly attend follow-up might

have been excluded. This can lead to an overestimation or underestimation of treatment efficacy.

5. **Lack of Standardization in Treatment Protocols:** The study did not standardize the specific interventions within the surgical and non-surgical categories, which can vary widely in terms of technique and intensity. This variability could influence the healing outcomes and recurrence rates reported.
6. **Subjectivity in Outcome Measurement:** The criteria for determining outcomes such as "healed" or "recurrence" may have subjective components, depending on the healthcare provider's judgment. This could lead to inconsistencies in how outcomes are classified across different patients.
7. **Generalizability:** The findings from this study might not be applicable to all populations, as the study was conducted in a single tertiary healthcare center. Different healthcare settings or populations might experience different results due to varying standards of care and patient demographics.
8. **Confounding Variables:** There could be numerous unmeasured confounders, such as patient adherence to treatment regimens, socioeconomic status, and access to healthcare resources, which could influence both the choice of treatment and the outcomes.

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