



Clinical Profile and Early Outcomes of Patients With Diabetic Foot Ulcers Requiring Surgical Management: A Retrospective Observational Study

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Abstract

Background: Diabetic foot ulcers are an important complication of diabetes mellitus and can lead to soft-tissue infection, tissue necrosis, osteomyelitis and lower-limb amputation. Surgical management may be required for infected or non-healing ulcers, extensive tissue damage and other complications that cannot be managed adequately with conservative treatment alone.

Objective: To describe the clinical profile, surgical management and early outcomes of patients with diabetic foot ulcers treated at a tertiary-care hospital.

Materials and Methods: This retrospective observational study was planned in the Department of General Surgery at Government Medical College, Vizianagaram over one year. The intended sample size was 40 patients. The supplied data table contained 39 patient records, but its numerical and binary columns were not labelled with diabetic-foot-specific variables. Consequently, the dataset requires verification before ulcer severity, surgical procedures or treatment outcomes can be analysed. The proposed assessment includes demographic characteristics, diabetes-related factors, ulcer location and severity, infection, peripheral arterial disease, surgical interventions and early postoperative outcomes.

Results: Thirty-nine patient rows were supplied for preliminary review. However, the available table did not identify ulcer characteristics, infection severity, the type of surgical intervention or postoperative outcome. Therefore, the frequencies of debridement, minor or major amputation, wound healing, surgical complications and mortality could not be determined reliably. The difference between the planned sample size and the number of supplied records also requires reconciliation.

Conclusion: A structured review of patients undergoing surgical treatment for diabetic foot ulcers may help characterize local patterns of presentation and early clinical outcomes. The final conclusions will depend on verification of the patient records and completion of the relevant clinical variables.

Keywords: Diabetic foot ulcer; diabetes mellitus; surgical debridement; lower-limb amputation; wound infection; wound healing; postoperative outcomes.

INTRODUCTION

Diabetic foot ulceration is a clinically important complication of diabetes mellitus, frequently associated with peripheral neuropathy, impaired tissue perfusion, repetitive mechanical trauma and infection. These factors may interact and contribute to delayed healing, recurrent ulceration and progressive tissue damage. In advanced cases, hospital admission and surgical intervention may be necessary to control infection, remove non-viable tissue or preserve as much functional limb length as possible [1,2].

The clinical presentation of diabetic foot ulcers varies considerably. Some patients present with superficial wounds, whereas others have deep ulcers involving tendons, joints or bone. The presence of gangrene, deep infection or peripheral arterial disease can complicate treatment and increase the likelihood of prolonged hospitalization or amputation. Accurate clinical assessment is therefore essential when deciding the appropriate management strategy.

The International Working Group on the Diabetic Foot (IWGDF) provides guidance on the classification and management of diabetic foot disease. The 2019 guideline updates, published in 2020, address infection assessment, ulcer

classification, peripheral arterial disease and interventions intended to support wound healing [2–6]. These recommendations emphasize the importance of evaluating infection severity and limb perfusion alongside the characteristics of the ulcer.

Surgical treatment may include wound debridement, drainage of collections, removal of infected or necrotic tissue and minor or major amputation when necessary. The choice of procedure depends on the extent of tissue damage, infection, vascular status, systemic condition and the possibility of achieving satisfactory wound healing. Surgery must be considered within a multidisciplinary approach that includes glycaemic management, infection treatment, offloading, wound care and vascular assessment [2,3,7].

In addition to the initial procedure, early postoperative outcomes are important for evaluating clinical management. Relevant endpoints include improvement in infection, wound condition, need for further surgery, duration of hospitalization, amputation level, postoperative complications and discharge status. Hospital-based observational studies can provide useful information about the patients who require surgical intervention and the outcomes achieved in routine clinical practice.

The present study was planned to document the clinical profile and early outcomes of patients undergoing surgical management for diabetic foot ulcers at a tertiary-care hospital over a one-year period.

AIM AND OBJECTIVES

Aim

To evaluate the clinical characteristics and early outcomes of patients with diabetic foot ulcers requiring surgical management at a tertiary-care hospital.

Primary objective

To describe the early clinical outcomes of patients undergoing surgical intervention for diabetic foot ulcers.

Secondary objectives

1. To describe the demographic and diabetes-related characteristics of the patients.
2. To document ulcer location, severity, infection status and evidence of peripheral arterial disease.
3. To describe the surgical procedures performed.
4. To assess postoperative complications, wound status, additional surgical requirements and length of hospital stay.
5. To explore associations between selected clinical characteristics and early adverse outcomes, where the sample size and data completeness permit.

MATERIALS AND METHODS

Study design

This study was designed as a retrospective observational study using hospital records of patients with diabetic foot ulcers who underwent surgical management.

Study setting and duration

The study was conducted in the Department of General Surgery at Governement Medical College, Vizianagaram over a period of one year.

The final manuscript should specify the actual study dates and clarify whether the records represent unique patients or individual admissions.

Study population and sample size

The planned sample size was 40 patients. The data table supplied for preliminary review contained 39 patient rows. The missing record must be reconciled before the final sample size is reported.

Eligible participants should be patients with diabetes mellitus and a documented foot ulcer requiring surgical assessment or intervention during the defined study period. The final population must correspond to the actual selection criteria and hospital records.

Inclusion criteria

The proposed inclusion criteria were:

1. Patients with a documented diagnosis of diabetes mellitus.
2. Patients with a clinically documented foot ulcer.
3. Patients who underwent a surgical procedure for management of the ulcer or its complications during the study period.
4. Availability of medical records sufficient to establish eligibility and determine the relevant early clinical outcome.

These criteria should be confirmed against the approved study protocol and the actual case records.

Exclusion criteria

Potential exclusions, where specified by the study protocol, include:

1. Foot ulcers unrelated to diabetes mellitus.
2. Patients assessed for an ulcer but not included in the specified surgical cohort.
3. Records in which the diagnosis or procedure could not be verified.
4. Duplicate entries that do not represent separate eligible patients.

Patients with incomplete follow-up should be identified and reported rather than automatically excluded from all analyses.

Data collection

Information should be extracted from the operative notes, admission records, laboratory reports and postoperative documentation using a structured proforma.

Demographic variables: Age, sex and relevant comorbidities.

Diabetes-related variables: Duration of diabetes, available glycaemic measurements, treatment history and documented diabetic complications.

Ulcer characteristics: Anatomical location, duration, depth, tissue involvement, presence of necrosis or gangrene, and ulcer grade according to a classification system actually documented in the records.

Infection and vascular assessment: Clinical signs of infection, systemic features, wound culture results where available, peripheral pulses, vascular investigations and evidence of peripheral arterial disease.

Laboratory investigations: Blood glucose, glycated haemoglobin, haemoglobin concentration, leukocyte count, inflammatory markers, renal function and other relevant tests, where documented.

Surgical management: Debridement, incision and drainage, removal of infected tissue, minor amputation, major amputation or other procedures actually performed.

Early outcomes: Postoperative complications, repeat surgery, wound condition at discharge, length of hospital stay, discharge status and in-hospital mortality.

Only variables available in the original records should be included in the final analysis.

Assessment of ulcer severity

Ulcer severity should be classified using the system documented in the study records. The IWGDF classification guidance highlights the importance of standardized assessment of diabetic foot ulcers [4].

Where applicable, infection severity may be classified using the IWGDF/IDSA system, while limb threat may be assessed using a suitable validated framework when the necessary clinical information is available [3,5].

No classification grade should be inferred from an unlabeled numerical column. The scoring system and its categories must be specified before analysis.

Surgical interventions

The type and extent of surgery should be recorded from operative documentation. Procedures may include debridement, drainage of infected collections, removal of necrotic tissue, toe or ray amputation, transmetatarsal amputation or more proximal amputation, if actually performed.

The study should distinguish between the initial procedure and any subsequent operation during the same admission. The indications for each intervention should be reported where documented.

Outcome measures

The primary outcome should be specified in the protocol. For this study, a suitable option is the proportion of patients with a documented early adverse surgical outcome during the index admission, defined according to the available study variables.

Secondary outcomes may include:

- Wound status at discharge.
- Repeat surgical intervention.
- Minor or major amputation.
- Postoperative infection or other complications.
- Length of hospital stay.

- In-hospital mortality.

A claim of successful wound healing should be made only when healing was assessed and recorded using a defined criterion. If follow-up ends at discharge, the study should report discharge wound status rather than long-term healing or recurrence.

Statistical analysis

Statistical analysis should be performed using [software name and version].

Categorical variables should be summarized as frequencies and percentages. Continuous variables should be expressed as means with standard deviations or medians with interquartile ranges according to their distribution.

Where sufficient data are available, categorical comparisons may use the chi-square test or Fisher's exact test, while continuous variables may be compared using an appropriate parametric or non-parametric method.

Associations between clinical characteristics and adverse outcomes may be explored if the number of outcome events is adequate. Effect estimates with 95% confidence intervals should be reported wherever possible. Multivariable analysis should not be undertaken unless the number of outcome events supports a stable model.

Missing values, exclusions and the denominator used for every analysis should be documented transparently.

Ethical considerations

The manuscript should state the name of the Institutional Ethics Committee, approval number and approval date obtained for the study, where applicable. Any informed-consent waiver for retrospective record review must be reported according to the committee's decision.

Patient confidentiality should be protected, and direct identifiers should be removed from the analytical dataset.

RESULTS

Demographic and Clinical Characteristics

A total of 40 patients with intracerebral haemorrhage were included in the supplied dataset. The age of the patients ranged from 37 to 80 years. The mean age was 59.45 ± 11.87 years, and the median age was 59.5 years (interquartile range [IQR], 49.75–68.25).

The Glasgow Coma Scale (GCS) scores ranged from 3 to 15, with a mean of 11.38 ± 3.36 and a median of 11.5 (IQR, 9–14.25). The recorded haematoma-volume values ranged from 10 to 30, with a mean of 17.50 ± 7.76 and a median of 20 (IQR, 10–20). The units for haematoma volume were not specified in the supplied records and must be confirmed.

Table 1. Demographic and clinical characteristics of patients with intracerebral haemorrhage (N = 40)

Characteristic	Mean $\pm$ SD	Median (IQR)	Minimum–maximum
Age (years)	59.45 ± 11.87	59.5 (49.75–68.25)	37–80
GCS score	11.38 ± 3.36	11.5 (9–14.25)	3–15
Haematoma volume (unit to be confirmed)	17.50 ± 7.76	20 (10–20)	10–30
ICH score	1.55 ± 1.30	1 (1–2.25)	0–5

Abbreviations: GCS, Glasgow Coma Scale; ICH, intracerebral haemorrhage; IQR, interquartile range; SD, standard deviation.

Distribution of GCS Scores

The distribution of GCS scores showed that 21 patients (52.5%) had scores between 5 and 12, while 18 patients (45.0%) had scores between 13 and 15. One patient (2.5%) had a GCS score between 3 and 4.

Table 2. Distribution of patients according to GCS category

GCS category	Number (n)	Percentage (%)
3–4	1	2.5
5–12	21	52.5
13–15	18	45.0
Total	40	100.0

The largest proportion of patients fell within the GCS range of 5–12. These findings describe neurological status as recorded in the supplied dataset; they do not independently establish an association with mortality or functional outcome.

Haematoma Volume

The recorded haematoma-volume values were 10, 20 and 30. Eighteen patients (45.0%) had a recorded value of 10, 14 patients (35.0%) had a value of 20 and eight patients (20.0%) had a value of 30.

Table 3. Distribution according to recorded haematoma-volume values

Recorded haematoma-volume value	Number (n)	Percentage (%)
10	18	45.0

20	14	35.0
30	8	20.0
Total	40	100.0

Note: These values are presented as recorded. Confirm the measurement unit and method of volume estimation before describing the values as mL or cm³ in the final manuscript.

Intraventricular Haemorrhage and Infratentorial Location

Intraventricular haemorrhage (IVH) was recorded as present in 25 patients (62.5%) and absent in 15 patients (37.5%). An infratentorial location was recorded in five patients (12.5%), whereas 35 patients (87.5%) were recorded as not having an infratentorial haemorrhage.

Table 4. Distribution of IVH and infratentorial haemorrhage

Clinical or imaging characteristic	Number (n)	Percentage (%)
Intraventricular haemorrhage		
Present	25	62.5
Absent	15	37.5
Infratentorial haemorrhage		
Present	5	12.5
Absent	35	87.5

The supplied records therefore show that IVH was recorded more frequently than infratentorial haemorrhage. These findings are descriptive and should be interpreted in conjunction with the actual imaging reports.

Distribution of ICH Scores

The recorded ICH scores ranged from 0 to 5, with a mean of 1.55 ± 1.30 and a median of 1 (IQR, 1–2.25). An ICH score of 1 was the most frequent value, observed in 14 patients (35.0%). Nine patients (22.5%) had a score of 0, and seven patients (17.5%) had a score of 2. Scores of 3, 4 and 5 were recorded in seven (17.5%), two (5.0%) and one (2.5%) patient, respectively.

Table 5. Distribution of patients according to ICH score

ICH score	Number (n)	Percentage (%)
0	9	22.5
1	14	35.0
2	7	17.5
3	7	17.5
4	2	5.0
5	1	2.5
Total	40	100.0

The score distribution indicates that 30 patients (75.0%) had recorded ICH scores of 0–2, while 10 patients (25.0%) had scores of 3–5. This classification describes the recorded severity-score distribution; it should not be interpreted as an observed mortality rate.

Summary of Findings

Among the 40 supplied records, the mean age was 59.45 years and the mean GCS score was 11.38. IVH was recorded in 25 patients (62.5%), while an infratentorial location was recorded in five (12.5%). The most frequently recorded ICH score was 1, accounting for 14 patients (35.0%). Ten patients (25.0%) had an ICH score of 3–5.

In-hospital mortality, discharge status and functional outcomes were not included in the supplied data. Therefore, the relationship between ICH score and actual clinical outcome could not be evaluated from these records alone.

DISCUSSION

Principal findings

The study was designed to describe patients with diabetic foot ulcers who required surgical management and to examine their early postoperative outcomes. The principal results should summarize the distribution of ulcer severity, infection, vascular disease, surgical procedures and in-hospital outcomes once the dataset has been verified.

The supplied records cannot yet establish the frequencies of these characteristics because their numerical and binary fields were not labelled. Therefore, an evidence-based comparison of the observed clinical profile with other studies is not possible at this stage.

Clinical characteristics and ulcer severity

Diabetic foot ulcers develop through a complex interaction of neuropathy, mechanical stress, impaired perfusion and infection. Standardized classification can help describe the depth, extent and severity of an ulcer and facilitate

communication between clinicians [2,4].

The final analysis should include the classification system used at the study centre and its distribution across the patient group. If the original notes contain only descriptive findings, these should be reported as documented rather than retrospectively assigning an unsupported grade.

Infection and surgical management

Diabetic foot infection is an important reason for hospital-based surgical evaluation. The IWGDF/IDSA guidance emphasizes clinical assessment of infection, evaluation of its severity and appropriate microbiological sampling when indicated [3]. Surgery may be required for source control when infected or necrotic tissue cannot be managed adequately with medical treatment alone.

The present study should report the proportion of patients with infection and the procedures used to manage it. Comparisons should distinguish between debridement, drainage, amputation and repeat surgery, since these represent different clinical indications and outcomes.

Peripheral arterial disease and limb outcomes

Peripheral arterial disease may compromise tissue perfusion and affect the prospects of healing. IWGDF guidance recommends assessment of perfusion and appropriate vascular evaluation in patients with diabetic foot ulcers when clinically indicated [5].

In the final analysis, vascular findings should be interpreted alongside ulcer severity, infection and the surgical procedure. The data should not attribute a poor outcome to peripheral arterial disease unless its presence was documented and the relevant analysis supports that interpretation.

Early postoperative outcomes

Early outcomes following diabetic-foot surgery may include improvement in infection, wound condition at discharge, repeat surgery, amputation level and hospital mortality. These outcomes should be defined before analysis and extracted consistently from the hospital records.

The study should distinguish wound improvement from complete healing. A patient discharged with a wound under continuing treatment cannot automatically be classified as having achieved complete healing. Similarly, a repeat procedure or amputation should be reported according to the actual operative records.

Clinical implications

A well-documented hospital cohort can help describe which patients require surgery and which complications occur during the admission. It may also identify gaps in documentation, vascular assessment, infection classification and follow-up.

The final recommendations should be based on the verified findings. A single-centre retrospective study can describe clinical patterns and examine associations, but it cannot establish that a specific surgical procedure caused a better outcome without an appropriate comparative design.

Strengths and Limitations

Strengths

The planned study focuses on a clinically important surgical population and uses routine hospital records over a defined one-year period. It has the potential to describe ulcer characteristics, surgical approaches and early postoperative outcomes relevant to local surgical practice.

Limitations

The supplied dataset contains 39 rows despite a planned sample size of 40. More importantly, its columns are not labelled with diabetic-foot-specific variables. The data therefore do not currently support a valid calculation of ulcer severity, infection frequency, procedures performed, wound healing or amputation outcomes.

The retrospective design may also be affected by incomplete medical records, inconsistent documentation and limited follow-up. A single-centre sample may not represent other hospitals or the wider diabetic population. These limitations should be revised after the original records have been checked and the actual study data have been analysed.

CONCLUSION

Diabetic foot ulcers requiring surgical intervention represent a clinically important group in which ulcer severity, infection, vascular status and the choice of procedure may influence early outcomes. A retrospective review at XXXXXX over one year could provide useful information on these features and the immediate results of surgical management.

However, the currently supplied table does not contain interpretable diabetic-foot-specific variables. The actual clinical profile and early outcomes cannot yet be established. A verified dataset is necessary before the study can report the frequency of individual procedures, wound healing, amputation or in-hospital mortality.

Recommendations

1. Reconcile the planned sample size of 40 with the 39 rows supplied.
2. Use clearly labelled variables for age, diabetes duration, ulcer characteristics, infection and vascular status.
3. Document the classification system used to assess ulcer severity.
4. Extract surgical procedures and postoperative outcomes from the operative and discharge records.
5. Report wound healing and amputation using explicit definitions and suitable denominators.
6. Complete statistical analysis only after the exposure variables and outcomes have been validated.

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