

A Case Study of Patient with Uncontrolled Type 2 Diabetes with Ulcerated Boil of Left Leg: Case Report

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Abstract

Background: Uncontrolled diabetes is a serious medical condition that can lead to various complications, including ulcerated boils on the legs. These complications occur due to the neurovascular complications associated with diabetes. *Staphylococcus aureus* and *Streptococcus agalactiae* are frequently encountered pathogens, and polymicrobial infections are prevalent. Antibiotic treatment targets commonly isolated organisms by considering local resistance profiles, patient preferences, and infection severity. Mild to moderate infections may be managed with oral antibiotics, whereas severe cases require intravenous therapy. Severe or persistent cases may require surgical intervention and specialized, multidisciplinary wound care. **Case Presentation:** In this case report, we present the case of a patient who presented with an ulcerated boil of the left leg that initially appeared as a pimple a week ago. The patient had been diagnosed with type 2 diabetes mellitus (T2DM) but had discontinued medication a year ago due to potential side effects. **Conclusion:** This case emphasizes the importance of maintaining proper diabetes management and adherence to medication to prevent complications, such as ulcerated boils on the legs.

Keywords: Uncontrolled Diabetes, Leg Ulcer, Boil, Skin Infection, Medication Compliance.

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INTRODUCTION

One of the many complications of diabetes is skin complications. Skin complications in diabetes can affect up to 80% of patients and have significant consequences for a patient's quality of life. In addition, these complications can result in increased morbidity and mortality rates [1]. Boils and carbuncles are deep skin infections caused by bacteria such as *Staphylococcus aureus*. They usually appear as painful, red, swollen bumps filled with pus. Boils and carbuncles can occur anywhere on the body, but they are most common on the face, neck, armpits, buttocks, and legs. People with diabetes are more susceptible to these infections due to weakened immune systems and impaired blood flow to the skin [2]. Skin changes in diabetes are influenced by hyperglycemia and insulin resistance, impacting molecular, cellular, and structural aspects of the skin [3]. Skin manifestations in diabetes are often linked to metabolic derangements, chronic complications, and infections, which can occur before or after the onset of

clinical diabetes [4]. Much of these results from the fact that diabetes significantly impacts wound healing processes. Studies have demonstrated that diabetic conditions lead to impaired wound healing. For example, diabetic mice models exhibit wound healing impairments similar to those observed in human diabetes [5]. The dysregulation of macrophage phenotypes in diabetes is associated with severely impaired wound healing [6]. Moreover, increased degranulation of mast cells in the skin of individuals with diabetes is linked to impaired wound healing, which can be improved with specific treatments [7].

Diabetes affects various aspects of wound healing, including inflammation, matrix deposition, and angiogenesis, resulting in altered blood flow and dysfunctional inflammatory states in diabetic wounds [8]. The downregulation of Peroxisome proliferator-activated receptor-alpha (PPAR α) is crucial in impaired mitochondrial function and delayed wound healing in diabetes [9]. Substance P is identified as a factor

involved in wound healing, with its specific role in diabetic skin wounds requiring further investigation [10]. Furthermore, impaired wound healing in diabetes is attributed to decreased concentrations of growth factors in the wound fluid, such as IGF-1 and TGF- β [11]. Defective regulation of molecular and cellular events necessary for proper wound healing is a key factor contributing to delayed wound healing in diabetes [12]. Additionally, the reduction in growth factor production, macrophage function, angiogenesis, and collagen production is associated with impaired wound healing in diabetes [13]. We report a case of a 64-year-old female who presented with a lesion on her left lower leg, initially resembling a small pimple a week earlier. The patient had been diagnosed with diabetes for eight years but ceased all medications a year ago due to concerns regarding potential side effects, including a few episodes of hypoglycemia. Clinical assessment unveiled cellulitis and an ulcerated boil, with subsequent investigations confirming uncontrolled diabetes. Treatment encompassed a multidisciplinary approach, incorporating surgical debridement, antibiotic regimen, and insulin initiation. Subsequent follow-up prioritized glycemic management, wound healing, and medication adjustments to optimize patient outcomes and mitigate complications. This emphasizes the significance of addressing medication concerns and ensuring that patients comprehend and actively participate in their treatment plan.

CASE PRESENTATION

A 64-year-old female presented with a left lower leg lesion that initially appeared as a small pimple approximately one week ago. The patient attributed it to an insect bite, but it rapidly progressed into a painful boil

accompanied by redness, swelling, mild fever, and general fatigue.



Figure 1: Ulcerated boil of left leg

The patient had been diagnosed with type 2 diabetes mellitus (T2DM) for eight years but had discontinued all medications a year ago due to concerns about potential side effects, including a few episodes of hypoglycemia. The patient also had a history of hypertension. Regarding her T2DM, she expressed reluctance to adhere to medication because of the unpleasant side effects experienced by some of her previous treatments. She had previously been prescribed amlodipine plus valsartan (5–160 mg) for hypertension.

Review of Systems

Table 1

System	Positive Signs	Negative Signs
Constitutional		No Chills, diaphoresis, fever
HENT		No congestion, no sore throat
Respiratory		No cough
Cardiovascular		Unremarkable findings
Genitourinary		Unremarkable findings
Gastrointestinal		No abdominal pain, no anorexia, no changes in bowel habits, no nausea, no vomiting
Musculoskeletal	Pain and Swelling of left lower leg	No back pain, no gait problems, no joint swelling, no myalgias, no neck pain
Skin	Ulcer of left lower leg	
Neurological		No vertigo, no weakness, no numbness, no headaches

Physical Examination

The patient's vital signs were observed during the examination, revealing a blood pressure of 148/82 mmHg, a pulse rate of 63 beats per minute, a tympanic temperature of 36.8°C (98.24°F), and a respiratory rate of 18 breaths per minute. Anthropometric measurements showed a height of 161 cm (63.38 inches) and a weight of 73.8kg. The patient's oxygen saturation (SpO₂) level was recorded at 99% and the calculated body mass index

(BMI) was 28.47 kg/m².

The patient's overall constitutional examination exhibited a normal appearance. The head, eyes, ears, nose, and throat (HENT) examination was normal, cardiovascular and pulmonary evaluations showed a normal pulse and normal pulmonary effort, the abdominal exam was unremarkable.

The musculoskeletal and skin examination showed swelling and tenderness and ulcerated boil on the left lower leg, accompanied by surrounding cellulitis. However, pulse examination revealed an intact peripheral pulse.

Neurologically, the patient did not display focal deficits or remarkable muscular weakness. Sensation, gait, and deep tendon reflexes were normal. The patient's mental status was reported as alert and oriented to person, place, and time. The psychiatric evaluation indicated a normal mood, affect, and behavior

Laboratory Results

Table 2

Component	Result	Reference Range
WBC	11.7 X10 ³ /uL	4-10 X10 ³ /uL
RBC	4.26 X10 ⁶ /uL	Male: 4.3-5.9 X10 ⁶ /uL, Female: 3.5-5.5 X10 ⁶ /uL
hemoglobin	12.6 g/dL	Female: 12–16 g/dL, male: 14–18 g/dL
hematocrit	38.4%	Female 37%–47%; male: 42%–50%
platelet count	303 X10 ³ /uL	150-350 X10 ³ /uL
Neutrophils	8.60 X10 ³ /uL	2-8 X10 ³ /uL
Lymphocytes	1.50 X10 ³ /uL	1 - 4.8 × X10 ³ /uL
Monocytes	1.40 X10 ³ /uL	0.2-0.8 X10 ³ /uL
Eosinophils	0.2 X10 ³ /uL	0.0-0.50 X10 ³ /uL
Basophils	0.10 X10 ³ /uL	0.00-0.10 X10 ³ /uL
Random blood sugar	434 mg/dL	140-180 mg/dL
C-reactive protein	329.4 mg/L	< 0.5 mg/dL
HbA1c	14.6%	4.0%–5.6%
procalcitonin	0.09 ng/ml	<0.05 ng/ml
creatinine	0.35 mg/dL	0.8-1.3 mg/dL
glomerular filtration rate (GFR)	114.8 mL/min/1.73 m ²	>60 mL/min/1.73 m ²
Na	132 mEq/L	136–145 mEq/L
K	3.5 mEq/L	3.5–5.0 mEq/L
Cl	92 mmol/L	95-105 mmol/L
Bicarbonate	25.5 mEq/L	23–26 mEq/L
Urea	31 mg/dL	6 - 24 mg/dL
Urine ketone	negative	negative

The patient was admitted for further management. Additional investigations included X-ray imaging of the left leg, which revealed osteoarthritic changes at the knee joint. However, the visualized shaft of the tibia and fibula appeared normal, with no focal lytic or sclerotic lesions. Further diagnostic measures

Subsequent investigations showed a white blood cell count (WBC) of 11.7 * 10³/uL, hemoglobin level of 12.6 g/dL, hematocrit of 38.4%, and platelet count of 303 * 10³/uL. Additionally, the random blood sugar (RBS) was recorded as 434 mg/dL, C-reactive protein as 329.4 mg/L, HbA1c as 14.6%, procalcitonin as 0.09 ng/mL, creatinine as 0.35 mg/dL, glomerular filtration rate (GFR) as 114.8 mL/min/1.73 m², and urine ketones were negative. The impression drawn from these findings suggested uncontrolled diabetes complicated by an ulcerated boil on the left leg and cellulitis.

included an Arterial Blood Gas (ABG) metabolic panel and wound culture analysis.

The wound culture from the ulcerated wound indicated heavy growth of *Staphylococcus aureus*, *Streptococci*, and beta-hemolytic group B.

Imaging Results: X-ray left leg showing normal shaft of the tibia and fibula, with no focal lytic or sclerotic lesions.



Figure 2: X-ray left leg showing normal shaft of the tibia and fibula, with no focal lytic or sclerotic lesions

The management plan for the patient's condition was executed using a multidisciplinary team approach. In internal medicine, the patient was prescribed a strict diabetic diet regimen and was initiated on glargine insulin 15 units daily. Additionally, a combination of sitagliptin and metformin (50-1000mg) was administered twice daily with meals, with close monitoring of fasting and postprandial blood sugar levels to watch for hypoglycemic episodes. Under the purview of Vascular Surgery, a Doppler ultrasound of the lower extremities was conducted to assess vascular status and assist in formulating a comprehensive treatment plan. Surgical intervention, overseen by the surgery team, involved meticulous debridement of necrotic tissue from the ulcer in the left leg under sterile conditions. The patient received intravenous ceftriaxone (2 g) during hospitalization, and amoxicillin-clavulanate was prescribed upon discharge. Offloading of the affected limb was implemented to alleviate pressure, with daily visits to the wound clinic for three months. The wound received daily dressings, with continuous monitoring for signs of systemic infection, such as fever and leukocytosis, as well as regular assessments for improvement or deterioration of the wound.

On follow up within 3 months, the patient's HbA1c level was 9.4%, indicating suboptimal glycemic control. Self-monitoring of blood glucose (SMBG) was advised, with instructions to increase insulin glargine to 17 units at bedtime (HS) and up-titrate every three days according to fasting blood glucose (FBG) levels, aiming for a target range of 80–130 mg/dL. The postprandial target level was set to < 180 mg/dL. Additionally, due to dyslipidemia with an elevated LDL level of 196 mg/dL (target LDL < 70 mg/dL), the patient was prescribed

rosuvastatin/ezetimibe combination therapy at 20/10 mg once daily, along with dietary modifications focusing on low saturated fat intake. Microalbuminuria was detected (microalbumin/creatinine ratio: 76.6 mg/g) and the patient was started on dapagliflozin 10 mg once daily. Management of primary hypertension involved reinitiation of amlodipine-valsartan combination therapy at 5/160 mg once daily, along with adherence to a healthy, low-salt DASH diet. Follow-up appointments were scheduled for regular visits to the wound clinic, diabetes clinic, and family medicine clinic. These appointments aimed to assess the wound healing progress, optimize glycemic control, and adjust medication regimens as necessary.

DISCUSSION

Delayed wound healing is a significant concern in diabetic patients, leading to prolonged recovery times and increased risks of complications. It has been reported that hyperglycemia and numerous other associated variables, including micro- and macrovascular problems, could be the processes preventing the ulcers from healing [14, 15]. Xiang *et al.*, reported that regulated HbA1c levels affected the healing of diabetic ulcer wounds [16]. Thus, blood glucose control is regarded as a fundamental part of managing wound healing in diabetic patients. The amalgamation of diminished protective sensation and delayed presentation, characteristic of this patient group, complicates management further [17].

To effectively treat diabetic ulcers, a combination of medical and surgical interventions is essential for promoting healing and preventing complications. Medically, the management of diabetic ulcers involves key aspects such as adequate

debridement, pressure offloading, moist wound care, infection control, and revascularization of ischemic limbs [18]. These approaches aim to enhance wound healing and enhance outcomes for patients with diabetic ulcers. Various treatment approaches have been explored, including the use of phenytoin and intralesional epidermal growth factor therapy [19, 20]. Furthermore, traditional medicinal plants like *Acacia nilotica* and *Curcuma pseudomontana* have been used for centuries to treat conditions such as ulcers, burns, and wounds, including those associated with diabetes. These plants contain bioactive compounds that exhibit antibacterial, anti-inflammatory, and antioxidant activities, which can be beneficial in managing diabetic wounds [21-22].

Recent advances in medicine has led to explorations of various interventions to address delayed wound healing in diabetic individuals, such as the use of melatonin to protect endothelial progenitor cells [23], the application of krill oil to accelerate healing [24], and the promotion of wound healing through the administration of Sheng-ji Hua-yu formula [25]. Additionally, strategies involving nanofibrous scaffolds containing bioactive compounds like curcumin have shown promise in enhancing wound healing in diabetic rats [26]. Medical records, laboratory test results, and evaluations of the subcutaneous, neurological, cardiovascular, musculoskeletal, rheumatological, and vascular states of the patient must all be considered throughout treatment. Our patient presented with a lesion on her left lower leg that initially appeared as a small pimple approximately a week prior. The patient had a history of poorly managed T2DM. Clinical examination revealed cellulitis and an ulcerated boil, and investigations indicated uncontrolled diabetes mellitus. The treatment involved multidisciplinary management, including surgical debridement, antibiotic therapy, and insulin initiation. Follow-up included glycemic control, wound care, and medication adjustments to address complications and improve outcomes.

CONCLUSION

This case underscores the critical importance of medication adherence in managing chronic conditions such as diabetes. This highlights the potential consequences of discontinuing medications without medical guidance, leading to uncontrolled disease progression and associated complications. Effective patient education and ongoing support are paramount for ensuring treatment compliance and optimizing health outcomes in individuals with chronic diseases. This case further emphasizes that the management of diabetic ulcers requires a holistic approach that addresses various aspects of care, including wound management, infection prevention, and patient education. Healthcare professionals can improve the outcomes of patients with diabetic ulcers by following evidence-based guidelines and utilizing advanced treatment modalities.

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