



Case Report

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Negligent glycemic control and clinical decision-making concerns: A case report on the progression of a simple hand wound to cellulitis

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Abstract

Diabetes Mellitus is recognized for its increased vulnerability to infections, notably cellulitis. This report presents a case of a 35-year-old male with a history of type 2 diabetes for three years. Following a minor bike accident, the patient's wound ended in cellulitis due to unmanaged diabetes and possible medical oversight. Initially, the wound was treated with tetanus toxoid and dusting powder. However, after a week, the wound worsened, showing signs of pus formation and significant swelling. Despite medical consultation, the absence of antibiotics led to a progression in symptoms and hospital admission. An elevated blood sugar levels was evident, with a glycated hemoglobin (HbA1c) of 8.5%. Subsequent therapeutic interventions, such as incisional drainage and intensive antibiotic therapy, led to stabilization. This case highlights the importance of vigilant wound management and therapeutic intervention in diabetic patients, emphasizing timely antibiotic administration to prevent complications.

Keywords: diabetes mellitus, cellulitis, HbA1c, piperacillin and tazobactam

1. Introduction

Diabetes Mellitus (DM), encompassing both type 1 and type 2, is associated with a significantly elevated risk of infection (1). A comprehensive retrospective study involving primary care patients demonstrated that diabetes potentially contributes to 6% of infection-related hospitalizations and 12% of infection-related fatalities. The most pronounced associations are observed in cases of bone and joint infections, the onset of sepsis, and cellulitis (2). A glycated hemoglobin (HbA1c) level exceeding 7.5% correlates with a 1.4-fold heightened risk of developing cellulitis. Furthermore, for every 1% increase in HbA1c, there is a corresponding 1.12-fold increased risk of cellulitis (3). The objective of this case report is to describe the situation of a 35-year-old male patient whose minor wound progressed to cellulitis in the dorsal side of the left-hand elbow due to unmanaged diabetes and potential oversight in medical care.

2. Case Report

A 35-year-old male patient was admitted to the general surgery ward of a tertiary care hospital on day 9 with complaints of intense pain, swelling, and erythema in the left hand, persisting for the previous six days. A written informed consent was obtained from the patient. The etiology traced back to a minor bike accident on day 0. Following the accident, the patient immediately received a tetanus toxoid injection and applied

dusting powder. Within two days, the pain receded, and the patient refrained from using any other ointments or antibiotics. However, on day 5, he experienced a resurgence of severe pain and noticed pus drainage from the wound. The pain intensity was self-rated at 8 out of 10. Concomitantly, swelling appeared at the elbow, resulting in compromised flexion of the joint.

Upon seeking medical advice, the patient recounted the symptoms, but the consulting physician only prescribed analgesics without any antibiotics. The same night, the patient developed a fever, and significant swelling enveloped the left hand. This warranted admission to another hospital on day 6, where the fever was addressed. Subsequent laboratory findings revealed elevated C-reactive protein levels at 115 mg/L. Hand radiographs ruled out any bony aberrations. He was prescribed amoxicillin and clavulanic acid 1.2g intravenously (IV) two times instead of three times a day. Over the next two days, the patient observed increased redness, irritation, and evidence of pitting edema in the left hand.

On presentation to another tertiary care hospital on day 9, the following were his laboratory parameters: HbA1c – 8.5%, Fasting Blood Sugar (FBS) – 154 mg/dl, Post-Prandial Blood Sugar (PPBS) – 176 mg/dl, Random Blood Sugar (RBS)– 161 mg/dl, and mean blood glucose – 197.2 mg/dl. The complete blood count showed a haemoglobin level of 11.5 gm/dl, Packed

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Cell Volume (PCV)– 34.6 Vol%, Mean Corpuscular Volume (MCV) – 67.2 fl, and Mean Corpuscular Hemoglobin (MCH) – 22.4 pg. Lipid profile was significant for high triglycerides at 341 mg/dl, Very Low-Density Lipoproteins (VLDL) at 68.2 mg/dl, a total cholesterol/High Density Lipoprotein (HDL), and a cholesterol ratio of 5.1. The patient's medical history was notable for a diabetes diagnosis in 2020, and he had been on a regimen of Sitagliptin (50 mg) and Metformin (500 mg) twice daily regimen. Both his parents had a history of type 2 diabetes mellitus.



Fig.1. There is pronounced swelling observed in the left hand, particularly in the elbow region

The therapeutic plan incorporated piperacillin and tazobactam 4.2g IV three times daily, Pantop 40 mg IV once daily, paracetamol 1g IV once daily, and tablet Serratiopeptidase three times daily. Additionally, tablet metformin 500mg was integrated to optimize glycemic control. He was subsequently referred to the general medicine department, resulting in the initiation of Human Actrapid, subcutaneously (S/C) three times daily (12 U before breakfast and before lunch, and 10U before dinner) and Neutral Protamine Hagedorn (NPH) 10 U S/C at 10 pm. This insulin regimen continued until discharge, and the patient was advised to discontinue his oral anti-diabetic medications. Magnesium sulphate (MgSo₄) dressing was applied daily. A consultation with the orthopedics department ruled out septic arthritis.

A minor incisional drainage was performed under local anesthesia to drain the purulent discharge from the wound. The wound was dressed in mupirocin ointment. The patient was declared stable and discharged on day 20 with prescriptions for tablet clindamycin 300 mg two times daily, tablet linezolid 600 mg two times daily, tablet Pantop 40 mg once daily in the early morning, tablet paracetamol 650 mg three times daily, tablet serratiopeptidase three times daily, tablet metformin 500mg three times daily, tablet glimepiride 1 mg two times daily, tablet gabapentin and nortriptyline at night time (h/s), ointment mupirocin twice daily, and tablet rosuvastatin 10 mg h/s.

3. Discussion

3.1. Patient negligence and non-adherence

Following a minor bike accident, the patient promptly received a tetanus toxoid injection and applied dusting powder to the

wound. While the administration of tetanus toxoid is a standard precautionary measure, relying exclusively on dusting powder without a professional wound assessment may have been inadequate, especially considering the subsequent complications. Two days after the accident, as the pain diminished, the patient concluded that the wound was healing satisfactorily. This self-assessment dissuaded the patient from seeking additional medical consultation or considering other treatments, such as antibiotics, which could have thwarted potential infections.

On day 5, when the patient experienced a resurgence of pain and noticed pus drainage, they consulted a physician rather than seeking specialized wound care. Consequently, the physician prescribed only analgesics, excluding antibiotics. This decision, although made by the physician, might have been influenced by the patient's prior reluctance to seek comprehensive care, which could have presented an incomplete clinical picture. That very night, the patient exhibited symptoms of fever and pronounced swelling, indicative of an infection. Despite the patient's eventual decision to be admitted to a hospital, one can argue that there was a delay in obtaining specialized care, which might have intensified the infection. It wasn't until the persistence of symptoms and the emergence of further complications that the patient turned to a tertiary care hospital. This sequential approach to medical facilities highlights the potential consequences of delaying specialized care.

The correlation between HbA_{1c} levels and the incidence of certain infections like cellulitis has been previously documented. Specifically, there is a noticeable increase in the crude rates of such infections as HbA_{1c} rises (4). In this context, the recorded HbA_{1c} value for the patient under consideration is 8.5%. This value is notably higher than the HbA_{1c} target recommended by the American Diabetes Association (ADA) for many non-pregnant adults, which stands at less than 7%. The ADA's recommendation aims to mitigate the risk of complications arising from diabetes (5).

An HbA_{1c} of 8.5% signifies that the patient's blood glucose levels have been persistently elevated beyond the recommended levels for a considerable duration. In terms of specific metrics, the ADA suggests blood glucose targets of 80-130 mg/dl when fasting and less than 180 mg/dl two hours post-meal (5). Prolonged deviation from these targets, resulting in compromised glycemic control, can predispose an individual to a range of complications. These include but are not limited to delayed wound healing and heightened vulnerability to infections. In fact, both these complications are discernible in the current patient's clinical presentation. It's crucial to understand that maintaining optimal glycemic control is not only about warding off long-term diabetes-related complications. Such control plays a pivotal role in the body's immediate response to injuries and infections, reinforcing its importance in immediate patient care (6).

3.2. Clinical decision-making concerns

Given the patient's presentation with persistent pain, erythema, and swelling in the hand, accompanied later by pus drainage, it is remarkable that antibiotics were not administered at the outset. These symptoms are salient indicators of a bacterial infection, which typically warrants antibiotic intervention. In cases where antibiotics are not initiated despite conspicuous signs of infection, there is an increased risk of exacerbation of the infectious process. Such neglect can culminate in grave complications, including septicemia, abscess development, and even the onset of septic shock (7). The standard therapeutic regimen for Amoxycyclav 1.2 g IV is to administer it every 8 hours, equating to three times daily (8). Opting for a twice-daily dosing schedule could lead to sub-therapeutic drug concentrations in the bloodstream, potentially undermining the efficacy of the treatment. This patient's self-management, characterized first by the omission of antibiotics and subsequently by the suboptimal Amoxycyclav dosing, raises concerns about the clinical decision-making in this instance. Both factors might have inadvertently prolonged the patient's recovery and complicated their clinical trajectory. It is imperative in bacterial infection management to administer antibiotic therapy judiciously, aligning it with clinical presentations and adhering to dosing guidelines. This approach is pivotal to facilitate recovery and avert complications.

3.3. Prognosis

The patient exhibited significant improvement upon receiving piperacillin and tazobactam 4.2g IV three times daily (Fig. 2.). Piperacillin/tazobactam is recommended for adults in treating both uncomplicated and complicated skin infections, such as cellulitis, cutaneous abscesses, and ischemic/diabetic foot infections, especially when caused by beta-lactamase producing isolates of *Staphylococcus aureus* (9). Although there was a marked reduction in swelling, redness, and pitting edema, the drainage of pus persisted. To address this, local anesthesia was administered to the affected area, followed by a minor incision to facilitate the drainage of the residual pus. Once drained, the swelling subsided entirely. However, the patient experienced a single day of diarrhea, which they associated with the administration of tablet metformin 1500 mg. After reducing the dose of metformin 1000 mg OD, the episodes of diarrhea discontinued entirely.

Following a bike accident, the patient's delayed medical consultation and elevated HbA1c level (8.5%) increased infection susceptibility. The physician's failure to prescribe antibiotics, despite evident bacterial infection signs, and suboptimal Amoxycyclav dosing raise clinical decision-making concerns. For optimal outcomes, patients should promptly seek specialized care post-injuries, and physicians must adhere to established antibiotic guidelines.

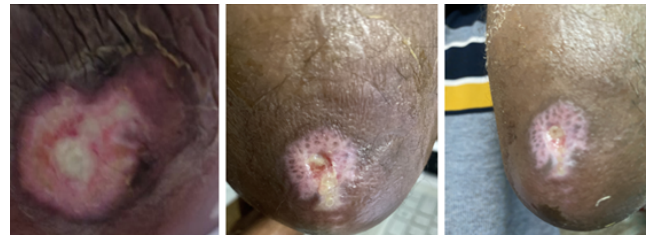


Fig. 2. The progression of the wound on the left elbow was monitored over specific intervals: Day 1, Day 14, and Day 20. By Day 14, the wound was still exuding pus. Consequently, a minor incision procedure was performed at the wound's center to facilitate complete drainage of the pus

Conflict of interest

The authors declare no conflicts of interest

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Authors' contributions

Concept: M.V.K., Y.S.R., Design: M.V.K., Y.S.R., Data Collection or Processing: S.S.S.N., Analysis or Interpretation: M.V.K., Y.S.R., S.S.S.N., Literature Search: S.S.S.N., Writing: M.V.K., Y.S.R., S.S.S.N.

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