

Septic infection at the insulin pump injection site: A case report

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Introduction

Skin infections in diabetic patients are a complex pathologic process requiring high attention [1]. This is mainly due to the extensive effects of diabetes on multiple systems of the patient's body, especially the alteration of the skin's microvasculature, nerve endings, and overall metabolic status [2]. Insulin pumps, the treatment of choice for type 1 diabetes mellitus, offer significant advantages in terms of glycemic control [3]. However, prolonged use of insulin pumps is also prone to complications such as infection and skin redness [4]. Tubular pumps store insulin in a reservoir within the pump unit, which is then delivered through a catheter into a small subcutaneous infusion cannula that adheres to the skin [5]. The body tends to sweat in the summer heat, resulting in moist skin, which provides favorable conditions for bacterial growth. The adhesive tape for fixing catheter needles in insulin pumps is prone to loosening and falling off due to moisture, making it easy for the needle to leave the skin and increasing the risk of infection. Measures such as enhanced skin sterilization treatment, regular needle replacement, selection of appropriate injection sites, and enhanced patient education and guidance are needed to reduce the risk of these complications [6]. With the implementation of these measures, the patient experience and quality of life can be improved [7].

Case Report

This woman is 40 years old, with type 1 diabetes mellitus of 20 years duration. She's been on insulin pump (Medtronic 712E) therapy with U-200 lispro insulin for over 10 years. The insulin pump is applied to the abdomen bilaterally 5 centimeters outward from the umbilicus circumference, alternating every 7 days.

She had no family history of diabetes mellitus and was thin (body mass index, 19.8 kg/m²). Glutamic acid decarboxylase and islet cell antibody tests were positive. C-peptide levels were low (0.55 mg/L; glucose, 6.9 mmol/L).

She has had a history of poor glycemic control for the past 5 years, and her glycosylated hemoglobin (HbA1c) levels have been consistently above 10.1%.

She has no previous skin conditions, allergies, or hereditary skin conditions. This patient was admitted to the hospital on July 15, 2024. Three days before admission, the insulin pump needle injection site developed skin redness and swelling that was painful to the touch, fluctuating, without breakage, and the mass was 5 cm in diameter. Initial laboratory tests on the day of the visit showed an elevated serum C-reactive protein level of 505 nmol/L and an elevated leukocyte level of $15.5 \times 10^9/L$. The patient was diagnosed as having a skin infection, and intravenous penicillin was initiated at 8 million/q6h, but the patient's symptoms did not improve. Therefore, skin incision drainage was performed three days later, and 10 ml of yellow-green pus was collected and sent to the hospital for laboratory culture. The wound was disinfected and changed daily. The results of bacterial culture and susceptibility to various antibiotics are shown in Table 1. On July 21, 2024, the patient's skin swelling was significantly reduced. One month later, the patient's wound was completely healed.

Table 1: Report of antimicrobial susceptibility testing of *Staphylococcus aureus* cultured from exudates collected from patient lesions.

Drug sensitivity results: <i>Staphylococcus aureus</i>		
Drug	¹ MIC	Interpretation
Penicillin sodium	≤0.03	² S
Amoxicillin	≤0.06	S
Cefazolin	≤0.15	S
Gentamicin	>8	³ R
Clarithromycin	>4	R
Clindamycin	≤4	S
Minocycline	>8	R
Fosfomycin	>4	R

¹MIC: Minimum Inhibitory Concentration; ²S: Sensitive; ³R: Resistant.

Discussion

The patient was a type 1 diabetic mellitus with chronic poor glycemic control. Septic skin infections are a common and dangerous consequence of diabetes mellitus, caused by a variety of factors, including repeated trauma, poor glycemic control, and neuropathy [8]. These patients are susceptible to various pathogens due to a low-functioning immune system, primarily through breaks in the skin or mucous membranes, such as skin ulcers, which can lead to rapid, deep-tissue infections [9]. *Staphylococcus aureus* is a common pathogen [10]. When these pathogenic microorganisms can reside or parasitize the weakly defended needle injection site effectively, they can rapidly spread and propagate to normal tissues, forming an infection or even pus. Therefore, for patients with type 1 diabetes mellitus treated with insulin pumps, especially those with poor glycemic control, the risk of skin and soft tissue infections at the needle injection site should be highly emphasized, and comprehensive therapeutic measures should be taken promptly to control the infection and promote wound healing.



Conclusion

This case reminds us that diabetic patients should pay great attention to cleaning and sterilizing the injection site and regular needle replacement during the use of insulin pumps. Meanwhile, the storage and use of insulin should also follow the norms to ensure its effectiveness and safety. In addition, strengthening patients' health education and management is also an important measure to prevent and control diabetic complications.

Declarations

Author statement authorship statement: Both authors meet the International Committee of Medical Journal Editors authorship criteria (ICMJE criteria). All authors are the attending physicians for this patient. Jingxian Fang wrote the manuscript.

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