

# A Rare Cutaneous Complication of Insulin in a Patient With Type 2 Diabetes That Developed Foot Necrosis at the Injection Site: A Result of Inadequate Patient Education

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## Abstract

Cutaneous complications of insulin became rare due to the introduction of highly purified recombinant human insulin preparations. We reported a case of a 63-year-old Anatolian man with type 2 diabetes mellitus that developed foot necrosis at the injection sites after local administration of analog recombinant mixed insulin to dorsal aspect of the foot due to foot pain. This case is rare and very interesting. The education of patients who use insulin is crucial to prevent skin-related complications of insulin therapy. So education is a part of treatment for patient with diabetes.

**Keywords:** Diabetic foot; Diabetes; Insulin therapy; Patient education

## Introduction

A large number of patients with diabetes are being treated with subcutaneous insulin injection [1]. Insulin allergy in patient with diabetes is a rare condition [2]. Insulin allergies range from localized skin reactions to systemic anaphylaxis. While insulin allergies were very common which were rated as 50-60% in the past, it is estimated to be less than 1-3% now [3]. This condition dramatically decreased due to improvement of the purification techniques and recombinant human insulin analogs [3, 4].

Foot infection in patient with diabetes is the most common and the major problem. Infection starts due to small

trauma, and it can be seen from light cellulite around the skin ulcers to severe cellulitis, progressive chronic osteomyelitis and gangrene [5-7]. The treatment of diabetic foot should include regulation of blood glucose, surgical debridement of wound and antibiotic therapy [6, 7].

## Case Report

A 63-year-old Anatolian man with type 2 diabetes mellitus had been using subcutaneous analog recombinant mixed insulin (25% insulin lispro and 75% insulin lispro protamine suspension, Humalog<sup>®</sup> Mix25, Eli Lilly & Co.) to control blood glucose for last 4 years without a deadly serious problem. The foot pain had continued for 1 week, although analgesic drug was used. He said that it was not other clinical evidence excluding mild edema. Fifteen days ago, he performed himself single local insulin to dorsal aspect of the foot due to foot pain. He had developed necrosis around the injection site (Fig. 1). He had been hospitalized because of necrosis at the dorsal aspect of left foot.

Plasma glucose level at the time of first acceptance was 171 mg/dL. HbA1c level was 12.2% (110 mmol/mol). On physical examination, he was 168 cm height and body weight was 70 kg, thus the body mass index (BMI) was 24.8 kg/m<sup>2</sup>. His blood pressure was 110/70 mmHg, pulse rate was 88/min and body temperature was 37.2 °C. The initial laboratory tests showed leukocytosis (WBC of 30.9/μL with 88.9% of neutrophils), anemia (hemoglobin 9.93 g/dL and hematocrit 27.8%) and hypoalbuminemia (albumin 1.8 g/dL). The erythrocyte sedimentation rate was increased (97 mm/h). C-reactive protein rate was increased (20.9 mg/L). All other laboratory parameters were in the normal range. There was not a history of allergy to insulin or other all drugs before. There were no other comorbidities and diabetic complications (as diabetic neuropathy and peripheral arterial disease). He was a nonsmoker. The patient was regularly examined in an outpatient diabetes clinic. However, we understand that it was regularly disobey to diet than patient's clinical history. There was no problem with the other foot on the clinical examination.

Foot necrosis suddenly occurred after the insulin injection.

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**Figure 1.** Clinical appearance of foot necrosis at the injection sites after local administration of insulin.

tion. Before necrosis, excluding mild edema, there was no maceration, infection, or hyperemia.

After he had been hospitalized, he consulted to endocrinology clinic because of the high serum glucose levels, and the treatment was ordered to him. *Streptococcus viridans* was isolated by culture from the wound specimen. Antibiotic therapy was prescribed during the first visit by the infectious disease clinic.

After preoperative preparation was made, transtibial amputation was performed due to a deep tissue necrosis. *Staphylococcus hemolyticus* was isolated by culture from the wound specimen after the surgery. However, it was resistant to the therapy. After antibiotic susceptibility tests had been made, an antibiotic therapy was prescribed during the secondary visit by infectious disease clinic.

After an intensive treatment of infection and a metabolic treatment were administered, the patient was recovered and discharged. Other laboratory tests were also unremarkable. No complication was detected during follow-up.

## Discussion

Cutaneous complications can be seen in patients with diabetes. In the patients with type 2 diabetes mellitus more often cutaneous infections are seen, although the patients with type 1 diabetes more often have autoimmune-related lesions [8]. Long-term microvascular and neurologic complications cause major morbidity and mortality in patients with insulin dependency. Effective therapy delays the progression of these conditions [9].

Patients with diabetes have a risk for foot ulcers at the rate of 12-25% during their life-time. The cause of 40-60% non-traumatic amputations is diabetic foot ulcers [10, 11]. Neuropathy and ischemia easily cause the foot ulcers developed in the high pressure regions of foot. These ulcers are a

suitable point of entry for bacteria, and eventually local infections may develop. If local infections are not treated, deep tissue infection, osteomyelitis and gangrenes may develop [6, 7]. Foot infections can be caused by a single or multiple bacteria species [7]. In the present case, *Streptococcus viridans* and *Staphylococcus hemolyticus* were isolated by culture from the wound specimen which increased contaminations at injection site leading to necrosis after injection.

Allergic reactions to insulin can be classified as local, generalized, delayed and biphasic [8, 12, 13]. Although new recombinant human insulin preparations and insulin analogs have decreased the immunogenic reactions, it has not been fully eliminated yet [14]. In our case, there was no history of allergy to insulin or other drugs before.

Common dermatological complications associated with subcutaneous insulin injection include specifically lipohypertrophy and lipoatrophy [1, 8, 13]. Other cutaneous complications may be associated with repeated subcutaneous injections [1, 8, 15, 16]. After repeated use, the needle can become significantly deformed, and this often causes more pain and increases contaminations at injection site [17].

The blood glucose control in the diabetes mellitus is the main aim of preventing systemic complications. Nonetheless, it is obligatory to prevent the cutaneous complications. The main factor in preventing the development of cutaneous complications in patients with diabetes is the education [18].

## Conclusions

We report a case of a 63-year-old man with type 2 diabetes mellitus that developed foot necrosis at the injection sites after local administration of insulin. We believe that this condition could be due to a wound infection after allergic reaction to insulin. Foot necrosis is a rare cutaneous complication after insulin therapy. Poor education and technique of insulin injection are important causes of cutaneous complications.

As a result, the education of patients who use insulin is crucial to prevent skin-related complications of insulin therapy.

### Conflict of Interest

The authors declare that they have no competing interests.

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