

# Evaluation and Management of Diabetes Mellitus with Diabetic Foot According to Wagner's Classification: A Case Report

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**Abstract:** *Type 2 Diabetes Mellitus is a health concern for the global population and the most common form of diabetes mellitus. Approximately 8-25% of diabetic patients have uncontrolled high blood sugar levels and cause complication foot ulcer. Proper management is the key to success so that the disease does not develop into progressive and get better. We present here a case of uncontrolled diabetes mellitus with diabetic foot and an overview of treatment strategies.*

**Keywords:** diabetes mellitus, diabetic foot, blood glucose, insulin, debridement

## 1. Introduction

Diabetes mellitus (called Diabetes), a health problem that is growing rapidly and becoming a health concern for the global population. This disease causes severe morbidity and mortality worldwide, due to the devastating effects of its chronic complications.[1] Type 2 Diabetes Mellitus (T2DM) is the most common form of DM, which accounts for 90-95% of all diabetic cases.[2,3] The prevalence of diabetes among those aged 20–79 years may increase to 7.7%, constituting 439 million by 2030 according to WHO. In 2015, about 62 million diabetics in India and the country will earn an embarrassing reputation from first (after China and the US) to register 79.4 million diagnosed cases of diabetes by 2030. [4, 5]

Diabetes mellitus is associated with endocrine metabolic disorders characterized by hyperglycemia due to impaired insulin secretion and increased insulin resistance, resulting in deficiency of insulin work, which normally maintains glucose homeostasis. In this case, to compensate for increasing insulin demand, the blood glucose level will be elevated gradually. [1, 6] Uncontrolled high blood sugar levels can cause complications, including skin infections. These complications tend to occur in patients with diabetes mellitus such as folliculitis, cellulitis, subcutaneous abscesses, and diabetic foot ulcer. [5, 7, 8] Usually this occurs in conditions of hyperglycemia, insulin is necessary, in addition to oral and dietary anti-hyperglycemia drugs. [2]

## 2. Case report

A 70-year-old woman, was treated with complaints of right leg pain for 1 week and worsened 1 day ago, accompanied by swelling and wounds. Patients also complain of nausea, decreased appetite for food and drink. His medical history

was significant for uncontrolled diabetes on insulin treatment, Novorapid 24U every 8h and Lantus 24U once a day. There is no history of trauma or foreign object puncture.

The patient's awareness was good, pain scale on the right leg was 7/10, with vital signs blood pressure 137/75 mmHg, heart rate 88/min, temperature 36.8°C, and respiratory rate of 20/min. On examination, right lower leg tenderness, swelling, redness, and ulcer. Laboratory tests performed after admission showed Hb 10.9 g/dL, WBC (21.11×10<sup>3</sup>/μL), hematocrit (32.8%), platelets (405×10<sup>3</sup>/μL), random blood glucose (437 mg/dL).

The patient was diagnosed with type 2 diabetes mellitus with cellulitis. The patient was given Novorapidinj. 24U every 8 hours, Lantus inj. 24U once daily, Ceftriaxone 2g IV every 12h, Paracetamol 500mg PO every 8 hours, Ranitidine 50mg IV every 12 hours, and Ondansetron 4mg every 8 hours. The patient was also planned for debridement in the diabetic foot area of the right leg after the blood sugar level decreased and stabilized.

Debridement was carried out for 60 minutes, with bleeding about 65 cc. Regional anesthesia is given in a supine position, namely block spinal anesthesia (BSA). Starting with disinfection using povidone iodine then a sterile duk is installed to narrow the field of operation. The incision was started at the right dorsal pedis along 7 cm, the evaluation found pus and necrotic tissue visible, then debrided and washed with Perhidrol. Incision on the plantar pedis along 7 cm, obtained necrotic tissue, then debrided and washed with Perhidrol. Dress the wound using sterile povidone iodine gauze and elastic bandage. Wound care was carried out every 2 days until there was no bleeding or pus when the patient was discharged from the hospital.

**Table 1:** Treatment maintenance according to blood glucose

Follow up	Blood glucose (mg/dL)		Treatment
	Fasting	Random	
Day 1 (Hospitalized)		437	Novorapid inj. 24U every 8h Lantus inj. 24U once a day
Day 2 (Before debridement)	241	94	Novorapid inj. 10U every 8h Lantus inj. 12U once a day
Day 3 (Before debridement)	224	193	Novorapid inj. 6U every 8h Lantus inj. paused
Day 4 Debridement	201	179	Novorapid inj. 4U every 8h Lantus inj. paused
Day 5 After debridement	195	171	Novorapid inj. 8U every 8h Lantus inj. 4U once a day

### 3. Discussion

Diabetes is a common disease affecting million persons in the world. With age the proportion of patients affected increases and it reaches 11% in the population over 65 years old. [9] Approximately 8-25% of diabetic patients have a foot ulcer, this being the main cause of non-traumatic amputation worldwide if not treated properly. With diabetes being a fast-growing disease, the importance of a better care has far more importance than before. [10]

Diabetic foot ulcers can be neuropathic or neuroischemic. It may develop into necrotic tissue, and it leads to amputation of toes, foot, or limb. The risk of amputation in diabetic foot ulcer (DFU) is more than 15%. [9,11] The Wagner classification is most commonly used for grading diabetic foot ulcers. According to Wagner's classification, patients with grade 3 diabetic foot found an ulcer that extends to a ligament, tendon, joint capsule, or fascia in the presence of an abscess. [12, 13]

Treatment goals for diabetes with diabetic foot ulcers include controlling blood glucose levels and debridement of diabetic foot in accordance with Wagner grade 3 management. Insulin therapy is the first choice in a hyperglycemic state of emergency, as well as severe and symptomatic hyperglycemic [14], as in this case. Another indication of insulin use is perioperative times especially major surgery or emergency.

Insulin therapy is a key player in the control of intermediate metabolism, which regulates glucose metabolism and is the most effective method of reducing hyperglycemia.[15] There is no upper limit in dosage for its therapeutic effect, so it can be used to reduce elevated blood glucose levels. It also exerts great influence on lipid metabolism in reducing triglycerides and increasing HDL. [16]

The combination of long acting insulin and rapid acting insulin provides a better reduction in blood glucose levels because it can meet the needs of basal insulin and prandial insulin, control blood glucose fluctuations, hypoglycemia events, and more controlled weight gain.[17]

In accordance with this case the use of Novorapid as a long acting insulin and Lantus as short acting insulin gave good results. The use of the initial doses of Novorapid 24U and Lantus 24U is suitable for reducing high glucose levels of

437 mg/dL. After the blood glucose begins to fall, the insulin dose is also reduced by the glucose level obtained. A decrease in fasting blood glucose deliver tangible results at the time of going to debridement is 201 mg/dL and after debridement to 195 mg/dL.

Novorapid is continued because it allows physiological replacement of insulin at mealtime due to its rapid onset of action, another advantage is that it can be given immediately before meals without interfering with glucose control. Because lantus is long acting to help manage the general needs of the body, the use of this insulin is not continued until debridement will be carried out to prevent hypoglycemia conditions. [18]

The patients will debridement after blood glucose levels have decreased, while other treatments are given such as analgesics, antibiotics and symptomatic drugs. Management of diabetic foot ulcers is based on the principles of wound debridement, identification and treatment of infection, use of dressings to maintain wound healing moisture, and offloading/redistribution of pressure from the wound.[9,19] The debridement action performed in this case was surgical debridement, which is the gold standard for the management of chronic wounds such as diabetic foot ulcers. The advantages are that it can remove necrotic tissue and callus, reduce pressure, perform extensive inspection of ulcers, aid in drainage of secretions or pus, help optimize the effectiveness of topical therapy, and stimulate healing. [20, 21]

Post debridement monitoring and wound dressing should be carried out regularly. For infected wounds or a lot of exudate, wound monitoring and dressing changes should be done every 2 - 3 days until the infection stabilizes. [19] In this case, the wound has been cleaned to a healthy tissue and there is a small amount of wound exudate. During treatment, there is no pus, bleeding, and odor on the wound which indicates that the debridement procedure was successful.

The patient's sole foot lesion may require offloading via some method or device to shift the weight fulcrum away from the side of the ulcer. The purpose of offloading is to prevent tissue trauma and facilitate wound healing. Some of the methods that can be done include bed rest, use of wheelchairs, walkers, and specially designed shoes.[9,19] Long-term assessments and interventions performed include regular debridement, strict sugar control, and monitoring of vascular and neurological status.

### 4. Conclusion

Surgical debridement is the gold standard in the management of diabetic foot ulcers with the Wagner grade 3 classification. Debridement is performed to remove dead tissue and help accelerate wound healing. Wound care including the use of wound dressings and offloading must be done appropriately to prevent trauma and recurrent ulcers. A comprehensive examination including vascular and neurological examinations should be performed routinely to look for the cause of diabetic foot ulcers.

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