Case report of a person with diabetes mellitus who has tropical diabetic hand syndrome

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ABSTRACT

Introduction: Diabetes mellitus (DM) is a chronic systemic disease that causes morbidity and mortality. Diabetes often increases the incidence and severity of various infections, especially those caused by bacteria and fungi, where patients have hyperglycemia and poor blood sugar control. Tropical diabetic hand syndrome (TDHS) is a specific hand complication experienced by people with DM in tropical countries. The syndrome involves localized cellulitis, which can be progressive and fulminant to hand sepsis and gangrene. Management of patients with TDHS requires a comprehensive strategy and management to reduce mortality and morbidity. This study aimed to report a rare case of a patient with T2DM who experienced TDHS.

Case Presentation: A 45-year-old man came to the emergency department of RSUD Dr. Soetomo, with a chief complaint of a wound on his right hand caused by a rusty nail that had not healed for three days. The patient said that he had uncontrolled DM for six years. In manus dextra examination, an ulcer measuring 0.5x0.5 cm was found on the back of the hand on the ulnar side, with edema, hyperemia, and active pus discharge. The patient was hospitalized for nine days and discharged when the complaints and the blood sugar level were improved. On the seventh day after discharge, the complaints felt significantly reduced, the wound improved with granulation tissue appearing, and the blood sugar level was within normal limits. The patient was given insulin aspart injection of 10 units thrice daily, basal insulin of 16 units, ciprofloxacin 500 mg twice daily, ibuprofen 400 mg thrice daily, and cilostazol 100 mg twice daily.

Conclusion: In this case report, we presented a case of a 45-year-old man with manifestations of TDHS as a complication of uncontrolled DM for six years and delay in obtaining medical services. Management of patients with TDHS includes hospitalization, elevation of the affected hand, optimal blood sugar control, administration of antibiotics, and wound care. Education for T2DM complications remains the most important preventive measure in developing countries.

Keywords: type 2 diabetes mellitus, tropical diabetic hand syndrome, complication, bacterial infection.


INTRODUCTION

Diabetes mellitus (DM) is a chronic systemic disease that causes morbidity and mortality.1,2 Therefore, diabetes often increases the incidence and severity of various infections, especially those caused by bacteria and fungi where patients have hyperglycemia and poor blood sugar control, which will affect the prognostic of their condition.3,4

Tropical diabetic hand syndrome (TDHS) is a specific hand complication experienced by people with DM in tropical countries. The syndrome involves localized cellulitis, which can be progressive and fulminant to hand sepsis and gangrene. Patients and healthcare professionals poorly understand the condition, resulting in delays in prompt and aggressive treatment. Several case reports have shown serious complications of TDHS, including permanent disability and death.5 TDHS was first reported in Nigeria in 1984, with most cases reported in Africa and some in India.6 Infections in the hands of diabetics are very rarely reported, and only a few studies have discussed it.7 However, the prevalence rate in Africa reaches 1.4-3.2% of diabetic hand cases.5 Although TDHS is a rare condition as a complication of DM, this infection is commonly found in tropical countries.8 Management of type 2 diabetes mellitus (T2DM) patients with TDHS requires a comprehensive strategy and management to reduce mortality and morbidity, especially complications from infectious conditions. This study aimed to report a rare case of a patient with T2DM who experienced TDHS.

CASE PRESENTATION

A 45-year-old man came to the emergency department of RSUD Dr. Soetomo with a chief complaint of a wound on his right hand that had not healed for three days; the patient felt that the wound was painful and festering. According to the Wong-Baker pain scale from 0-10, the patient stated the point was 4. The patient admitted that initially, the wound was caused by a rusty nail because the patient worked as a construction worker; the patient thought it would heal itself like previous wounds and treated himself with only antiseptic. After seven days, the patient complained of increasing pain and, heat, swelling and began to ooze pus from the palm of his hand, so the patient decided to go to Soewandi Hospital for treatment for one day; there was no improvement and finally...
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Figure 1. Clinical picture of the patient's right hand at admission. (A) Palm view, (B) side view, and (C) back view of the patient's right hand.

referred to Dr. Soetomo Hospital. Figure 1 shows the clinical picture of the patient's right hand.

The patient had a history of DM for six years, which was diagnosed at the public health center at that time and the patient did not feel any complaints, so he did not seek any treatment. The patient also denied having frothy urine and high blood pressure. The patient admitted that he still felt his legs, so when he wore sandals, he felt the sandals slipping off. The patient had medical control at the health center for the last year. The patient was given glibenclamide 10 mg once daily, but the patient did not take the medicine regularly. He prefers to use herbs, and during the medical control, the patient claimed that his blood sugar was consistently within normal limits.

In the physical examination, we found that the the patient was fully alert, blood pressure was 130/70 mmHg, pulse rate was 98x/min, respiratory rate was 20x/min, regular, axillar temperature was 36.5°C, and his body mass index was 19.53 kg/m². On the physical examination of the one-third distal region of the right antebrachial, hyperemia and edema were found. In the right-hand region, an ulcer measuring 0.5 x 0.5 cm was found on the dorsum of the hand on the ulnar side. Edema, hyperemia, and active pus discharge were also found. The other physical examination was within the normal limit.

We also performed a blood examination of the patient and found leukocytosis (leukocyte count 25.64 x10³ cells/mm³), and the other hematological parameters were within normal levels. In the blood chemistry parameter, we found that the random blood glucose level of the patient was high (322 mg/dl). Meanwhile, the other parameter was within the normal limit. We also performed a urinalysis and found elevated glucose levels in the urine (+4). The COVID-19 PCR test was negative. The chest x-ray revealed that the heart and lungs were normal. In the x-ray of the right hand (manus dextra), we found that the soft tissue was swollen without any sign of osteomyelitis.

Based on the clinical findings, the patient was diagnosed with a right-hand ulcer with T2DM. The patient was planned to have a repeat blood examination, urinalysis, blood chemistry examination, and blood culture. The patient’s eye was also checked by a fellow ophthalmologist and treated with wound care every 2 days by a fellow plastic surgeon. The patient then hospitalized and was given treatment such as diet of 2,100 kcal/day, IVFD NaCl 0.9% 500 ml/24 hours, ceftriaxone 1 gram IV twice daily, metronidazole 500 mg IV thrice daily, insulin Aspart injection 6 units subcutaneously thrice daily, insulin Glargine injection 10 units subcutaneously once daily every 10.00 PM, and also given ibuprofen 400 mg orally thrice daily.

Disease progression

The patient still feels weak, and the wound on the right hand is still painful. A physical examination of the right-hand region found an ulcer with pus and signs of acute inflammation. Blood examination showed that the fasting blood sugar was 185 mg/dl, and the two-hour post-prandial blood glucose was 244 mg/dl (Table 1). The patient’s HbA1C examination was 12.5%, and his albumin level was 2.7 g/dl. In the urinalysis, it was found that the glucose was +2. There was no sign of diabetic retinopathy on the ophthalmology examination. The patient was diagnosed with TDHS dextra with T2DM. The patient was given insulin aspart adjusted using the insulin correction dose technique according to Table 1, and the patient was given cilostazol 100 mg orally twice daily. Routine wound care was performed every two days. With a change in insulin dose for day three, 8 units for insulin injection before breakfast, 8 units for insulin injection before lunch, 8 units for insulin injection before dinner, and 12 units for basal insulin injection.

| Table 1. Patient’s blood glucose level on the second day of treatment |
|-----------------------------|------------------|---------------------|
| Blood glucose examination   | Blood glucose level | Insulin correction dose |
| Fasting blood glucose       | 185              | Increase glargine 2 U |
| Two-hour post-prandial blood glucose | 244         | Increase aspart 2 U  |

| Table 2. Patient’s blood glucose level on the fifth day of treatment |
|-----------------------------|------------------|---------------------|
| Blood glucose examination   | Blood glucose level | Insulin correction dose |
| Fasting blood glucose       | 177              | Increase Lantus 2 U  |
| Two-hour post-prandial blood glucose | 183 | Dosage remain unchanged |

| Table 3. Patient’s blood glucose level on the eleventh day of treatment |
|-----------------------------|------------------|---------------------|
| Blood glucose examination   | Blood glucose level | Insulin correction dose |
| Fasting blood glucose       | 115              | -                   |
| Two-hour post-prandial blood glucose | 126 | -                   |
**The fifth day of treatment**
The wounds on the right hand are still felt painful. On physical examination of the right hand, ulcers with slough were still obtained, and signs of acute inflammation and pulsation of the radial and brachial arteries are still palpable (Figure 2). On blood examination, leukocyte count was 15,000 cells/mm3, fasting blood glucose was 177 mg/dl, and the two-hour post-prandial blood glucose was 183 mg/dl (Table 2). Pus culture examination revealed *Staphylococcus aureus* with a positive sensitivity test to ciprofloxacin, clindamycin, linezolid, cotrimoxazole, gentamicin, vancomycin, mupirocin, and fosomycin. The patient was diagnosed with TDHS dextra with T2DM. The patient was given insulin with insulin dose correction, according to Table 2. The patient received prandial insulin therapy of 10 units before breakfast, 10 units before lunch, 10 units before dinner, and 14 units of basal insulin. The patient was also given antibiotics infusion of ciprofloxacin 400 mg twice daily and cilostazol 100 mg orally twice daily. Routine wound care was done once every two days. On day six of treatment, the patient had a change in insulin injection dose to 10 units for insulin before breakfast, 10 units for insulin before lunch, 10 units for insulin before dinner, and 16 units for basal insulin.

**The ninth day of treatment**
Complaints of wounds on the right hand are still painful but reduced, and swelling in the hand has also begun to decrease. On physical examination, the right hand still obtained ulcers without pus and slough. The granulation tissue began to form on the back of the hand, and signs of acute inflammation were absent. Blood examination showed that the leukocyte count was 11,360 cells/mm3, fasting blood glucose was 115 mg/dl, and the two-hour post-prandial blood glucose was 126 mg/dl (Table 3). The patient was diagnosed with TDHS dextra with T2DM. The plastic surgeon fellow discharged the patient with a routine wound care plan at the polyclinic. He was also given insulin therapy according to blood glucose levels (Table 3). He was given aspart 10 units insulin before breakfast, 10 units before lunch, 10 units before dinner, and 16 units of basal insulin. He was also given ciprofloxacin 400 mg once daily until seven days after discharge, ibuprofen 400 mg thrice daily, and cilostazol 100 mg twice daily.

**The seventh day after discharge**
The patient sought medical control at Dr. Soetomo Hospital Surabaya. Pain on the right hand was still felt, but the swelling was much reduced. A physical examination of the right hand showed no more swelling, and the wound had improved with granulation tissue. Blood examination showed that the leukocyte count was 10,880 cells/mm3, fasting blood glucose was 110 mg/dL, and the two-hour post-prandial blood glucose was 166 mg/dL. The patient is still diagnosed with TDHS dextra with T2DM. Outpatient therapy given was insulin aspart injection 10 units in the morning, 10 units in the afternoon, 10 units in the evening, and 16 units of basal insulin. The patient is still given ciprofloxacin 500 mg twice daily, ibuprofen 400 mg thrice daily, and cilostazol 100 mg twice daily.

**DISCUSSION**
Diabetes mellitus is a group of metabolic diseases with hyperglycemia characteristics that occur in disorders of insulin secretion, insulin action, or both. The diagnosis criteria of T2DM, according to the American Diabetes Association (ADA), are fasting blood sugar levels ≥126 mg/dl, or blood sugar after an oral glucose tolerance test ≥200 mg/dl, or the presence of classic symptoms of hyperglycemia conditions with current blood sugar ≥200 mg/dl, or HbA1c ≥6.5% where the laboratory used is National Glycohemoglobin Standardization Program (NGSP) certified.

The patient has had a history of DM since 2015, taking glibenclamide irregularly, and blood sugar is not well controlled. The patient also experienced a delay in health services for his wound three days after the hand was swollen painful, and pus came out. The patient thought it was a normal wound that healed immediately and was self-treated with antiseptic. Infectious conditions play an essential role in the pathogenesis of TDHS. The thickening of the basement membrane in small blood vessels blocks the movement of leukocytes to the inflammatory area and also blocks the transport of nutrients to the tissue. Hyperglycemia conditions can also reduce neutrophil activity and secondary chemotaxis dysfunction, resulting in leukocyte attachment and dysfunction, reducing phagocytic ability. This explains the high rate of necrosis and gangrene followed by minor wounds or infections in people with diabetes. Peripheral neuropathy conditions also increase the risk of TDHS than peripheral arterial disease, where this neuropathy reduces the sensation of the hand so that patients tend to get wounds.

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The patient sought medical control at Dr. Soetomo Hospital Surabaya. Pain on the right hand was still felt, but the swelling was much reduced. A physical examination of the right hand showed no more swelling, and the wound had improved with granulation tissue. Blood examination showed that the leukocyte count was 10,880 cells/mm³, fasting blood glucose was 110 mg/dL, and the two-hour post-prandial blood glucose was 166 mg/dL. The patient is still diagnosed with TDHS dextra with T2DM. Outpatient therapy given was insulin aspart injection 10 units in the morning, 10 units in the afternoon, 10 units in the evening, and 16 units of basal insulin. The patient is still given ciprofloxacin 500 mg twice daily, ibuprofen 400 mg thrice daily, and cilostazol 100 mg twice daily.
with monofilament was not performed because the equipment was unavailable. The anatomical location of TDHS is 57.7% in the fingers, 30.8% in the hand, and 11.5% in the arm. Clinical symptoms in TDHS are like signs of inflammation in general, namely swelling (tumor), pain (dolor), heat (calor), redness (rubor), and decreased function (functio laesa). TDHS infection can begin with minor injuries in abrasions, lacerations, or just insect bites. Patients with TDHS always involve the hands, especially the palmar and dorsum of the fingers. In TDHS, there is also limited joint motion and thickening of the skin of the hands. Clinically, a study by Kasim et al. showed that pulsation in the elbow and wrist areas was still palpable in 82.1% of the 95 patients examined.

The patient had swelling of the right hand, pain, and pus discharge but no fever. The patient also started with a minor wound punctured by a rusty nail. According to the predisposition of the wound, which always involves the dorsum manus side, the patient also has a thickening of the skin of the hand and limitation of motion of the finger joints. The status localis also showed signs of acute inflammation in the right hand. A blood culture examination can be done to look for the causative agent of infection. If there are systemic symptoms, a blood culture can be done. The causative bacteria of TDHS are often Staphylococcus sp, while Streptococcus sp, Klebsiella, Enterobacter, Proteus, Escherichia coli, and anaerobic bacteria can also be found. Some patients have a combination of germs, usually with a poor prognosis of hand amputation, disability, and death, but rarely.

On the examination of the patient's local status in the antebrachial region dextra there is edema and hyperemia. In the manus dextra region, necrotic tissue with a size of 0.5 cm x 0.5 cm was found in the dorsum of the manus, and a lump full of pus was palpated in the manus dextra. Moreover, the culture examination showed Staphylococcus aureus bacteria. Management of patients with TDHS includes hospitalization, elevation of the affected hand, optimal blood sugar control, administration of antibiotics, wound care in incision, debridement, drainage, further surgery, and continued other rehabilitation measures if necessary. Optimal blood sugar control with insulin administration due to hyperglycemia worsens infection and slows wound healing, while infection worsens blood glucose metabolism. One study showed that the addition of hyperbaric oxygen therapy to standard therapy is a safe method to optimize healing from TDHS.

The patient was given a ceftiraxone injection of 1 gram twice daily and a metronidazole infusion of 500 mg thrice daily, which was changed according to the culture results with a ciprofloxacin infusion of 400 mg twice daily. Then insulin therapy was given with 6 units of insulin aspart every 8 hours subcutaneously, 10 units of insulin glargine subcutaneously, and the dose was titrated until the blood sugar reached the target with a dose of insulin aspartate 10 units in the morning, 10 units in the afternoon, 10 units in the evening, and 16 units of basal insulin. The patient was also given wound care every two days by a colleague from the plastic surgeon fellow. Insulin in hospitalized DM patients can be used either subcutaneously or intravenously by continuous infusion. In insulin administration, according to ADA 2018, the pre-prandial blood sugar target is 80-130 mg/dl, post-prandial <180 mg/dl, and HbA1c <7%. Various kinds of insulin usage, from the simplest to the most sophisticated, include intravenous regulation every hour or subcutaneous regulation. Using subcutaneous rapid regulation, depending on the initial random glucose level obtained, insulin is given subcutaneously with an extra initial dose, and the insulin dose is maintained 3x a day with dosing guidelines. In general, both can be used in cases that require immediate blood sugar reduction or ordinary diabetes mellitus cases that are hospitalized with blood glucose >250 mg/dl.

The patient was first admitted to the hospital with a blood sugar of 350 mg/dL. RCS was performed with a double dose of 6 units and maintenance of 6 units every 8 hours, and a basal insulin dose of 10 units was given. The therapeutic target of surgery is very complex both in terms of saving the affected extremities and maintaining hand function and is very expensive and difficult to achieve. Therefore, educating workers, especially diabetics, on the importance of maintaining hand health by avoiding all kinds of trauma to the hands, taking regular anti-diabetic drugs, and if exposure to wounds does not delay treatment so that it will improve the prognosis of TDHS itself. TDHS has received less attention than diabetic foot ulcers. Even though TDHS can also provide an equally poor prognosis.

The delay greatly influences the prognosis of TDHS in getting medical help due to a lack of attention to the signs of TDHS with life-threatening consequences. The prognosis of hand ulcers is also considered as to how long the patient has diabetes. If he had DM for more than three years, he would have a worse prognosis (less than three years). Of the total patients in China, 76% experienced healing and did not need amputation, while the rest experienced permanent disability of the hand and amputation. In Africa, according to Abbas et al., 13% in Tanzania had amputation. The patient's prognosis in this case is good because the infectious process has been resolved, and the patient has good blood sugar control.

CONCLUSION

In this case report, we presented a 45-year-old man with manifestations of a wound on the left hand that did not heal for three days, with a risk factor of suffering from DM for six years, who did not control his blood sugar and experienced delays in obtaining medical services. Management of patients with TDHS includes hospitalization, elevation of the affected hand, optimal blood sugar control, administration of antibiotics, and wound care in incision, debridement, drainage, surgery and other rehabilitation measures should also be done if necessary. Education for T2DM complications like TDHS remains the most important preventive tool in developing countries.

PATIENT’S INFORMED CONSENT

The patient has signed a written informed consent and agreed to this study’s publication.
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CONFLICT OF INTEREST
The authors declare that there are no conflicts of interest.

FUNDING
None.

AUTHOR CONTRIBUTIONS
All authors contributed equally to this study and the manuscript preparation until publication.

REFERENCES