



## Case Presentation

# Tropical diabetic hand syndrome, a common but unknown pathology

*Síndrome de mano diabética tropical, una patología frecuente pero desconocida*

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**ABSTRACT. Introduction.** Out of 10 patients with diabetes mellitus, 4 could have significant hand injuries that require timely medical evaluation. Here we report a rare condition called tropical diabetic hand syndrome (TDHS), its classification and treatment of a case in the Mosquitia region of Honduras. TDHS is defined as any adult diagnosed with diabetes mellitus presenting with cellulitis, abscess and/or gangrene in any region of the hand and upper limb. **Case presentation.** A 22-year-old woman with diabetes mellitus type 1 attended Hospital de Puerto Lempira on two occasions in a period of 4 months. She showed up with inflammatory changes in her right hand, which she attributed to an unnoticed injury while doing her daily activities. Multiple surgical interventions and broad-spectrum antibiotic treatment were necessary to control the injury. **Discussion.** The term TDHS is rarely used to designate inflammatory changes in the hands of diabetic patients living in tropical countries. Compared to the diabetic foot, TDHS occurs in a 20:1 ratio, and it's not uncommon to see a rapid spread of infection through the hand and forearm compartments, with Meleney's gangrene its complication. **Conclusion.** TDHS must be treated aggressively from the beginning given its rapid evolution to complications. A complementary therapy must be integrated.

**RESUMEN. Introducción.** De 10 pacientes con diabetes mellitus, 4 de ellos pueden llegar a presentar lesiones importantes en la mano que requieren evaluación médica oportuna. Aquí reportamos una rara condición llamada el síndrome de mano diabética tropical (TDHS), su clasificación y tratamiento, mediante la presentación de un caso en la región de la Mosquitia de Honduras. TDHS se define como cualquier adulto diagnosticado con diabetes mellitus que presente celulitis, absceso y/o gangrena en cualquier región de la mano y miembro superior. **Presentación del caso.** Mujer de 22 años con diabetes mellitus tipo 1. Acudió al Hospital Puerto Lempira en dos ocasiones en el periodo de 4 meses, con cambios inflamatorios en la mano derecha atribuido a una lesión desapercibida mientras hacía sus actividades diarias. Múltiples intervenciones quirúrgicas y antibiótico de amplio espectro fueron necesarios para controlar la lesión. **Discusión.** Rara vez se utiliza el término TDHS para designar los cambios inflamatorios en las manos de pacientes diabéticos que viven en los países del trópico. En comparación al pie diabético, el TDHS se presenta en una proporción 20:1, y no es extraño evidenciar una rápida propagación de la infección a través de los compartimientos de la mano y antebrazo, siendo la gangrena de Meleney su complicación. **Conclusión.** El TDHS debe tratarse agresivamente desde su comienzo dada su rápida evolución a complicaciones. Es necesario integrar una terapia complementaria.

## 1. Introduction

Diabetes mellitus is an endocrine-metabolic disease determined by environmental factors, eating habits, physical activity, and genetic factors, among others. Its main characteristic is the poor production of insulin by the beta cells of the pancreas, in some cases the total absence of insulin production, as well as alterations in the uptake of insulin by membrane receptors. The person suffering from this disease has a poor macronutrient metabolism (fats,

proteins, and carbohydrates), as well as levels of insulin resistance. It produces florid alterations in the organism. High blood glucose levels (hyperglycemia) dangerously stand out. Once this pathology is established, fasting hyperglycemia can be identified and, in many cases, an extensive evolution of the disease including complications such as microangiopathic, as well as macroangiopathies, enteropathies and neuropathies (de Mora, 2019).

The American Diabetes Association (ADA) proposes diagnostic criteria for diabetes mellitus, which are: fasting glucose  $\geq 126$  mg/dL (with a minimum fast of 8 hours); 2-

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hour plasma glucose  $\geq 200$  mg/dL during a glucose tolerance test. For the test, a load of 75 grams of anhydrous glucose dissolved in water is applied; glycosylated hemoglobin (A1C)  $\geq 6.5\%$ . Classic symptoms of hyperglycemia or hyperglycemic crisis are diagnosed with random glucose  $\geq 200$  mg/dL (ADA, 2020).

Along with poor control of this disease, complications develop, such as diabetic foot syndrome, Fournier's gangrene, chronic kidney injury, diabetic retinopathy, reduced immunocompetence, furunculosis, alterations in the upper limb, among others. The alteration of the hands of diabetic patients is more common in type 2 diabetes than in type 1. However, its determining factor is the time of evolution. In any case, the entity is directly related to the underlying metabolic alteration (Proubasta Renart, 2015). Tropical diabetic hand syndrome (TDHS) was first mentioned as an entity typical of diabetic patients who are between the Tropics of Cancer in the northern hemisphere and the Tropic of Capricorn in the southern hemisphere. However, it is known that this alteration can appear worldwide, so certain authors prefer to name it within the spectrum of diabetic hand syndrome. TDHS is defined as any adult diagnosed with diabetes mellitus presenting with cellulitis, abscess and/or gangrene in any region of the hand and upper limb. It is not surprising that most medical personnel name this problem as "abscess in the hand" or "inflammatory changes in the hand", being the main problem its entity identification and study (Álvarez et al., 2020).

## 2. Case presentation

A 22-year-old female patient diagnosed with type 1 diabetes mellitus, with an evolution of 13 years from

Yumanta, Gracias a Dios went to the Puerto Lempira Hospital (PLH) emergency room on Thursday, October 10, 2019, due to an ulcer on her right hand (Figure 1). The base and edges of the lesion were blackish, which is attributed to the application of "Sika" on the injury. There were inflammatory changes in the first finger of the right hand that extended to the thenar region, second finger and wrist, with an evolution of approximately one month. The patient indicated that she went to the PLH, as a suggestion from the hospital internist. "Sika" is the Misquito name that corresponds to their traditional medicine, being used to name ointments, infusions, rituals, etc. In this case it was used to name an "antiseptic" cream based on herbs and roots. The patient reported that she was being treated with long-acting insulin, which was abandoned after two months of initiation. She didn't remember the set dose.

Admission to the General Women's Ward was decided to comply with antibiotic coverage, glycemic control and surgical treatment for abscess drainage and deep debridement. Three surgical interventions and 19 days in the hospital were necessary, with several wound cleanings per day and staggered antimicrobial treatment, using from clindamycin and gentamicin, piperacillin plus tazobactam, to imipenem. Medical discharge was indicated on November 18, 2019, with insulin treatment (long-acting insulin 32 International Units [I.U.] at 7:00 a.m. and 18 I.U. at 10:00 p.m.) and daily ulcer dressings. An appointment was scheduled in an outpatient consultation with the endocrinology service, due to metabolic imbalance. The patient did not show up for scheduled appointments. It is worth mentioning that the diagnosis was recorded by the treating endocrinologist.



**Figure 1.** Patient's right hand with ulcer in resolution.

On Thursday, January 22, 2020, the patient returned to the PLH emergency room due to purulent discharge from an abscess on her right hand. This time affecting the entire back and palmar region of the hand, with inflammatory changes that extended to the distal 1/3 of the forearm (Figure 2). Random glucometry/ of 365 mg/dL was found. The patient reported a fever of approximately three days of evolution, accompanied by an inability to pick up objects with the affected hand, this being her main reason for seeking medical attention. Two surgical interventions were performed under blockade of the upper limb (cleaning, debridement, and abscess drainage on 01/28/2020 and 02/04/2020), broad-spectrum antimicrobial treatment (from oxacillin to imipenem) to achieve control of the infection, as well as personalized insulin treatment, using long-acting insulin 38 I.U. in the morning and 26 I.U. at night, accompanied by rapid-acting insulin 10 I.U. at 7:00 a.m., 10 I.U. previous lunch and 10 I.U. prior dinner. The patient was hospitalized for 24 days in the General Women's Ward, performing 2 to 3 daily dressings using hydrogen peroxide, chlorhexidine gluconate and povidone iodine. Medical discharge was decided on February 15, 2020, with the insulin regimen and medical appointment with endocrinology services.

During her second stay in the PLH, Grade 2 Joint Mobility Limitation (LMA) was detected, with involvement of the first finger of the right hand, inability to flex the finger (interphalangeal, metacarpophalagic and carpometacarpal joints) and limited flexion of the fifth finger (proximal and distal interphalangeal joint), favoring the definitive diagnosis of Diabetic Hand. The diagnoses at the time of medical discharge were the following: compensated type 1 diabetes mellitus, TDHS in resolution, Grade 2 Joint Mobility Limitation.



**Figure 2.** Patient's hand asymmetry due to inflammation.

### 3. Discussion

The first reports of TDHS date back to 1975 in the United States of America (USA) and in 1984 at Nigeria, with the African continent being the site with the greatest study of this pathology (Abbas, 2001). TDHS shares similar risk factors with diabetic foot syndrome, peripheral neuropathy, vascular and angiopathy, in addition to being female, insect bites, poorly controlled diabetes, hand injuries, low socioeconomic status, residing in coastal areas and late medical evaluation. Because TDHS is reported infrequently in the medical literature, both patients and treating physicians ignore this entity and favor a rapid and extensive evolution of the infection. Most of the cases observed are in advanced stages, added to the precarious health care that worsens the prognosis (Montes de Oca, 2008; Altamirano Olvera, 2019).

Glycemic control has been adopted as one of the main triggering factors. Its pathophysiology lies in the high blood glucose levels experienced by patients, due to poor medication control and/or poor adherence to treatment. This leads to peripheral neurological lesions and compromised immune response. The antimicrobial action of the immune system is largely overwhelmed by vasoconstriction secondary to inflammatory changes, generating poor irrigation of the affected tissues, as well as hypoxia of the local tissues. TDHS shares most of the pathophysiological mechanisms of diabetic foot syndrome, but the mechanism of the initial trauma is related to an unnoticed injury while the person is carrying out their daily activities. Complications of diabetes mellitus in the hands are relatively rare compared to complications in the foot, with a ratio of 1:20 (Proubasta Renart, 2015; Zyluk, 2015).

If the patient does not go to medical services, the infection follows a rapidly progressive course, spreading through the different virtual spaces found in the hand. Any adult diagnosed with diabetes mellitus in the tropical regions of the world, who also observes cellulitis, abscess and/or gangrene in any region of the hand, will have a diagnosis of TDHS. It is worth mentioning that this affection is part of the diabetic hand syndrome spectrum, which implies any alteration in the hands of patients diagnosed with diabetes mellitus, this disease being the main trigger (Okpara et al., 2015; Öztürk, 2018).

This pathology presents its own clinical characteristics. As the main criterion, a poorly controlled diabetes mellitus. Most of adult patients do not remember a daily trauma that it goes unnoticed (injury by a sharp object, wood splinter or during nail cutting). It is common to find neurosensory alterations such as paresthesia and anesthesia, as well as discovering that most patients sought care from a local healer, which worsens the prognosis. This increases the chances of Meleney's gangrene involving extensive upper limb tissue destruction, culminating in amputation (Okpara et al., 2015; Proubasta Renart, 2015; Lawal et al., 2013).

There is currently no widely accepted classification of TDHS. However, Lawal et al. (2013) propose a very useful classification. They studied 36 patients, all with type 2 diabetes mellitus. Patients were broadly classified into three groups based on degree of severity and prognosis, starting with patients presenting with infection of the hand limited to the skin, subcutaneous cellular tissue, and muscle, the network of spaces between the metacarpals, including the virtual space of Parona (61.1%), which corresponded to group 1. Patients with infection affecting the deep tendons of the hand, bones, and joints, including data of osteomyelitis, but without gangrene (13.9%) corresponded to group 2. Group 3 corresponded to digital and/or hand gangrene, Meleney's gangrene (13.9%). According to the study recommendations, all groups require hospital care for broad-spectrum antibiotic coverage and a decision whether a surgical procedure will be performed, if necessary (Lawal et al., 2013).

Physical therapy is recommended during inpatient and outpatient days. This improves blood flow and enhances the immune reaction at the site of infection (Lawal et al., 2013). Multiple studies indicate a speedy recovery in individuals treated with hyperbaric oxygen therapy, reducing hospitalization time by up to half of what is usual. Unfortunately, TDHS predominates in countries with an inefficient hospital system, causing a huge investment in resources due to a prolonged hospital stay. The PLH has a two-compartment hyperbaric chamber that is used as the main treatment for patients with decompression sickness (diver's disease), common in this region of the country due to artisanal pearl fishing. Two daily sessions of 120 minutes imply a cost of \$250 USD. Patients cannot opt for this therapeutic scheme due to its high cost. The diverse

microbial flora found on the hands (bacteria, fungi, etc.) due to their use in multiple activities contributes to the rapid evolution of the disease. The use of secretion culture to guide antimicrobial therapy is ruled out for this reason. All these factors may contribute to an opportunistic infection in the ulcer; therefore, an empirical antibiotic therapy should be started (Naqash, 2016; Cánaves, 2013).

Depending on the hospital resource, a wide range of antibiotics can be applied, since many patients turn to local traditional medicine as their first option to treat their ailment, increasing the incidence of medical consultations with patients in states of sepsis and/or septic shock, requiring admission to the intensive care unit. Within surgical treatment there is a variety of procedures ranging from simple cures to the need for partial or complete amputation of the hand (Lawal et al., 2013). Once the diagnosis has been established as such, glycemic control will be through human insulin. The use of oral hypoglycemic agents as the only treatment is contraindicated (Ince, 2015; Núñez Parada, 2016; Proubasta Renart, 2015).

The LMA considerably affects the daily activities of patients, reducing their quality of life and requiring certain dependence on third parties. LMA can be classified according to its level of involvement. Its main method of prevention is the metabolic control of the patient. Once established, there are few effective treatments against this pathology. Strict glycemic control delays the progression of this disease. Most treatments are not very effective (Cánaves, 2013). Surgical interventions (fasciotomy, resection of the A1 pulley, among others) are indicated only if it affects the patient's daily activities. However, certain authors recommend surgical treatment as a preventive measure for possible deformities and complications such as a pain syndrome due to restricted movement. More research is needed in this regard to clarify this conflict. Although there is still no internationally accepted convention for LMA, active and passive physiotherapy is recommended. The affected joint may benefit from prolonged use of a corrective brace. Likewise, the paraffin bath favors loosening the affected joints (Proubasta Renart, 2015).

#### 4. Conclusion

More studies are needed to validate the different TDHS classifications found in the literature. This disease, like all metabolic pathologies, is preventable if its identified and treated correctly since the beginning. TDHS must be treated aggressively from its beginning, which implies efficient health care for all patients diagnosed with diabetes mellitus. The hyperbaric chamber located in the PLH would be a highly valuable adjuvant treatment for patients with TDHS and all pathologies that can be treated in this modality, such as diabetic foot, Fournier's gangrene, carbon monoxide poisoning, among others.

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## 6. Author Contributions

JO, SL and OO participated in the literature review, as well as in the presentation of the case. SL translated the manuscript to English. All authors read and approved the final version of the manuscript.

## 7. Conflicts of Interest

The authors declare no conflict of interest.

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