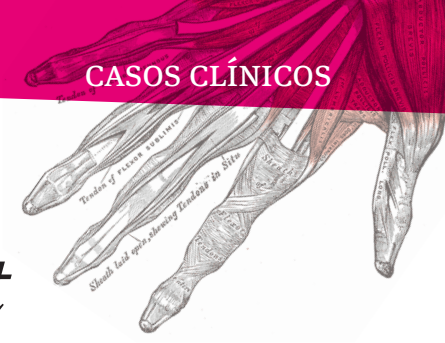

Prevention and treatment of burns in diabetic patients' feet

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THE LOSS OF SENSIBILITY CAUSED BY DIABETIC NEUROPATHY REQUIRES THE PATIENT'S SELF-CARE TO AVOID FAINT WOUNDS. IN THIS CASE, THE PATIENT SUFFERS BURNS DESPITE BEING EDUCATED IN THE MATTER. THIS CAN BE ATTRIBUTED TO THE THERMAL SOURCE'S RARITY (SAND). THE PATIENT DOES NOT IDENTIFY THE RISK BECAUSE HE DOES NOT RELATE IT TO HIS PATHOLOGY. THIS CLINICAL CASE IS AIMED AT STRESSING THE NEED FOR A PROPER EDUCATION IN CASES OF DIABETIC NEUROPATHY, INCLUDING THE RISKS THAT, ALTHOUGH INFREQUENT, ARE REMARKABLE.

DIABETES MELLITUS II; DIABETIC NEUROPATHY; BURNS; THERMAL SOURCES; DIABETIC FOOT.

Introduction

Diabetic neuropathy is one of the main long-term complications of diabetes. The evidence supports the fact that a good metabolic control delays its appearance (1, 2) as hyperglycemia is the main factor for its progress (3). Several hypotheses are considered about its etiology, which still remains unknown. Some of them suggest the existence of neuronal damage caused by the metabolism of glucose to sorbitol. Others propose macrophages' detrimental actions as the main source of axon degeneration (4). The major consequences of this neuropathy are wounds that become ulcerated or infected. As the protection provided by unaltered sensibility is missing in these patients, injuries that go unnoticed appear (5). This has implications for diabetes being the first cause of non-traumatic amputation (2), since it has no treatment and the injuries produced by neuropathy lead to the loss of the limb if not timely detected and treated. The consequences of this damage are thus potentially disastrous for the patient. However, a high percentage of the cases are preventable (1, 2, 5), which urges for comprehensive follow-up and education after the diagnosis of diabetic neuropathy.

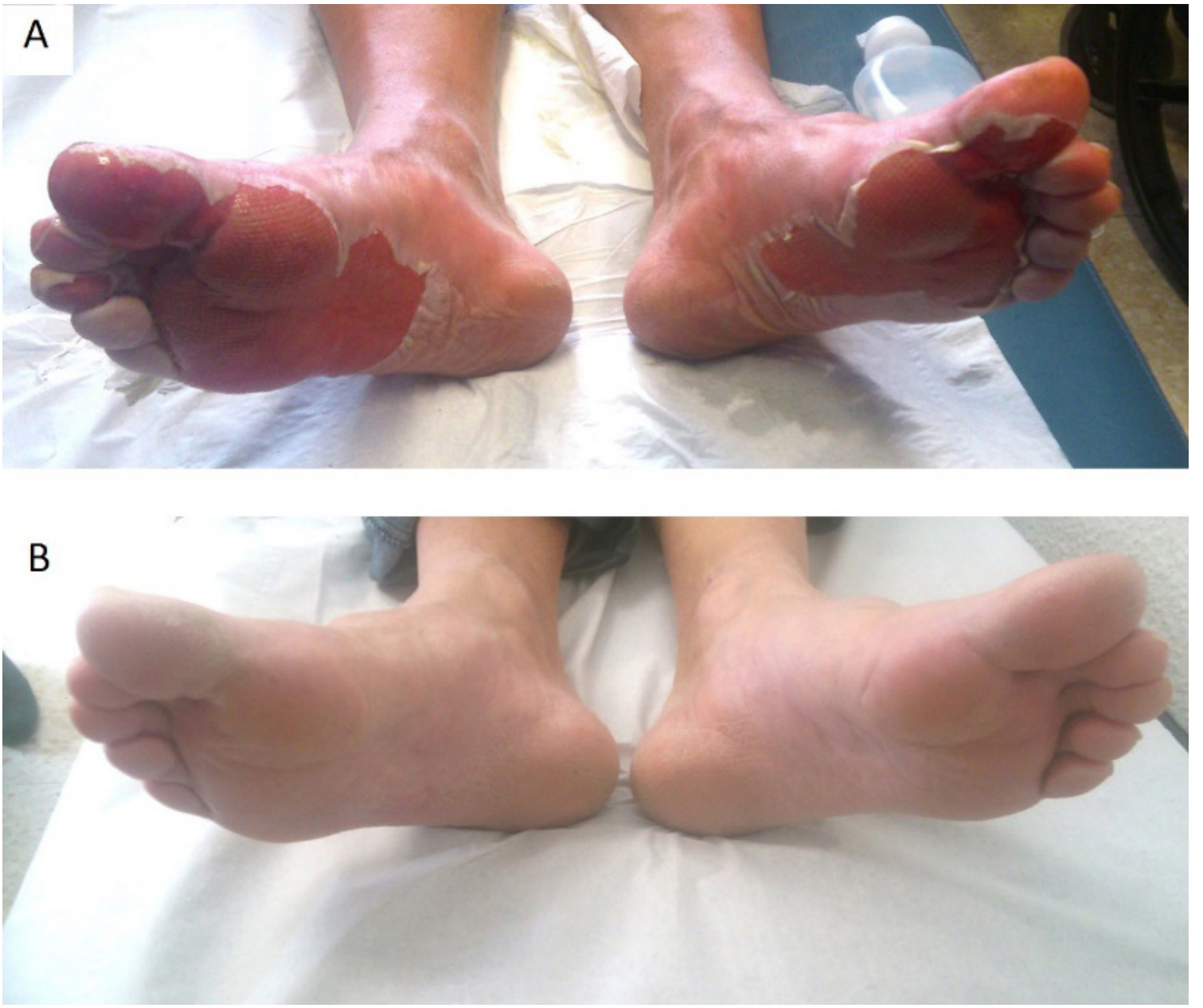
Presentation of case

Male patient, 63-year-old, long distance truck driver, smoker of about 12 cigarettes a day, obesity grade I. Diagnosed of Diabetes Mellitus type II, with 40 years of evolution, insulin dependent, currently treated with Biguanide Metformine (850 mg every 8 hours) and Detemir (40 units) as basal overnight insulin. He has had poor metabolic control during the last 10 years (glycated hemoglobin higher than 9%).

The patient presents neurological and cardiovascular complications as well as a metabolic syndrome. Insulinization treatment was decided and currently glycosylated hemoglobin has been normalized to 7% and control has improved. Nonetheless, complications are still present, stressing a diabetic neuropathy. The patient's neuropathy causes a loss of overall sensitivity (from thermoception to nociception) in both feet, with pulses preserved on both limbs. Thus the patient's pathology was recognized as a high risk diabetic foot.

Due to his situation, the patient was instructed in the type of footwear to be used, hygiene and hydration measures to be taken in the affected area, monitoring and inspecting his feet and exhaustively control his blood sugar levels. He was also advised to eliminate other risk factors (smoking, obesity, hypertension or hypercholesterolemia) and to avoid behaviors that may favor an unconscious harm of the foot (hot spots, walking barefoot, etc.) (6, 7).

In summer 2014, the patient comes to the emergency department of a hospital located on the coast due to burns on the feet. Burns were subsequent to standing up in contact with hot sand. Because of the neuropathy, he was not aware of heat and thus he remained in that position for several hours to the point of burning until losing the skin. Wounds were valued as second degree burns in 6% of the body surface (including soles, instep and ankles). After basic health care, the patient goes to his usual health center for a follow-up. He is referred to plastic and vascular surgery for an in-depth assessment of the limbs and a prospective intervention depending on the evolution of the injuries.To do so, the health center followed the clinical practice guidelines for burn care, proposed by the Andalusian Health Service. Treatment (6) included:



▲ **Figure 1**. *Feet burns in patient with diabetic neuropathy. (A) Patient's arrival at the health care centre. (B) After three months of treatment.*

- Washing with a saline solution.
- Silver sulfadiazine ointment.
- Silicone bandages.
- Tetanus vaccine.
- Amoxicillin 500 mg every eight hours.

No analgesic treatment was proposed since the patient felt no pain due to the neuropathy.

Despite the severity of the case, and after three months of treatment, skin grafts were not necessary and skin integrity was recovered without performing invasive techniques (Figure 1). In subsequent follow-ups the neuropathy was examined as earlier, emphasizing new educational aspects arising out of the case.

Discussion

Within the instructions given to patients with diabetic neuropathy, the avoidance of heat sources is emphasized. There is a wide variety of them, but more usually associated with winter type situations (braziers, hot baths ...) since these are more frequent, sometimes forgetting that during the summer we are also in contact with heat. After performing a search in the NCBI and NLM databases, a large number of articles were consulted. Few are the cases referring burns which do not result from hot baths or foot warmers. Only a similar case reported by Valdeset was found (8), in which the patient suffers burns caused by walking in the sand. Also relevant was the case of Putz Z *et al.* (9). In this article, the patient discovers third-degree burns after repeatedly

kicking construction material that had been exposed to the sun. Other examples of unusual heat sources are those cited in the study of Abu-Qamar A MZ and Wilson (10) on diabetic patient who did not recognized certain Muslim customs as risk factors and suffered burns when they washed prior to attending mass. In line with this work is that of Al-Qattan MM (11). Twelve patients were studied, of which eight were suffering from diabetic neuropathy. Burns resulted from walking barefoot towards the Muslim mass, being more serious in these patients than in non-diabetics. As discussed, preventive education helps patients avoid heat sources and even warn them about the risks of walking barefoot. Nonetheless, there are other usual situations which can be done on a daily basis and which are sometimes unnoticed. These include walking barefoot on the beach, certain religious customs or even work, and also pose a risk in the case of developing neuropathy.

In this particular case, the patient had been given education on the matter and was conscious about self-care and preventive behaviors to be undertaken. However, he suffered a completely avoidable injury since burns resulting from sand are considered rare. Therefore, we would like to emphasize the importance of comprehensive education of patients with diabetic foot. This does not only covers information about the most common heat sources, but also make the patient realize that some situations, though infrequent, also pose a risk. Currently, the means used to educate patients with a neuropathy are flyers and information provided by doctors or nurses. To improve the quality of the educational program, we propose giving lectures and including behavior modification practices to make the patient autonomous as far as care and preventive actions are concerned. Hence, the patient would be able to detect such situations in any context and react to not to suffer any injuries. Furthermore, these activities would help us verify the complete and correct understanding of the information given in flyers and informative magazines. In this field, the approach of Van Acker, K. seems very interesting (12). Van Acker places emphasis on the importance of building political support for such programs, stating that diabetic neuropathy requires a multidisciplinary action. He proposed a professional training for patients (a four-day course, for instance) that would allow them to be trained in preventive care. In fact, Van Acker suggests that the patient should widely know his or her illness and the injury risk he or she is exposed to. For such purpose, investment in national and regional organizations for the treatment of diabetes would be necessary. In fact, it has been proved that effective multidisciplinary work results in a decrease in the number of amputations (13).

References

1. Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J. Harrison. *Principios de Medicina Interna*. Vol 2 18º Ed. México. McGraw-Hill. 2012.
2. American Diabetes Association. *Standars of Medical Care in Diabetes. Diabetes Care*. 2015; 38 (1):S58-66.
3. Bowling, F. L. *et al. Preventing and treating foot complications associated with diabetes mellitus*.Nat. Rev. Endocrinol. 2015 Aug DOI:10.1038/nrendo.2015.130.
4. Farreras P, Rozman C. *Medicina Interna*. Vol 2 17º Ed. España. Elsevier. 2012.
5. Boulton AJ. *What You Can't Feel Can Hurt You*. J Am Podiatr Med Assoc. 2010 Sep-Oct;100(5):349-52.
6. Servicio Andaluz de Salud. *Guía de Práctica Clínica para el Cuidado de Pacientes que Sufren Quemaduras*. Junta de Andalucía, Consejería de Salud. 2011.
7. Singh N, Armstrong DG, Lipsky BA. *Preventing foot ulcers in patients with diabetes*. JAMA. 2005 Jan 12; 293 (2):217-28.
8. Gaztelu Valdes V, Gago Fornells M, Gartcia Gonzalez RF *et al. Hot sand burns on the sole of a patient with diabetes*. J WoundCare, 2002 May; 11 (5): 170–71.
9. Putz Z, Nadas J, Jermendy G. *Severe but preventable foot burn injury in diabetic patients with peripheral neuropathy*. Med SciMonit. 2008 Sep; 14 (9): CS89-91.
10. Abu-Qamar MZ, Wilson A. *The lived experience of a foot burn injury from the perspective of seven Jordanians with diabetes: a hermeneutic phenomenological study*. IntWound J 2012 Feb; 9 (1):33–43.
11. Al-Qattan MM. *The "Friday Mass" burns of the feet in Saudi Arabia*. Burns, 2000 Feb; 26 (1): 102–5
12. Van Acker K. *Diabetic foot disease: When the alarm to action is missing*. Diabetes Res ClinPract. 2015 Jul; DOI:10.1016/j. diabres.2015.07.005.
13. Krishnan, S., Nash, F., Baker, N., Fowler, D. & Rayman, G. *Reduction in diabetic amputations over eleven years in a defined UK population: benefits of multi-disciplinary team work and continuous prospective audit*. Diabetes Care 31, 99–101 (2008).