Peripheral Neuropathy and Microangiopathy: Major Causes of Severe Foot Burn Injury

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Abstract

Diabetic neuropathy is responsible for serious accidental foot burns due to the sensory loss in the lower extremities. A 62 year old man with diabetic neuropathy is presented with deep burn of both feet after hot water foot-bath. Bed rest, daily local disinfection, antibiotics, and surgical intervention (debridement, thin skin graft) were applied. After a long healing period of three months, the patient recovered with acceptable residual findings.

Severe local and general clinical consequences of foot burn injuries of unusual circumstances may occur in diabetic patients with neuropathy. The vasculopathy could worsen the prognosis. Treatment and prevention of these burns are discussed.

Keywords: Diabetes mellitus; Diabetic Neuropathy; vasculopathy; Foot Burn

Introduction

Distal symmetrical sensorimotor polyneuropathy is the most frequent finding in everyday clinical practice which should also be considered as the major contributory factor in the pathogenesis of the diabetic foot syndrome. The management of these foot injuries represented a major problem for surgeons. Case of severe and unperceived but preventable burn injuries of unusual etiology may be of interest.

Case report

A 62 year old farmer with uncontrolled type 2 diabetes for twenty years with peripheral neuropathy (latest HbA1c = 8.7%). He had a history of painless and unperceived burn injuries developed during a 15 minutes hot water foot-bath.

On examination he had a 6% deep burns of both feet. The discriminative sensation was totally absent in both feet but the peripheral pulses were palpable. A daily oxygenated water foot bath for 5 minutes and dressing with sulphadiazine cream were prescript.

At the general level, renal and cardio vascular autonomic function tests were normal but he presented a ketotic decompensation managed with intravenous insulin infusion and electrolyte replacement during three days than a twice daily injection of long action insulin was used. The blood sugar level was measured every morning before eating and several times per day. Rapid action insulin injections were necessary at an average of three times per day.

Two days after arriving at the hospital, he presented a 39°C of fever and positive inflammatory blood tests (CBC= 26900; CRP= 54.8)

Than antibiotics were prescript (cefotaxime, vancomycin and gentamicin). Etiological evaluation results: One positive blood culture for coagulase-negative staphylococci , one positive urine culture for trichomonas vaginalis and E coli.

Sixty days after hospitalization, necrosis tissue debridement under general anesthetic was applied. (Figure 1 and 2) Local bacteria specimen was positive for acinetobacter baumanni, pseudomonas aeroginosa and klebsiella. The antibiotics prescription was substituted to tigecycline for 15 days with permanent apyrexia.

After a long period of 86 days, the patient developed a heel eschar of both feet. (Figure 3 and 4) Than eschar excision and thin skin graft of unhealed lesions were applied. One month later, the patient recovered with acceptable residual local findings allowing a plantigrade locomotion.

Discussion

Peripheral neuropathy and vasculopathy are the most common diabetic foot problems [1]. Diabetic patients with peripheral neuropathy are at increased risk of burn injury to their periphery as a result of impaired protective pain and thermal sensation [2]. Accidental foot injuries due to sensory loss in diabetic patients have been published as case reports or small series [3,4]. Foot burn injury was observed in diabetic patients as a result of walking on hot sand [4]. In addition, diabetics suffering from cold feet symptoms uses foot spas, foot baths (our case),
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Figure 1: Left foot 16 days after burn injuries

Figure 2: Right foot 16 days after burn injuries

Figure 3: 80 days after burn injuries (dorsal view)

Figure 4: 80 days after burn injuries (plantar view)

As result, the healing period is long and therefore the costs are high [7]. The prognosis is always uncertain. It may be a combination of factors, including neuropathy, hyperglycemia, immune suppression, increased risk of infection and diminished vascular supply [3], all of which can delay healing [5].

Foot burn injuries in diabetic patients should be considered severe but preventable.

In fact, we must consider first the prevention of peripheral neuropathy and vasculopathy.

As for the neuropathy, we should insist on the fact that early diagnosis is the key to a successful outcome. A neurological exam is constantly necessary. In planning the initial treatment, medical or surgical therapy is selected based on the location and type of the pathology. Foot deformities can be corrected with resting, anti-inflammatory treatment, appropriate shoes, orthosis and socks, and if required, ankle stabilization can be attempted. If the patient is still unresponsive, surgical treatment may be applied [8]. Successful treatment of the initial condition of neuropathic foot pain in diabetic patients involves elimination of the causes of neuropathic pain, particularly tarsal tunnel syndrome. Pathologies that may mimic diabetic neuropathy should be treated primarily [8].

As for the diabetic microangiopathy, it is therefore the responsibility of diabetologists to diagnose it by performing a constant clinical cardiovascular exam.
The slightest doubt may require a specialist advice. Additionally, for preventing the development and progression of neuropathy and peripheral vascular disease, optimal glycemic control (HbA1c value < 7%) should be maintained for years.

On another level, for preventing foot injuries, diabetic patients should be instructed on foot care, their shoes must fit well, and they must exercise care with exposure to heat [4]. Early detection of foot problems can lead to earlier intervention and thereby reduce the potential for hospitalization and amputation [9].

In this study, we tried to highlight the role of both peripheral neuropathy and vasculopathy in the foot burn injuries (figure 5) as well as the severity of burns injuries of diabetic patients.

**Conclusion**

Severe but preventable foot burn injury may occur in diabetic patients with neuropathy. To prevent severe foot burn injuries and other type of foot injuries, continuous education and if necessary a specialist advice should be provided for diabetic patients. Early detection of foot problems can lead to earlier intervention and thereby reduce the potential for hospitalization and amputation.

**Declarations**

**Conflict of Interest**

The authors certify that they have no conflicts of interest in relation to this article.

**References**