

Diabetic Foot--Recent ideas and Methods of Management

F.StanleyMangalakumar Robert¹, Ph. D, Dr.JaipalMoopil², MBBS, DGO, MD,
Dr. Krishna Kumar Mallick³, MBBS(Gold Medalist), MS(Gen Surg),
FCGP(India), FSASMS(Delhi), MRSH(London), PhD(USA)

1. Sr. Associate professor, Unit of Physiology, AIMST University, Malaysia.

2. Associate professor, Unit of Obstetrics & Gynecology, AIMST University, Malaysia.

3. Professor of Surgery Melaka Manipal Medical College, Malaysia

Corresponding Author: Prof. Dr. K.K.Mallick

Key Words: DM Diabetes Mellitus DF Diabetic Foot DFU Diabetic Foot Ulcer

Date of Submission: 01-01-2019

Date of acceptance: 15-01-2019

I. Introduction

All over the world the incidence of Diabetes Mellitus has increased to reach epidemic proportions. The incidence has increased four times in the last three decades and today about 10 percent of the population between the age of 20 and 80 years suffer from the disease worldwide. Most of these are type 2 diabetics¹. The prevalence figures of DM in Malaysia is 20.8% for adults over 30 years of age and the prevalence among the ethnic Indians over the age 18 years is 24.9%. It is also projected that by the year 2020, 30% of the population will suffer from the disease². A sedentary lifestyle with little or no physical activity and unhealthy dietary habits (excessive consumption of red and processed meats, refined flour and sweetened drinks) are the major reasons for this epidemic spreading so rapidly. In addition to this an ageing population, with a better economic status living in urban conditions have all contributed to this emerging epidemic. Asia has emerged as the epicenter for this epidemic.

A common complication of both types of Diabetes is DFU. DM leads to peripheral neuropathy, peripheral occlusive vascular disease and structural deformity of the foot. In such a scenario even a minor injury could lead on to a local infection, which could rapidly lead to cellulitis and osteomyelitis. The US National Institute of Health, in the National Diabetes Statistics, reported that the lifetime incidence of DFU in individuals with diabetes is about 25%. Every day about 230 amputations are performed in the US for complications of the DF. In USA the leading cause of non-traumatic lower-limb amputations is Type 2 DM³. About one third of the amputees in the UK have DM⁴, while in Australia, about half of amputees have DM⁵. Prevention, early recognition and early treatment may help protection from amputations and surgical intervention.

The family physician has a central role in the prevention and early diagnosis of DF infections. A comprehensive examination of a diabetic patient should include a clinical exam, testing for peripheral neuropathy and for vaso-occlusive disease. However various studies have shown that foot examinations are not adequately carried out by physicians in the outpatient setting³⁻⁴ and also among hospitalized patients⁶. In this review we aim to focus on the causes and pathogenesis of DF, and the best way to prevent and manage this condition is at a family physician level.

Causes of DF

Hyperglycemia contributes to the development of neuropathy and peripheral arterial disease⁷. Diminished sensation or loss of sensation caused by peripheral neuropathy, leading to unnoticed micro trauma and ischemia due to peripheral vaso-occlusive disease, or a combination of these may lead to infection and DFU.

In the developing countries, lack of education about foot care and lack of trained personnel to impart this knowledge, bare foot walking, particularly in rural areas and lack of facilities for prevention, early detection and treatment all become risk factors for this complication which culminate in amputation.

Patient Education

Meticulous foot care and proper treatment of minor foot injuries can prevent ulcer formation. Patients with diabetes should be educated on how to take care of their feet. This would include proper foot hygiene, wearing of correct fitting and sometimes custom made shoes, which prevent pressure points that could devitalize

the skin and cause ulcers. They should be educated on selection of proper foot wear and advised to wear shoes that enclose the feet at all times, even within the confines of their homes, to prevent any foot trauma. They, sometimes, along with their family members, should be taught to inspect the feet every day to see any discoloration or ulceration of the skin. The individual should be taught to do self-examination of the sole of the foot with the help of a mirror. The patient should continue to supervise examination of the foot till he can independently demonstrate proper methods of foot care.

Foot examination.

At every visit the feet and legs of a diabetic patient should be examined by a doctor or a trained health care person.

It is important to take a history. History taking should focus on symptoms that are suggestive of possible peripheral neuropathy or peripheral occlusive arterial disease.

Peripheral neuropathy

The symptoms of peripheral neuropathy could be:

- Most people with peripheral occlusive arterial disease of the lower extremities are asymptomatic
- Pain/burning, stabbing or electric-shock sensations, hyperesthesia and paresthesia are the main initial features/symptoms which get worse at night²⁻³.
- intermittent claudication, ischemic pain at rest, frank ischemia of the foot and ulcerations of the foot may follow.

Assessment of peripheral neuropathy

Diabetic peripheral neuropathy would show signs of loss of deep tendon reflexes particularly the ankle jerk, foot drop, and muscle wasting. Trophic ulcerations may also be seen.

Patient's gait should be observed for abnormalities, like a broad based gait or foot drop. Musculoskeletal evaluation to see the mobility of the ankle joint and any bony abnormalities. Charcot's joint should be looked for. If any abnormalities are detected, patient should be referred for suitable consultation.

The sole of the foot should be tested for sensation using a monofilament nylon which bends with a force of 10 grams (Semmes Weinstein monofilament). To maximize the diagnostic value of SWME, three sites on the sole of the foot, i.e. the plantar aspects of the great toe, the third metatarsal and the fifth metatarsal should be used⁸. However, current literature suggests that nerve conduction study (NCS) is the gold standard for diagnosing diabetic peripheral neuropathy. Vibration sensation should be assessed using a 128Hz tuning fork to assess the extent of neurological damage.

Peripheral Arterial Occlusive Disease

Peripheral vaso occlusive disease is more common in diabetics than in non-diabetics⁹. The tibial and peroneal arteries are commonly involved in diabetic vaso-occlusive disease and are more in smokers and in hypertensive patients. The patient may present with pain in the feet often more on walking, absence of popliteal and posterior tibial pulse, loss of hair over the lower limb with a thin and glossy skin.

The vascular evaluation should include palpation of the pulses in the lower extremities and inspection of the feet and legs for any gross ischemic changes.

Scars showing vein harvest sites would indicate previous coronary bypass surgery. Loss of hair over the lower limb is also suggestive of peripheral arterial occlusive disease. Any pallor or discoloration could indicate devitalized skin due to poor vascular perfusion. Evidence of missing toes due to previous amputation could also be an ominous sign. If significant peripheral vascular disease is present, a vascular consultation should be considered, where either noninvasive technique using Doppler or an angiography could be carried out. In cases of major occlusion surgical intervention may be required.

Metabolic control

Patients with uncontrolled or poorly controlled diabetes are more prone to infection as their resistance to infection is reduced. Therefore a good control of diabetes with regular medication, adequate nutrition and regular physical activity along with self-monitoring of blood glucose levels and a periodic check of glycosylated hemoglobin should be the aim of patient's total care. Conversely, in the event of an ulcerated foot, adequate treatment both surgically and with antibiotics to control infection and can help bring blood glucose levels under control.

Prevention of the ulcers

The cornerstone of prevention of ulcers is proper foot care and early management of foot injuries. Daily foot inspection is essential. Since the skin tends to be dry and prone to cracks-formation, routine cleaning with soap and water and keeping the skin soft and moisturized with any moisturizing cream will go a long way in preventing ulcers. Patient should be advised not do the home-remedies from the first-aid box, like iodine or mercurochrome to treat minor lacerations, but should clean the wound gently and apply topical antibiotic creams. The leg should be seen by the doctor at periodic intervals.

Ulcer formation

In spite of the best of care some patients will develop foot ulcers. Most of these neuropathic ulcers are painless and often surrounded by callous tissue. Adequate debridement until bleeding healthy tissue is seen and exploration of the extent of the ulcer and removal of all the structures involved in it is essential. Osteomyelitis should be ruled out in deep and long standing ulcers and should be referred to the orthopedic colleagues. They would in turn classify the wound according to various criteria and advise whether conservative treatment would suffice or if an amputation is required.

Thus at the family physician level, recognizing the risk factors, regular inspection of the foot and ensuring that the patient too carries out regular foot care, could ensure the prevention of foot ulcers. If a foot ulcer does develop, early diagnosis, proper investigation and appropriate management would greatly reduce the number of amputations.

II. Discussion

Thus, we see that DM may make the life of the patients miserable if they are ignorant about its complications. DF and DFU are the complications which could be prevented and if at all occur could be treated successfully if diagnosed at an early stage.

Taking this seriously, proper education of DM patients to keep the sugar levels control, to take proper foot-care and to consult the family doctor immediately in case of any suspicion is mandatory to avoid DF or DFU.

References

- [1]. International Diabetes Federation. IDF Diabetes Atlas — 7th Edition. *Diabetes Atlas* <http://www.diabetesatlas.org/> (2015).
- [2]. National Health and Morbidity Survey (NHMS) 2011
- [3]. Wylie-Rosset J, Walker EA, Shamooh H, Engel S, Basch C, Zybert P. Assessment of documented foot examinations for patients with diabetes in inner-city primary care clinics. *Arch Fam Med*. 1995; 4:46–50.
- [4]. Bailey TS, Yu HM, Rayfield EJ. Patterns of foot examination in a diabetes clinic. *Am J Med*. 1985; 78:371–4.
- [5]. Edelson GW, Armstrong DG, Lavery LA, Caicco G. The acutely infected diabetic foot is not adequately evaluated in an inpatient setting. *Arch Intern Med*. 1996; 156:2373–8.
- [6]. National Center for Chronic Disease Prevention and Health Promotion, Division of Diabetes Translation. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. *Centers for Disease Control and Prevention*
- [7]. Schofield, C. J. *et al. Mortality and hospitalization in patients after amputation: a comparison between patients with and without diabetes. Diabetes Care* **29**, 2252–2256 (2006).
- [8]. GBD 2013 Mortality and Causes of Death Collaborators. *Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet* **385**, 117–171 (2015).
- [9]. The Semmes Weinstein monofilament examination as a screening tool for diabetic peripheral neuropathy **YuzheFengFelix J.SchlösserMD, PhD, BaueE.SumpioMD, PhD. Journal of vascular surgery Vol 50, Issue 3, September 2009**

F.S tanley Mangalakumar Robert. "Diabetic Foot--Recent ideas and Methods of Management."
IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 1, 2019, pp 01-03.