ISSN 2475-5451

Review Article

International Journal of Diabetes & Metabolic Disorders

Diabetic Foot a Real Challenge

Rama Kant[1]*, Pooja Ramakant[2], Rama Shankhdhar[3] and SP Mishra[4]

[1]*GCRG Institute of Medical Sciences, Lucknow*

[2]*Endocrine Surgery, King George Medical University, Lucknow*

[3]*Department of Anatomy, GCRG Institute of Medical Sciences, Lucknow*

[4]*Department of Surgery, GCRG Institute of Medical Sciences, Lucknow*

***Corresponding author:**
Dr. Rama Kant, GCRG Institute of Medical Sciences, C 221, C-Block Crossing, Indira Nagar, Lucknow, UP, India 226016, Phone No: +91 9415007299; Email: ramakantkgmc@rediffmail.com

Submitted: 09 Aug 2018; **Accepted**: 20 Aug 2018; **Published**: 10 Sep 2018

The World Health Organisation predicted that number of Diabetics will rise to 366 million by the year 2030. In one's life time someone travels equal to 4 times around earth, therefore complex "machine of foot" has to be near perfect and needs equally quality care. This is commonest cause of hospitalization in Diabetic patients. Neuropathy, Ischemia, foot deformity constitutes a triad for ulceration in foot. Delay in diagnosis, lack of team of trained personnel, lack of state of art Diabetic foot specialized clinics and underestimation of the gravity of situation by patients and tired attendants are contributory factors in the challenging situation of this unassuming serious disease. Most patients are over 10 years Diabetic, so are reluctant to understand the gravity of situation and there is lack of awareness programs over which "just professional approach sans empathy" of medical professionals lay the "Icing on cake".

More than 80,000 amputations are done yearly in USA in Diabetic patients and most of the patients die within 5 years of major amputation on one side. Within this period most of them get other side's amputation because extra ordinary pressure on the other lower limb. Every 30 seconds a lower leg is lost to Diabetes somewhere in the world. 70% of all leg amputations happen to people with diabetes. Prevalence of neuropathy is approximately 30% among diabetic patients attending hospital. In elderly, prevalence may be 50%

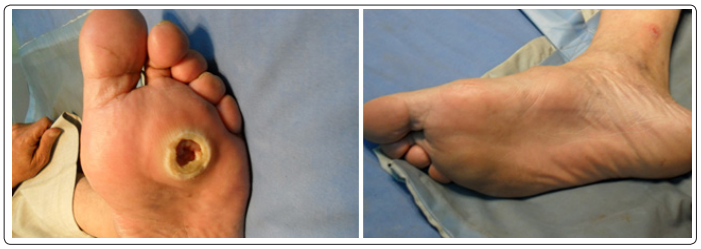
Charcot foot, a serious presentation of neuropathic foot, is a non-infective arthropathy in a well-perfused, insensitive foot. Its treatment depends on the stage at which it is diagnosed. Plaster cast is effective in reducing activity of the disease. Neuropathic foot ulceration represents a major global medical, social and economic problem and commonest major end-point of diabetic complications. Thus Diabetic neuropathy and peripheral vascular disease are the main aetiological factors in foot ulceration and may act alone, together, or in combination with other factors such as micro vascular disease, biomechanical abnormalities, limited joint mobility and increased susceptibility to infection. While more than 5% of diabetic patients have a history of foot ulceration, the cumulative lifetime incidence may be 25%.

The 'diabetic foot syndrome' encompasses a number of pathologies, including neuropathy, peripheral vascular disease, neuroarthropathy, foot ulceration, osteomyelitis and the potentially preventable amputation. Patients with diabetic foot can have many diabetic complications and a multidisciplinary approach is usually necessary.

Factors leading to ulceration in Diabetic foot

These patients have vascular insufficiency, neurological problem leading to poor or no insensate foot, multiple foot deformities, poor vision due to Diabetic retinopathy, irritability due to hypertension with compromised renal functions and over all increasing instances poor care of elderly by the family members leaving these poor people on mercy of God and majority of government hospital with hardly any real specialized foot care clinics. Most of the times either cutting nails with poor vision leading to injury in toes or digits, minor trauma to foot due to neuropathy with no pain, rat bites, burns, nails or gravels in shoes lead to such hardly noticed and many times presenting as non-healing wound or pus discharging foul smelling wounds.

Thus the triad of vascular ischemia, neuropathy and deformity leads to ulceration due to PRESSURE POINT PHENONMENON, which easily gets infected usually also associated with poor control of Diabetes.



Neuropathic ulcer Healed by offloading

Grading of Diabetic foot ulcers

The evaluation and classification of diabetic foot ulcers are essential in order to organize the appropriate treatment plan and follow up. During the past years, several foot-ulcer classification methods have been proposed, however, none of the proposals have been universally accepted. The Wagner-Meggitt classification7 is based mainly on wound depth and consists of 6 wound grades.
These include:

Grade 0 (intact skin),
Grade 1 (superficial ulcer),
Grade 2 (deep ulcer to tendon, bone, or joint),
Grade 3 (deep ulcer with abscess or osteomyelitis),
Grade 4 (forefoot gangrene) and
Grade 5 (whole foot gangrene)

In a simplified clinical classification approach, diabetic foot ulcers can be characterized as neuropathic, ischemic, or neuroischemic, depending on how complications such as peripheral neuropathy and arterial disease affect the ulcer's etiology.

Other important factors that must be considered are: wound size and depth, the presence of sinus tracts or probing to bone, the amount of granulation tissue, the amount of fibrotic or dysvascular tissue, the type and amount of drainage, the amount of hyperkeratosis tissue surrounding the wound, and signs of infection such as erythema, edema, odor, or increased warmth.

Wound size and depth should be documented at the initial visit and at each subsequent visit. Wound area can be measured in several ways and include tracings inked on clear acetate, calibrated digital photographs, or direct measurement of maximum length and width with a small ruler or scalpel blade handle. Wound depth can be determined by using a sterile probe or sterile cotton-tipped applicator in the deepest part of the wound. These measurements provide the basis for estimating the progression of wound contraction and filling, and more importantly, the efficacy of the current treatment [1-6].

The tissue present at the base of the wound can provide a wealth of information regarding the vascularity and the possible presence of infection. Ideally, a healthy, well-perfused wound demonstrates a red granular bed that bleeds well with debridement. A wound with abundant fibrotic or necrotic tissue, or a wound with a dry desiccated appearance may indicate impaired vascular perfusion (Figure 1). In such a case, effective revascularization surgery is necessary before initiation of any wound care treatment.

Treatment

Cornerstones

Debridement is widely recognized as one of the most important techniques in wound bed preparation. Apart from having all nonviable tissues removed, wound debridement also promotes the release of growth factors that contributes to more progressive wound healing (Figure 2). If ischemia is suspected, aggressive debridement should be postponed until a vascular examination is obtained and, if necessary, a revascularization procedure is completed. Presently, the most widely used wound debridement methods are: surgical (sharp), autolytic, chemical, mechanical, and biologic. Autolytic, chemical, and surgical methods remove mainly necrotic tissue (selective debridement), whereas mechanical methods remove both necrotic and viable tissue (nonselective debridement).

Pre-operative Immediate postop final healing

Aggressive debridement Sharp debridement

Sharp technique for wound debridement is the most efficient and is typically utilized when a wound has asignificant amount of necrotic debris or infected tissue. Sharp technique is performed using surgical instruments. Sharp debridement is considered the gold standard for debriding diabetic foot ulcers. Thus tissue for culture is also obtained here. However, if debridement is extensive or sensation to the foot is intact, sharp debridement should be carried out in the operating room under appropriate anaesthesia and in sterile conditions. But when infection has destroyed foot function or if infection threatens the patient's life, a guillotine amputation may be necessary to allow prompt control of the infection and delayed suturing can be done.

Ideally, ulcer treatment should minimize tissue loss, preserve optimal foot function, and avoid deformities that might lead to recurrent ulceration. The optimal treatment should also recognize the potential for revascularization to ensure healing. The surgeon's experience in this area and vascular surgery support are important to achieve desired results.

Enzymatic debridement involves the use of topical agents that degrade necrotic tissue via proteolytic enzymes such as papain, collagenase, fibrinolysin-DNase, papain-urea, streptokinase-streptodornase, and trypsin. Studies on the clinical efficacy of these agents have reported variable results. The resurgence of maggot therapy for debridement of necrotic tissue, decreasing bacterial load and stimulation of wound healing regained popularity for use on non-healing wounds. Recent clinical trials have shown maggot therapy to be effective in the treatment of diabetic foot ulcers and pressure ulcers that were unresponsive to conventional therapy, in the United States; this therapy has not been fully embraced by the medical community mainly due to the high cost of medical grade maggots. The use of low energy ultrasound has been advocated for the debridement of diabetic foot ulcers. This method of wound debridement continues to undergo both clinical and scientific research.

Pressure Offloading

This must always be a part of the treatment plan for plantar foot ulcers. As discussed previously, ulcerations occur in high-pressure areas of the insensate foot. The most popular methods include total contact casting, half shoes, short leg walkers, and felted foam dressings.

This therapeutic method involves the use of a well-moulded minimally padded plaster cast, resulting in equal pressure distribution to the entire limb. This method allows the patient to move during the Treatment and has been found to be helpful in oedema control, which is linked to healing impairment. Commercially available devices, such as the half shoe and short leg walker, are more commonly used. Thus every team must have a modified shoe supplier. Best method tom get the photographs of the foot wear from outside and inside, Mat scan study to find pressure points and offload these confirmed by the scan. Now the modified shoes can be mad based on this data.

Peripheral vascular disease

Atherosclerotic disease is present, even in subclinical form, in most patients with diabetes of long duration. Vascular disease is responsible for up to 70% of deaths in type-2 diabetics. In addition, the premenopausal protection from vascular disease is lost in female diabetic patients and peripheral vascular disease may be 20 times

more common in diabetics. Peripheral ischemia resulting from proximal arterial disease causes ulceration in 35% of patients. It is therefore susceptible to pressure from footwear.

Summarily surgical treatment revolves around Aggressive debridement, plastic reconstructions, application of growth factors, vascular interventions both endoscopic and open including laser therapy and stents in peripheral vessels, and recently Hyperbaric Oxygen therapy, Stem Cell treatment and boot therapy and modified Boot Therapy. Adequate antibiotics determine success. Tube dressings in Diabetics are a boon. Offloading with modified shoes is most important part of our armamentarium in treatment. The success depends on a multidisciplinary team work.

Diabetic foot can be prevented with good glycaemic control, regular foot assessment, appropriate footwear, patient education, and early referral for pre-ulcerative lesions of foot ulceration and regular foot examination are key to early detection and prevention of serious condition [7-10].

Biggest challenges are making really a working team of General surgeon, Dialectologist, Vascular surgeon, orthopaedic surgeon, plastic reconstructive surgeon, podiatrist, Paedo orthist, nurse educators, clinical Psychologist, trained dressers and needed armamentarium. We can respond to the challenge by our dedicated approach, service before self, clinical acumen and Empathy.

References

1. Indian Ministry of Health and Family Welfare (2016) Standard treatment guidelines: The diabetic foot: prevention and management in India.
2. SA Bus, DG Armstrong, RW van Deursen, J Lewis, CF Caravaggi (2015) International Working Group on the Diabetic Foot. Guidance on footwear and offloading interventions to prevent and heal foot ulcers in people with diabetes. Diabetes Metab Res Rev 32: 99-118.
3. National Institute for Health and Care Excellence (2016) diabetic foot problems: prevention and management. Clinical guideline.
4. National Institute for Health and Care Excellence (2018) peripheral arterial disease: diagnosis and management.
5. Benjamin A Lipsky, Anthony R Berendt, Paul B Cornia, James C Pile, Edgar J G Peters, et al. (2012) Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clinical Infectious Diseases 54: e132-e173.
6. Wild S, Roglic G, Green A, Sicree R, King H (2004) Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 27: 1047-1053.
7. Boulton AJM, Malik RA, Arezzo JC, Sosenko JM (2004) Diabetic somatic neuropathies: technical review. Diabetes Care 27: 1458-1486.
8. Young MJ, Boulton AJM, Macleod AF, Williams DR, Sonksen PH (1993) A multicentre Study of the prevalence of diabetic peripheral neuropathy in the United Kingdom hospital clinic population. Diabetologia 36: 150-156.
9. Kumar S, Ashe HC, Parnell LN, Fernando DJ, Tsigos C, et al. (1994) The prevalence of foot ulceration and its correlates in type 3 diabetes. Diabet Med 11: 480-484.
10. Cabesas-Cerrato J (1998) the prevalence of diabetic neuropathy in Spain: a study in primary care and hospital clinic groups. Diabetologia 41: 1263-1269.