Summary& Conclusion

Diabetes mellitus is a global epidemic. Peripheral neuropathy and peripheral vascular disease are complications of diabetes mellitus and the primary causative factors for foot ulceration. This summary describes the etiology and risk factors for diabetic foot ulceration and a system for evaluating the diabetic foot. The assessment of neuropathy and the grading of foot ulcers are critically examined. The management of diabetic foot syndrome is reviewed. The treatments to ensure vascular supply to the lower limb and control of infection as well as novel therapies, which are becoming available to treat nonhealing, "no-option" diabetic ulcers, are discussed.

Pathophysiology of Diabetic Foot Ulcers

Diabetic neuropathy is central and present in the majority of patients. Distal symmetrical polyneuropathy has been reported as the primary cause of plantar ulceration. Nerve damage involves sensory, motor, and autonomic nerves and subsequently the patients' ability to perceive pain, pressure, touch and temperature is altered. Altered proprioception makes the patient unable to determine the position of the foot. Motor neuropathy affects the small muscles of the foot and causes weakness, atrophy, and deformity. Autonomic neuropathy may reduce sweating and increase the temperature of the foot, predisposing to infection. Charcot's neurarthropathy is the result of bony dislocation and collapse of the arch.

Arterial insufficiency occurs in the diabetic lower limb. Wound healing depends on an adequate blood supply and ischemia impairs healing by reducing the supply of oxygen, nutrients and soluble mediators that are involved in the repair process.

Treatment of the Diabetic Foot Ulcers

Grading Systems

The University of Texas system appears to be a good predictor of outcomes. The Wagner grading system is also used for foot ulcers but does not incorporate the presence of coexistent infection or vascular function. A recent Kobe classification statement details hard endpoints for use in clinical trials of wound healing treatments.

Vascular Supply

All patients with tissue loss and arterial disease should be considered for arterial reconstruction. The effective revascularization procedures include the bypass grafts to foot vessels, angioplasty (balloon and laser), stenting and atherectomy.

Debridement

Sharp debridement has been the most thoroughly studied and regular sharp debridement every week is associated with more rapid healing of ulcers than less frequent debridement. Larval therapy significantly reduced wound area, but more research is needed to evaluate the range of debridement methods available.

Dressings

The use of moist dressings on clean granulating wounds improves the wound environment. A systematic review investigating silver-based dressings found insufficient evidence to establish whether silver-containing

dressings or topical agents promote wound healing or prevent wound infection.

Negative pressure wound therapy

The use of negative pressure wound therapy by Topical negative pressure increases the rate of ulcer healing. Negative pressure wound therapy delivered by the VAC therapy system. Topical negative pressure is a safe and effective treatment for complex diabetic foot wounds. Its use is contraindicated in untreated osteomyelitis.

Footwear

The footwear should be of adequate width and depth. Custom-made foot orthoses reduce plantar callus thickness and the incidence of ulcer relapse and should be used. This custom-made footwear should be considered in patients with evidence of deformity with or without loss of peripheral sensation. The use of custom-molded shoes is required in people with severe deformity or partial amputation.

Infection

The choice of antibiotic depends on cultured pathogens. There are new drugs and generations of antibiotics recently working on for treatment of resistant infections.

Emerging modalities

The therapies described below are adjunct treatments to the standard care previously outlined.

a- Inflammatory Mediators

The exact details of the inflammatory cascade have not been elucidated, but it is known that administration of these agents can benefit wound healing. Cytokines and growth factors have been investigated in diabetic ulceration.

b- Tissue-Engineered Biological Dressings

These products were initially aimed to act as a skin substitute for ulcers. They are thought to act by filling the wound with extracellular matrix and inducing the expression of growth factors and cytokines that contribute to wound healing.

c- Stem Cells

There is an increasing body of research on the use of autologous stem cell administration to treat diabetic ulcers, ischemic ulcers, and critical limb ischemia. The administration of the therapy has been intramuscular, intra-arterial, and topical. Bone marrow mononuclear cells and peripheral blood mononuclear cells have been studied.

Hyperbaric Oxygen Therapy

Hyperbaric oxygen for treatment of diabetic ulcers has been investigated in the past and reapproved nowadays to be safe and effective therapy in conjunction with the established methods of treatment.

Conclusion: Diabetic foot ulceration is a preventable disease. Newer therapies are being developed though these are adjuncts to standard multidisciplinary management.