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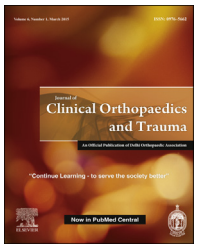

Review Article

Management of diabetic foot: Brief synopsis for busy orthopedist

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ARTICLE INFO

Article history:
Received 30 June 2014
Accepted 21 October 2014
Available online 14 November 2014

Keywords:
Diabetic
Wound
Flap
Reconstruction

ABSTRACT

According to available medical reports, over 10% of diabetic patients will develop foot ulcers during their lifetimes. This condition still remains great challenges to many clinicians. Various mechanisms may explain treatment-resistant entity. Treatment varies widely, relying on the severity of the ulceration as well as the presence of infection or ischemia. However, the most important things to keep in mind should consist of the following: 1) appropriate debridement; 2) off-loading of pressure; 3) effective control of infection; 4) local wound care strategy; 5) timely reconstructive surgery. The ideal flap for diabetic foot reconstruction should provide a well-vascularized tissue to control infection, adequate contour for footwear, durability, and solid anchorage to resist shearing forces. A thorough assessment of patient's general condition and voluntary motivation of the patient should be warranted to prevent any sort of postoperative recurrence.

1. Introduction

According to available medical reports, over 10% of diabetic patients will develop foot ulcers during their lifetimes.[1] Diabetic foot ulcers are well known to many clinicians that they respond poorly to conventional treatment, making them very difficult to care.[2] Various mechanisms including neuropathy, arterial insufficiency, decreased expression of various growth factors, sustained inflammation, and increased apoptosis may explain these treatment-resistant entity.[3] Over the last decade, significant advances have been made regarding the treatment of diabetic foot ulceration.[4]

Treatment varies widely, relying on the severity of the ulceration as well as the presence of infection or ischemia. However, the cornerstones of treatment for diabetic foot ulcers regardless whether it is at past or in the present should consist of the following: 1) appropriate debridement; 2) off-loading of pressure; 3) effective control of infection; 4) local wound care strategy; 5) timely reconstructive surgery.

2. Diabetic foot management

2.1. *Appropriate debridement*

Debridement is necessary before application of other wound closure procedures and improves the overall outcome of the diabetic foot.[5] Appropriate debridement causes activation of platelets (PLT) to control hemorrhagic responses and releases growth factors that initiate the cascade of wound healing process.[6] After appropriate debridement, tissues should be kept

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http://dx.doi.org/10.1016/j.jcot.2014.10.003

moist to prevent formation of devitalized tissue and subsequent deepening of the wound.[7] However, excessive moisture is a risk factor for pressure sores, and other dermatitis.

2.2. *Effective control of infection*

Diabetic foot ulcers act as portals of entry for systemic infection[8]. Diabetic Foot infections have a wide range of spectrum from paronychia, cellulitis, myositis, abscesses, necrotizing fasciitis, septic arthritis, tendinitis, and osteomyelitis. Risk factors for OM can be summarized as follows: Appearance of a swollen, deformed red toe, visible or palpable bone on probing, infected ulcer with an ESR > 70 mm per hour, nonhealing ulcer after a few weeks of appropriate care and off-loading of pressure, radio logically evident bone destruction beneath ulcer, ulcer area >2 cm^2 or >3 mm deep, ulceration over bony prominences > two weeks, ulceration with unexplained leukocytosis. The most common pathogens in acute, previously untreated, superficial diabetic foot infection are aerobic G (+) bacteria (particularly staphylococcus aureus and beta-hemolytic streptococci), while MRSA is a more frequently encountered pathogen in diabetic patients who have recently received antibiotic therapy in a hospital.

Diabetic foot infections are one of the major causes of amputation. Hence effective control and prevention are very important to decrease morbidity and mortality of the patients.

Topical antimicrobial therapies such as liquid silver nitrate, silver sulfadiazine, and silver-coated dressings have been shown to eliminate bacteria in diabetic foot ulcers.[9]

2.3. *Relief of pressure*

Various new off-loading modalities are being investigated, because of the drawbacks of total contact casting. At low risk group, prevention, education and basic footwear advice will do. At moderate risk group, intensive footwear advice and special footwear for feet are recommend. If patients with recurrence diabetic ulceration, total contact cases, air casts, scotch cast boots, hope cast boot, heel shoe, wheel chair ambulation, or best rest are recommended. Two examples are removable cast walkers and half-shoes.[10,11]

2.4. *Local wound care strategy*

2.4.1. *Vacuum-drainage systems*

Negative-pressure wound therapy has been shown to be beneficial in treating some soft tissue defects caused by diabetic foot wounds (Fig. 1).[12–19]

This therapy should be considered in large foot ulcers and particularly post local amputation wounds. In addition, it is also indicated when satisfactory healing is not occurring after a 3-week implementation of the protocol.[20] Younan et al[21] in their experimental study showed that vacuum-assisted closure therapy modulated nerve fiber and neuropeptide production in the wound. By optimizing the kinetics of vacuum-assisted closure application, clinicians can contribute to further improve wound healing in denervated wounds such as pressure sores and diabetic foot ulcerations.

Recently, Lerman et al introduced new ultraportable negative-pressure wound therapy devices reducing many disadvantages of previous products such as bulky and noisy characteristics, high cost and requiring an electrical power source.[22]

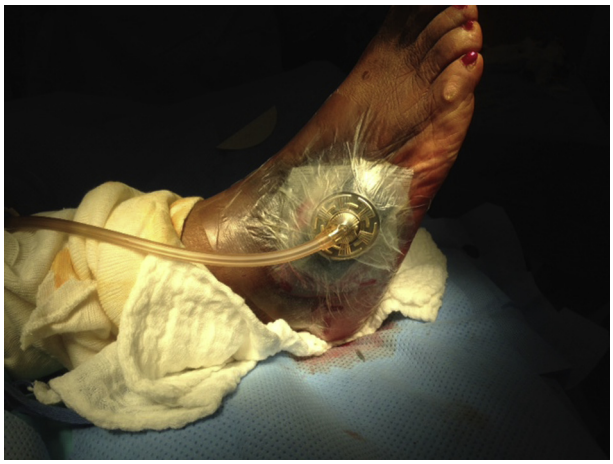

Fig. 1 – Showing wound vac in place.

2.4.2. *Skin substitutes (e.g., Apligraf, Epifix)*

Apligraf is a composite graft composed of a cultured living dermis and sequentially cultured epidermis and is derived from neonatal foreskin (Fig. 2).[23]

Histologic comparison shows that Apligraf and human skin are very similar. Apligraf lacks Langerhans cells, melanocytes (epidermis level), any hair follicles, sweat glands, endothelial cells, or blood cells (dermis level). Instead of providing instant coverage, Apligraf instead serves as a vehicle for the delivery of growth factors and other cellular constituents essential to the normal wound healing process.[23,24] Epifix is a dehydrated human amnion/chorion membrane allograft, which includes amnion and chorion. These 2 layers are a rich source of collagen, connective tissue, cytokines and growth factors. Hence Epifix provides a biological active matrix and growth factors for cellular ingrowth. Results have shown that Epifix contains one or more soluble

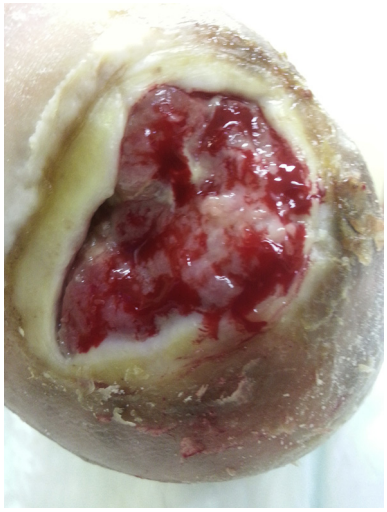

Fig. 2 – Showing dermagraft in place.