Comparative study between Negative Pressure Wound Therapy (NPWT) and Standard Moist Wound Dressing (SMWD) in management of diabetic non ischemic foot ulcers

Thesis

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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ABSTRACT

Background and aims: Diabetes is rapidly increasing in prevalence worldwide and surgery in patients with diabetic foot is becoming more common. Foot complications are a major cause of admissions in diabetic patients, and comprise a disproportionately high number of hospital days because of multiple surgical procedures and prolonged length of stay in hospital. Diabetic foot is an umbrella term for foot problems in patients with diabetes mellitus. Foot disorders such as ulceration, infection and gangrene are the most common, complex and costly sequelae of diabetes mellitus. The optimal therapy for diabetic foot ulcers remains ill-defined. Saline-moistened gauze has been the standard method; however, it has been difficult to continuously maintain a moist wound environment with these dressings. This has led to the development of various hydrocolloid wound gels, which provided more consistent moisture retention. Refinements in topical ointments have resulted in the addition of various pharmacological agents including growth factors and enzymatic debridement compounds. Hyperbaric oxygen therapy and culture skin substitutes are other wound therapies that have been advocated. All these therapies are associated with significant expense and are being utilized in some situations without sufficient scientific evidence demonstrating their efficacy. **Methods:** we performed a cohort study involving 30 patients with active diabetic foot ulcers, in a high volume tertiary referral vascular center. They were divided into 2 groups: 15 patients (group A) were prescribed NPWT and the other 15 patients (group B) received SMWD. During follow up visits, progress of healing was evaluated and documented in the form of change in wound diameter, depth, up or down scaling along UTWC, wound status at 2, 4, 8, and 12 weeks and 4 weekly thereafter till complete epithelialization**. Results:** As regard to ulcer depth there were statistically significant difference between the 2 groups during follow up duration of the study after 4 weeks with group A showing faster decrease in ulcer depth than group B denoting faster formation of granulation tissue. As regard to complete granulation of ulcer there were statistically significant difference between the 2 groups during follow up duration of the study markedly shown after 6 weeks with group A showing complete ulcer granulation faster than group B, with statistically significant difference as regard to number of days on dressing and follow up duration in weeks between the 2 groups with group A showing lesser number of days on dressing and shorter follow up duration in weeks than group B**. Conclusion:** NPWT has a definitive role in promotion of proliferation of granulation tissue, reduction in the wound size, by and rapid clearing of bacterial load. Our data demonstrates that negative pressure wound dressings decrease the wound size more effectively than saline gauze dressings over the first 4 weeks of therapy. It is suggested that NPWT is a cost-effective, easy to use and patient-friendly method of treating diabetic foot ulcers which helps in early closure of wounds, preventing complications and hence promising a better outcome.

Key word:

Comparative, Negative, Standard, SMWD, Diabetic, Ischemic

INTRODUCTION

Diabetes is rapidly increasing in prevalence worldwide and surgery in patients with diabetic foot is becoming more common. Foot complications are a major cause of admissions in diabetic patients, and comprise a disproportionately high number of hospital days because of multiple surgical procedures and prolonged length of stay in hospital ***(Ahmed et al., 2002)***

Diabetic foot is an umbrella term for foot problems in patients with diabetes mellitus. Foot disorders such as ulceration, infection and gangrene are the most common, complex and costly sequelae of diabetes mellitus ***(Singh et al., 2005)***.

The optimal therapy for diabetic foot ulcers remains ill-defined. Saline-moistened gauze has been the standard method; however, it has been difficult to continuously maintain a moist wound environment with these dressings. This has led to the development of various hydrocolloid wound gels, which provided more consistent moisture retention. Refinements in topical ointments have resulted in the addition of various pharmacological agents including growth factors and enzymatic debridement compounds. Hyperbaric oxygen therapy and culture skin substitutes are other wound therapies that have been advocated. All these therapies are associated with significant expense and are being utilized in some situations without sufficient scientific evidence demonstrating their efficacy. Therefore, the search for an efficacious, convenient and cost-effective therapy continues.

Negative Pressure Wound Therapy (NPWT) is a newer noninvasive adjunctive therapy system that uses controlled negative pressure using Vacuum-Assisted Closure device (VAC) to help promote wound healing by removing fluid from open wounds through a sealed dressing and tubing which is connected to a collection container. The use of sub-atmospheric pressure dressings, available commercially as a VAC device, has been shown to be an effective way to accelerate healing of various wounds. ***(Schwien et al., 2005)***

Till today, very limited data is available on the role of negative pressure dressing in healing of diabetic foot ulcers. Therefore, we endeavor to put forward a study to evaluate the role of negative pressure dressing in healing of diabetic foot ulcers using VAC device.

Aim of the work

The aim of this study is to compare wound outcome, limb salvage, and cost effectiveness between Negative pressure wound therapy (NPWT) and Standard moist wound therapy (SMWT) in management of diabetic non ischemic foot ulcers..

Anatomical Considerations

The human foot is a flexible highly developed, biomechanically complex structure, capable of conforming to variations in surface and load to maintain effective force transmission between the lower limb and the ground. (***Luke et al., 2014)***

Bones of the Foot

The 26 bones of the foot, separated into the three main sections of the foot: Forefoot, Midfoot, Hindfoot, is summarized below: ***(Standring et al., 2015)***

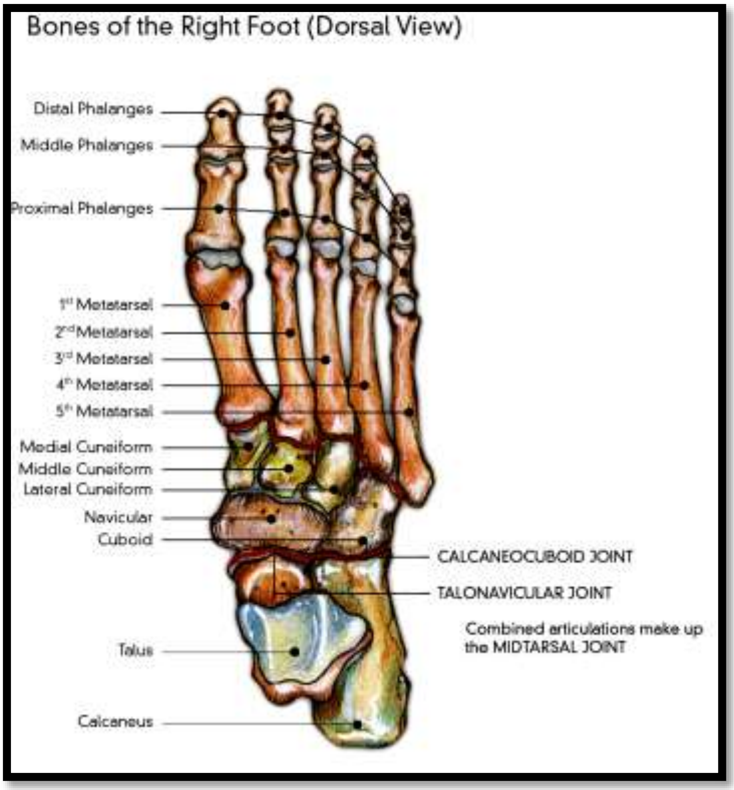

Fig. (1): Dorsal View, right foot ***(Standring et al., 2015)***

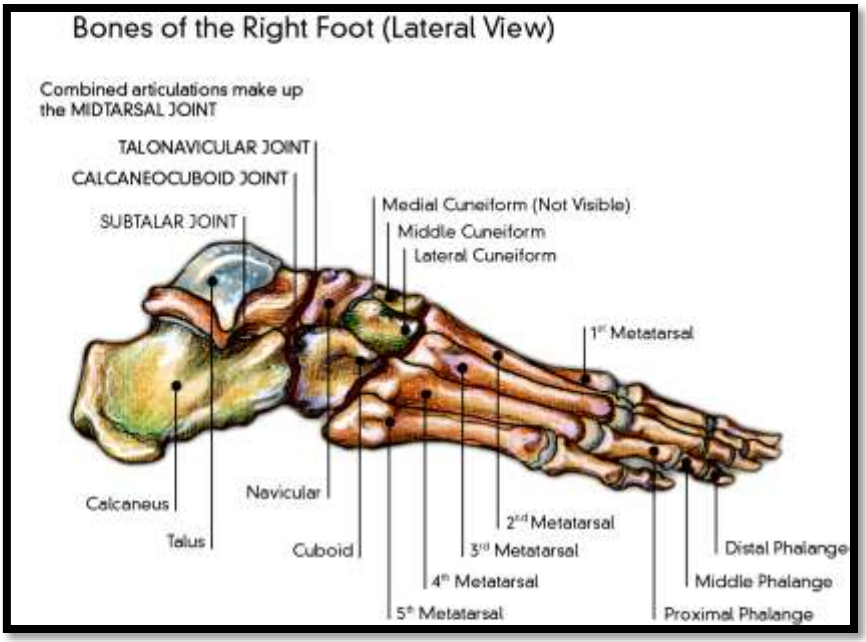

Fig. (2): Lateral View, right foot ***(Standring et al., 2015)***

Joints of Foot

The fore foot

The forefoot consists of five metatarsals starting with the first to the fifth; and five toes, each of which consists of three bones (except for the big toe which consists of two). The bones of each toe are the proximal phalanx, the middle phalanx, and the distal phalanx (except the big toe which has only proximal and distal). Between each of these bones is a joint which allows for the movement necessary of each section of the foot. ***(Standring et al., 2015)***

The joints of the fore foot are:

1. MTP joint - metatarsal phalangeal joint - between the metatarsal and the proximal phalanx of the adjacent toe.
2. PIP joint - proximal interphalangeal joint - between the proximal phalanx and the middle phalanx of each toe.
3. DIP joint - distal interphalangeal joint - between the middle phalanx and the distal phalanx of each toe.
4. The big ("great") toe has only one joint between its two phalanges and therefore this joint is called the great (or "big") toe interphalangeal joint.

Metatarsal head is the end of the metatarsals, which articulate with the joints of the adjacent bones (generally used to describe the distal metatarsal head, the portion that articulates with the proximal phalanx of the adjacent toe.) ***(Standring et al., 2015)***

The Mid foot

The Mid foot consists of five bones with numerous articular surfaces (surfaces which articulate by way of joints with other bones).

1. Navicular
2. Cuboid
3. Three cuneiform bones: medial, middle and lateral

Distally, the fourth and fifth metatarsals articulate with the cuboid bone. The first, second and third metatarsals articulate with each of their respective cuneiform bones. Each of these has an individual joint capsule but all are wrapped in one big capsule as well to form the tarso-metatarsal joint (the “Lis Franc joint”).

Proximally, the talonavicular and calcaneocuboid joints, together form the combined articulations of the midtarsal joint (of “Chopart”). ***(Standring et al., 2015)***

The Hind foot

The tibia articulates with the dome of the talus and thereby transmits the forces of the leg to the ankle. This is commonly called the “Tibialtalar joint” or simply the “Ankle joint”. In turn, the talus articulates with the calcaneus, the main weight-bearing (and the largest) bone of the foot by way of the subtalar joint.

The subtalar joint, known as the “agility joint”, is a key joint in the ankle. It has three surfaces of articulation with three separate facet joints. A great deal of the movement in the ankle happens in this joint - the rest of the movement happens at the tibialtalar joint. ***(Standring et al., 2015)***