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Original Research Article

A clinical study of outcome of various dressings in management of diabetic foot ulcers

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ABSTRACT

Background: Diabetic foot ulcers are a prevalent and serious global health issue. Dressings form a key part of ulcer treatment. The purpose of the present study was to evaluate the outcome of various dressings in management of diabetic foot among the patients with diabetic foot ulcer.
Methods: This is a prospective study carried out in a surgical unit of Saveetha Medical College & Hospital, Chennai, Tamilnadu, from February 2015 January 2017. All patients were allocated randomly into four groups – Group A, Group B, Group C and Group D which corresponded to saline, povidone-iodine, metronidazole and eusol dressing respectively. Data was collected by history taking, clinical examination, and follow up of the cases. All patients underwent daily surgical wound debridement and dressing. The results were collected, analyzed and compared.
Results: total of 83 patients were evaluated age ranged between 20 to 80 years with maximal clustering between 51-60 years of age. Male to female ratio was 2:1. Poor glycemic control and diabetes for more than 5 – 10 years increase the risk of foot ulcer. Usage of Povidone Iodine, Eusol and Metronidazole did not offer any healing benefit when compared to normal saline dressing.
Conclusions: Early diagnosis, proper management like bed rest, adequate surgical wound debridement and non-irritant dressing is the mainstay of treatment for diabetic foot ulcer without ischemia. Since diabetic foot has a multi factorial origin, multi-disciplinary approach forms the backbone for the management of diabetic foot.

Keywords: Diabetic foot ulcer, Diabetes mellitus, Saline dressing, Wound debridement

INTRODUCTION

Diabetic foot ulcer is a major complication of diabetes mellitus. Wound healing is an innate mechanism of action that works reliably most of the time.

A key feature of wound healing is stepwise repair of lost extracellular matrix that forms the largest component of the dermal skin layer.[1]

But in some cases, certain disorders or physiological insult disturbs the wound healing process. Diabetes mellitus is one such metabolic disorder that impedes the normal steps of the wound healing process. Many studies show a prolonged inflammatory phase in diabetic wounds, which causes a delay in the formation of mature granulation tissue and a parallel reduction in wound tensile strength.[2]

Diabetic foot ulcers are classified as either neuropathic, neuro ischemic or ischaemic.[3]

Risk factors implicated in the development of diabetic foot ulcers are infection, older age, diabetic neuropathy, peripheral vascular disease, cigarette smoking, poor glycemic control, previous foot ulcerations or

amputations and ischemia of small and large blood vessels.[4-7] Prior history of foot disease, foot deformities that produce abnormally high forces of pressure, renal failure, oedema, impaired ability to look after personal care (eg. Visual impairment) are further risk factors for diabetic foot ulcer. Patient with diabetes often develop diabetic neuropathy due to several metabolic and neurovascular factors. Peripheral neuropathy causes loss of pain or feeling in the toes, feet, legs and arms due to distal nerve damage and low blood flow.

Blisters and sores appear on numb areas of the feet and legs such as metatarso-phalyngeal joints, heel region and as a result pressure or injury goes unnoticed and eventually become portal of entry for bacteria and infection. People with loss of feeling in their feet on a daily basis, to ensure that there are no wounds starting to develop.[8,9]

They should not walk around bare foot but use proper footwear at all times. Treatment of diabetic foot ulcers should include: blood sugar control, removal of dead tissue from the wound, wound dressings, and removing pressure from the wound through techniques such as total contact casting.[10]

Surgery in some cases may improve outcomes. Hyperbaric oxygen therapy may also help but is expensive.[10] It occurs in 15% of people with diabetes and precedes 84% of all diabetes-related lower leg amputations.[11]

METHODS

This is a prospective study was carried out in surgical unit of Saveetha Medical College and Hospital, Chennai, Tamil Nadu, from February 2015 January 2017.

Table 1: The depth-ischemia classification of foot lesions.

Depth classification and definition
0- The “at-risk” foot: previous ulcer or neuropathy with deformity that may cause new ulceration
1- Superficial ulceration, not affected
2- Deep ulceration exposing a tendon or joint (with or without specific infection)
3- Extensive ulceration with exposed bone and/or deep infection (i.e., osteomylitis or abscess)
Ischemia classification and definition
A- Not ischemic
B- Ischemia without gangrene
C- Partial (forefoot) gangrene of the foot
D- Complete foot gangrene

All 83 patients were admitted through emergency and OPD basis who fit in to inclusion criteria. All patients were classified according to depth ischemia classification (Table 1). Patients in grade: Depth 0, 1, 2, 3 and ischemia A were included in the study.

Appearance of healthy granulation tissue in the floor of the ulcer is taken as the end point for observation. All patients were allocated randomly into four groups – Group A, Group B, Group C and Group D which corresponded to saline, povidone-iodine, metronidazole and eusol dressing respectively. Data was collected by meticulous history taking, careful clinical examination including the age of onset of diabetes mellitus and follow up of the cases.

All patients underwent daily surgical wound debridement and dressing. The results were collected, analyzed and compared.

RESULTS

Out of 83 patients, 66% were male and 34% were females. Maximum numbers of patients were seen between the age group of 51-60 years of age. In about 62% of patient positive family history of diabetic mellitus was present and 38% gives either no positive history or unaware about this condition. About 60% of patients had a duration of diabetes mellitus for about 5 to 10 years. This implies greater the duration, greater is the risk of developing foot ulcer.

Nearly 72% of the patients in this study was on irregular treatment and about 78% of the patients were in active working group and 22% had a sedentary lifestyle. The most common site of occurrence was toes followed by metatarsal heads, heel and dorsum of foot. All these indicate that the ulcer is more likely to develop in pressure areas.

In this study about 60% of the patients were in Grade 2A which implies patients with ulcer exposing joints and tendons without ischemia. Rest of the patients had Grade 1A or Grade 3A ulcer. Of the 83 patients participated in the study about 21 patients were allocated in Group A, 20 in Group B, 21 in Group C and 21 in Group D. All these patients were allocated randomly. Group A, B, C and D corresponded to Saline Dressing, Povidone Iodine Dressing, Metranidazole Dressing and Eusol Dressing respectively (Table 2).

All the patients were subjected to daily surgical wound debridement, daily dressing and given complete bed rest with positional variation. The end point for the study was taken as appearance of healthy granulation tissue in the entire floor of ulcer. About 11 patients in Group A, 15 patients in Group B, 13 patients in Group C and 9 patients in Group D did respond to this modality of treatment.

Totally about 45 persons responded, and 35 persons did not respond. Of the patients who did respond the time interval between intervention and healing was nearly the

same in all the groups. But the duration for the appearance of healthy granulation tissue increased as the grade of ulcer progressed. This study shows adequate bed rest, thorough surgical wound debridement and nonirritant dressing are the main modality of treatment of diabetic foot ulcer with no vascular compromise.

Table 2: Study group.

Grading	Group A saline dressing	Group B Povidone iodine dressing	Group C Metronidazole dressing	Group D Eusol dressing
1A	3	4	3	4
2A	13	12	12	13
3A	5	4	6	4
Total	21	20	21	21

In those who presented with vascular compromise establishing adequate vascularity by grafting, stenting or angioplasty should be tried. If these measures fail, amputation at appropriate level is the final modality of treatment.

DISCUSSION

Foot ulcers in diabetes require multidisciplinary assessment, usually by diabetes nurse specialist, a tissue viability nurse specialist, a tissue viability nurse, podiatrists, diabetes specialist and surgeons to improve the outcomes and limit the risk of lower extremity amputation.[12,13] Approximately, 15% of people with diabetes experience foot ulcers. Diabetic foot disease is the leading cause of non-traumatic lower limb amputations. An aim to improve glycemic control, if poor, forms part of the management, to slow disease progression.

Assessment of diabetic foot ulcer includes identifying risk factors such as diabetic peripheral neuropathy, noting that 50 percent of people are asymptomatic, and ruling out other causes of peripheral neuropathy such as alcohol abuse and spinal injury. Individuals who have sausage shaped toes, a positive 'probe to bone' test, evidence suggesting osteomyelitis, suspected charcot neuroarthropathy, or those whose ulcers do not improve within 4 weeks of standard care and where there is evidence that exudates is of synovial membrane in origin. When osteomyelitis is suspected to be involved in the foot ulcer, but not evidenced on an x-ray, an MRI scan should be obtained.

With regards to infected foot ulcers, the presence of microorganisms is not in itself enough to determine whether an infection is present. Signs such as inflammation and purulence are the best indicators of an active infection. The most common organism causing infection is staphylococcus. The treatment consists of debridement, appropriate bandages, managing peripheral arterial disease and appropriate use of antibiotics (against pseudomonas aeruginosa, staphylococcus, streptococcus and anaerobe strains), and arterial revascularization.

Wound care plays a pivotal role in the management of diabetic foot ulcer, which comprises cleaning the wound with normal saline following aseptic techniques and the use of modern wound care techniques that promote a moist wound healing environment.[14,15]

Although topical treatment is an important aspect of wound care, it is always considered secondary to surgical and systemic care.[16]

There are numerous topical regimens and devices available for the management of diabetic foot wounds including hydrogels, hydrocolloids, alginates, foam, silver impregnated atraumatic dressings, vacuum aided devices, hyperbaric oxygen therapy, etc.

However, before choosing a regime one should consider factors such as the general health of the patient, the process of tissue repair, assessment of the wound by means of grading, description and classification of the wound, local environment of the wound, knowledge on specific properties of the dressing materials and devices as well as their availability, affordability, and accessibility.

The ideal characteristics of a wound dressing are as follows:[17,18]

- Sterile, easy to use, cost effective;
- Maintain a moist wound healing environment;
- Absorb excess exudates;
- Non-adherent/non-toxic, non-allergic;
- Not contaminate the wound with foreign particles;
- Protect the wound from microorganisms;
- Allow gaseous exchange and control wound ador; and
- Provide thermal insulation and mechanical protection.

CONCLUSION

Early diagnosis, proper management like bed rest, adequate surgical wound debridement and nonirritant

dressing is the mainstay of treatment for diabetic foot ulcer without ischemia. Since diabetic foot has a multi factorial origin, multi-disciplinary approach forms the backbone for the management of diabetic foot.

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