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Case Report

Theruptor novo: wound dressing for diabetic foot ulcer

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ABSTRACT

One of the main risk factor affecting the normal wound healing process of is diabetes. India being the capital for diabetes, has a prevalence of 9.6% with 74 million patients living with diabetes and is expected to be 124 million by 2045. The most dreadful complication of diabetes mellitus is the diabetic foot ulcer. Foot ulcer and amputation are among the leading reasons for high morbidity, healthcare costs and mortality in diabetes patients. Numerous things must come together for a chronic wound to heal, and one crucial component of care is the use of wound dressings and these should create an ideal environment for healing while safeguarding the site from infection and additional damage. A diabetic patient presented with a non-healing diabetic foot ulcer (10.83 cm^2) with severe loss of protective sensation, exposed excised fourth and fifth metatarsals and he was treated and followed up with regular normal saline washes and Theruptor Novo dressings. The wound started to show signs of healing and within 7 weeks, the wound healed with complete epithelization. Theruptor Novo dressing was helpful in terms of good granulation tissue growth and epithelialization over time with good exudate management. Theruptor Novo, a non-adherent dressing with unique antimicrobial action cab be useful in managing diabetic foot ulcers.

Keywords: Diabetes mellitus, Diabetic foot ulcer, Wound dressings, Theruptor Novo dressing

INTRODUCTION

Wound heals after a complex sequence of events that begin with injury and end with complete closure. The stream of events associated with wound healing can be altered in a variety of disease processes, leading to the formation of chronic, non-healing wounds. One of the main risk factor affecting the normal healing process is diabetes.[1]

According to IDF projections, it is anticipated that by 2045, around 783 million people or roughly one in eight adults will be affected by diabetes worldwide marking a significant rise of 46% and 3 in 4 adults with diabetes live in low- and middle-income. India, known as the diabetes capital, currently has a prevalence rate of 9.6%, with a staggering 74 million individuals currently living with diabetes. This number is projected to skyrocket to 124 million by the year 2045.[2] The most dreadful complication of diabetes mellitus is the diabetic foot ulcer.[3] The pathogenic triad, which includes injury, ischemia, and neuropathy, are the other predisposing factors for diabetic foot ulcer in diabetic patients.[4]

Ensuring adherence to medication therapy, dietary restrictions, and physical activity is essential for diabetic patients to maintain optimal glucose control. In order to reduce the long-term consequences of not following treatment recommendations, it is crucial to prioritize all of the aforementioned factors.[5] Foot ulcers and amputations are significant factors contributing to the increased morbidity, healthcare expenses, and mortality rates observed in individuals with diabetes.[6] Numerous things must come together for a chronic wound to heal, and one crucial component of care is the use of wound dressings. These should create the ideal environment for healing while safeguarding the site from infection and additional damage.

The wound dressing should maintain the moisture of the wound without causing it to become overly saturated or dry, prevent excessive bacterial growth, minimize unpleasant odour, and promote wound healing by stimulating the growth of granulation tissue.[7] In this case, we report the use of Theruptor Novo (Healthium, India) a non-adherent 3D hydrocellular dressing pad, with dimethyl tetradecyl [3(trimethoxysily) propyl] ammonium chloride (DTAC) for antimicrobial action.[8]

CASE REPORT

A middle-aged male presented with a one and half month-old wound on his right foot. Patient was a farmer by occupation and had sustained injury to the little toe while doing farming activities. The small toe was gangrenous and the surrounding skin was erythematous. He underwent little toe amputation and wound exploration resulting in a wound over lateral and dorso lateral aspect of right foot. He was diagnosed with type 2 diabetes mellitus three years ago. On examination, vital signs were within the normal limit and the physical examination of right foot revealed a wound of size 10.83 cm^2 (measured using AveryDot and DeepLabel app) with exposed excised fourth and fifth metatarsals, minimal slough, pus, exudate and bad odour (Figure 1).

Figure 1: Wound of size 10.83 cm^2 at presentation.

Figure 2: Application of Theruptor Novo dressing.

Figure 3: Exudate management by Theruptor Novo.

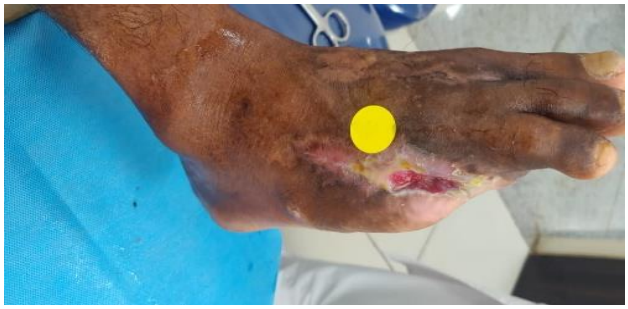

Figure 4: Wound healing with epithelization.

Figure 5: Completely healed wound by 7 weeks.

There was no peripheral arterial disease and the distal vascular perfusion was good but severe LOPS (Loss of protective sensation) was present. The wound was managed with normal saline washes and Theruptor Novo dressing once every 3 days as shown in the Figure 2. The wound started improving with decreasing signs of infection and healthy granulation tissue. No dressing remnants were left on the wound after the dressing removal and also there was no complaint of pain while changing the wound dressing. The exudate was absorbed in the Theruptor Novo (Figure 3). The wound was thoroughly rinsed with normal saline to ensure proper cleansing. Upon examination on 9^{th} day, the wound exhibited formation of granulation tissue, and significant growth of cells along the wound edge, indicating ongoing epithelisation (Figure 4). We changed the frequency of the wound treatment to every week from day nine because the wound had less exudate and healing was good. The patient continued the treatment with Theruptor Novo dressing. Eventually the wound diameter decreased, and over the 7 weeks healed with complete epithelisation as seen in the Figure 5.

DISCUSSION

It's critical to stop the progression of diabetic foot ulcers because the foot is a complex structure that supports the entire body. The diabetic foot ulcers management revolves around the proper wound care, which includes cleaning the site with regular saline or PHMB after using proper asepsis techniques and using modern wound care techniques that reassure a moist wound healing environment.[9] More than 3000 different products have been created as a result of technological advancements in technology to treat various kinds of wounds by addressing different components of the healing process.[1] However, the following are the ideal qualities of a wound dressing: maintaining moist wound milieu; ability to remove excess exudate; sterile, simple to use, and affordable; be non-adherent/non-allergic, non-toxic; avoid wound contamination with foreign particles; prevent wound infection; and allow gaseous exchange and regulate wound odour.[9]

Moist wound milieu is one of the important parts of the wound healing process. It not only facilitates the autolytic process but also acts a transport vehicle for all the growth factors that play a role in epithelialization. The collagen matrix in the wound and the wound edges will dry out, if moist wound milieu is not maintained.[10] In this case, the non-adherent Theruptor Novo dressing, with its unique 3-dimensional knitted fabric structure maintained the moisture balance very well which helped in faster re-epithelialization along with the effective exudate management while allowing gaseous exchange as well. Theruptor Novo dressing has permanently bound quaternary ammonium chloride compound with “physical kill mechanism” for microbial protection and it doesn’t leach into the wound for its antimicrobial action unlike silver or other antimicrobial agents impregnated dressings.[8]

In an in vitro study, Theruptor Novo was reported to have antimicrobial action against a broad spectrum of microorganisms along with a broad duration of action i.e., 1 min to 28 days. Such properties are of great importance for managing through the different stages of wound healing, as they ensure long-term protection from possible sources of infection.[11] Lower limb amputations and expensive medical treatments for chronic non healing wounds are ascribed to the high incidence of diabetic lower limb ulcers. Cellulitis and osteomyelitis can develop quickly when the ulcers get infected.[12] Therefore, early and aggressive treatment of apparent localized wound infections is of paramount importance.

CONCLUSION

Non healing lower limb ulcers in diabetic patients are often difficult to treat and can end up as a chronic, non-healing lower limb wounds. Timely intervention can improve the healing process. Theruptor Novo was helpful in terms of good granulation tissue growth and epithelialization over time with good exudate management. This poses an interest in further evaluating the efficacy of Theruptor Novo in the treatment of diabetic foot ulcers.

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