A case report of diabetic foot ulcer underwent an autolytic debridement using hydrogel and hydrocellular foam combination

Hendry Irawan, Ketut Putu Yasa

ABSTRACT

Background: All diabetic patients have 15-20% risk of foot ulcer during a lifetime. Approximately 70% diabetic ulcers heal within five years. However, the healing is often slow, and the ulcer may become a chronic wound. Proper treatment can improve the healing process. It includes autolytic debridement. It is a process in which the body removes the necrotic tissue. Case: A female, 45-year-old complained wound on her right foot since 1.5 months ago. The wound did not heal and became larger with bad odor and pus. She had type 2 diabetes mellitus since five years ago with uncontrolled blood sugar. We performed surgical debridement to extend the wound and to drain the pus. We used a combination of hydrogel and hydrocellular foam to treat the wound.

Conclusion: The overall performance of a combination of hydrogel and hydrocellular foam was shown to have clinical advantages such as autolytic debridement. We observed an increase of wound granulation and epithelialization and a decrease of slough and exudates.

Keywords: autolytic debridement, diabetic foot, wound dressing


INTRODUCTION

All diabetic patients have 15-20% risk of foot ulcer during a lifetime. Approximately 70% of ulcers heal within five years. The main risk factors are peripheral vascular disease, peripheral neuropathy, abnormal plantar pressure load, and infection. All diabetic foot ulcers (DFUs) may develop into necrotic tissue, and it leads to amputation of toes, foot, or limb. The risk of amputation in DFU is more than 15%. The DFU is often difficult to heal and become a chronic wound. The wound care is challenging. Wound care and wound healing are complex processes. However, a proper treatment includes debridement, and topical regimen can improve the healing process.

A debridement involves removal of dead, infected, or damaged tissue to promote the healing process of the healthy tissues. Autolytic debridement is a process in which the body removes the necrotic tissue. A necrotic tissue liquefies in a moist wound environment. In this case, we performed DFU wound care using a combination of hydrogel and hydrocellular foam.

CASE REPORT

A 45-year-old female came with a wound on her right foot which appeared 1.5 months ago. She already had her first toe of the right foot amputated one month ago because the first toe was necrotic and the surrounding skin was blackish. After the amputation, the wound did not heal and became larger with bad odor, and pus. She had had type 2 diabetes mellitus since five years ago, but the blood sugar had been uncontrolled because she did not consume the diabetic medicine routinely. Her vital sign was within the normal limit. The physical examination of her right foot revealed a missing first toe, slough, no necrotic tissue, positive for pus, exudates, and bad odor (Figure 1). The distal vascular perfusion was good.

We performed a surgical debridement to extend the wound and drain the pus (Figure 2). We used a combination of hydrogel (Figure 3) and hydrocellular foam (Figure 4) to treat the wound every two days. We observed a granulation, epithelialization, slough presentation, and pus. We found the exudates absorbed in the hydrocellular foam and hydrogel was liquefied with slough and necrotic tissue (Figure 5A). After we had cleaned the wound with normal saline, the wound had a healthy granulation, less slough, and more epithelialization on the edge of the wound (Figure 5B).

We continued treating the wound, and we found an excellent response of autolytic debridement (Figure 6A, Figure 6B, Figure 7A, Figure 7B). We changed the frequency of the wound treatment to every three days at day six because the wound...
Figure 1  The clinical picture of the foot in her first visit

Figure 2  The clinical picture after a surgical debridement (Day 0)

Figure 3  Hydrogel wound dressing (Intrasite Gel)

Figure 4  Hydrocellular Foam wound dressing. (A) Allevyn Non-Adhesive. (B) Wound contact layer. (C) Outer polyurethane top film.

Figure 5A  The foot after the wound dressing was removed (Day 2)

Figure 5B  The foot after the wound was cleaned (Day 2)
had less exudate (Figure 8A, Figure 8B, Figure 9A, Figure 9B).

The patient continued the wound treatment with hydrogel and hydrocellular foam. She cleaned the wound every three days, and she claimed there were good responses. We observed the wound diameter decreased and it had less slough, less bad odor, and less pus. In contrast, the wound showed more granulation and epithelialization. The last picture after a month (Figure 10) showed the wound on the sole had healed completely. The edge of the wound had epithelialized, and the wound diameter was reduced to 50% compared to the first finding.

DISCUSSION

Preventing progression of DFUs is important. A comprehensive treatment must be done to improve the outcome and to limit the risk for amputation. The main goal of the treatment is the wound healing process. A wound healing is a complex process because it involves growth factors, responses of cells, and a good clinical care. The fundamentals are moist wound care, frequent debridement, offloading, treatment of infection, and revascularization of the ischemic limb.

Debridement is a method to facilitate the removal of dead/necrotic tissue, cell debris or foreign bodies from a wound. It improves the healing potential of the remaining healthy tissues. A dead tissue can prevent the wound from healing and make wound vulnerable to infection. There are many techniques of debridement can be used by the healthcare professionals. However, they can be divided into an active debridement and an autolytic debridement.

An active debridement includes a sharp/surgical debridement, a mechanical debridement, a larvae/maggot debridement, and an enzymatic debridement. An autolytic debridement is a process in which the body remove the necrotic tissue. A necrotic tissue is liquefied in a moist wound.
A moist environment will naturally degrade and remove a slough from the healthy tissue. This process is helped by the presence of enzyme matrix metalloproteinases (MMPs). The enzyme is produced by the injured tissue. The liquefying process can be enhanced by a moist wound environment. A moist environment can use products produce moisture such as hydrocolloids and hydrogels and absorb excess moisture such as alginates, cellulose dressings or foams. Hydrogel consist of carboxymethylcellulose polymers or insoluble starch, and 96% water. Hydrogel can promote autolysis, wound hydration, cool the wound, wound healing, increased granulation tissue, maintains clean wound bed, and provide an analgesic effect.

Foam dressing is used to absorb excess fluid from the wound and to avoid the exudates from damaging its surrounding skin which causing a maceration. Allevyn Non-Adhesive dressing combines hydrocellular pad with non-adherent wound contact layer, and a breathable top film contain polyurethane. Foam dressing with polyurethane film provides barrier to bacteria, prevents strikethrough, and reduces risk of bacterial contamination. The overall performance of hydrogel and hydrocellular foam combination was shown to function as autolytic debridement. We observe increased wound granulation and epithelialization and decreased slough and exudates.

CONCLUSION

Foot ulcer in a diabetic patient is often difficult to heal and may become a chronic wound. Proper treatment can improve healing process includes autolytic debridement. The use of hydrogel and hydrocellular foam combination was shown to have a clinical advantage as autolytic debridement. We observed increased wound granulation and epithelialization and decreased slough and exudates.

ADDITIONAL INFORMATION

The patients gave a written permission that the picture of the wound will be used for a scientific forum and used as a learning material. We do not have any conflict of interest of the products utilized in this case report.

REFERENCES