# Healing Diabetic Foot and Heel Ulcers with Biopad®, an Equine Type I Heterologous Lyophilized Collagen Primary Wound Dressing


**AUTHOR**
Jeffrey C. Karr, DPM, ACCPPS, FAPWCA, CWS, PA, Karr Foot and Leg Centers Lakeland, FL



**ABSTRACT**
The use of Biopad® in Diabetic foot and heel ulcers offers a clear advantage for wound care management. Biopad® is an equine heterologous lyophilized type I collagen primary wound dressing. Biopad® is FDA approved for pressure sores, donor sites and other bleeding surfaces, dehisced surgical incisions, lacerations, venous stasis ulcers, diabetic ulcers, partial and full thickness wounds, post-laser surgery, podiatric wounds, and surgical and traumatic wounds. Biopad® is a sponge shaped device, constituted exclusively by lyophilized native heterologous equine type I collagen which transforms into a soft gel with hydration allowing contact with the entire wound bed. Biopad® when applied to a wound constitutes a barrier for wound management against exogenous infective agents. This study looks at the benefit of Biopad® in the management of Diabetic foot and heel wounds. Biopad® was utilized in ten lower extremity Diabetic foot and heel wounds in eight patients and was proven extremely useful in healing these wounds. The results suggest that Biopad® is beneficial in healing Diabetic foot and heel wounds.


**METHOD**
Biopad® was applied to Diabetic thirteen foot and heel ulcers from nine patients under clean technique after sharp debridement or wound excision. Biopad® was moistened with normal saline and applied to the wound. Gauze moistened with normal saline was then placed on the Biopad®, followed by a dry dressing. The Biopad® dressing was changed daily. Although, Biopad® may be applied less frequently if indicated. Pressure off loading, when necessary, was strictly adhered to. The off pressure loading was accomplished with a surgical shoe, crutches, or a wheel chair. Vascular status was evaluated in all the patients. The vascular status was deemed adequate to heal if the pedal, popliteal, and superficial femoral pulses were palpable. Patients that did not meet this criterion had a non-invasive arterial vascular study completed and intervention if required.

**RESULTS**
13 ulcers from 9 patients were evaluated for the benefit of Biopad® in treating Diabetic foot and heel ulcers (Chart 1). Of these ulcers, 11 were from the foot and 2 were from the heel. Ten ulcers were from male patients and 3 ulcers were from female patients. All patients in this review had Diabetes. Six of the ulcers were in patients that smoked. Three of the ulcers were from patients with impaired arterial circulation managed with an arthrectomy. The remaining patients were deemed to have adequate arterial circulation by the presence of palpable pedal, popliteal, and superficial femoral artery pulses. The average age of the patients was 54 years old. The average time that the ulcer was present before Biopad® application was 87 days. The average time to complete healing for the all the patients was 31 days. These results are summarized in chart one.

| Pt. | Ulcer | Days open | Days to closure | Original size (cm) | Sq. Cm | Depth | Location | A1C | Age | Sex | Tobacco | Arterial vasc. status | Revasculized | Post vasc. status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 21 | 62 | 2.5 x .5 .4 | 1.25 | sub-q | foot, plantar | 11.0 | 50 | m | no | good | no | n/a |
| 2 | 2 | 32 | 22 | 1 x .5 x .3 | 0.5 | sub-q | foot, plantar | 9.7 | 48 | m | 30 pyh | good | no | n/a |
| 2 | 3 | 270 | 49 | .5 x 1.5 x .3 | 0.75 | sub-q | foot, lateral | 9.7 | 48 | m | 30 pyh | good | no | n/a |
| 2 | 4 | 32 | 22 | 1.5 x .5 x .3 | 0.75 | sub-q | heel | 9.7 | 48 | m | 30 pyh | good | no | n/a |
| 2 | 5 | 37 | 29 | 2 x 1.5 x .3 | 3 | sub-q | heel | 9.7 | 48 | m | 30 pyh | good | no | n/a |
| 3 | 7 | 14 | 7 | 2 x .5 x .3 | 1 | sub-q | foot, heel | 7.0 | 58 | f | no | good | no | n/a |
| 4 | 8 | 187 | 7 | .8 x .8 x .4 | 0.64 | fascia | foot, lateral | 15.6 | 49 | f | 80 pyh | poor | yes | good |
| 5 | 9 | 32 | 21 | 4 x 1 x .3 | 4 | sub-q | foot, dorsal | 12.0 | 60 | m | no | good | no | n/a |
| 6 | 10 | 211 | 58 | 1 x 1 x .4 | 1 | sub-q | foot, plantar | 13.0 | 41 | m | no | | no | n/a |
| 7 | 11 | 124 | 62 | 1 x 1.5 x .3 | 1.5 | sub-q | toe | 8.5 | 73 | m | no | good | no | n/a |
| 8 | 12 | 52 | 21 | .5 x .5 x .4 | 0.25 | bone | toe | 10.0 | 67 | m | no | poor | yes | good |
| 9 | 13 | 9 | 14 | 1 x .3 x .3 | 0.3 | sub-q | toe | 7.1 | 61 | f | 60 pyh | poor | yes | good |
| | | | | | | | | | | | | | | |
| | | 85.1 | 31.2 | | 1.2 | | | 10.3 | 54.3 | | | | | |

Abbreviations: Sub-q – subcutaneous tissue, cm-centimeter, sq. cm.-square centimeter, m-male, f-female, vasc.-vascular, pyh-pack year history, n/a-not applicable.

BIO-K1Rev

**CASE REVIEW OF SELECTED PATIENT**
This 58-year-old non-smoker female presented with a Diabetic heel ulcer of 41 days duration (picture 1). Her past medical history was significant for hypertension and arrhythmia. The ulcer was subject to sharp debridement with a surgical curette. Biopad® was moistened with normal saline and applied to the ulcer. Gauze moistened with normal saline was then placed on the Biopad®, followed by a dry dressing (picture 2). The Biopad® dressing was changed daily with the same gauze dressing system described above. Pressure offloading was accomplished with crutches. In seven days there complete healing without reoccurrence at a six month follow-up (picture 3).

*picture 1*

*picture 2*

*picture 3*

**DISCUSSION**
Several important points were identified. Biopad® was beneficial in treating these Diabetic foot and heel ulcers. The ulcers were open an average of 87 days with healing at an average of 31 days. These results support that addition studies with larger enrollment would verify these initial findings.

**CONCLUSION**
This study suggests that Diabetic foot and heel ulcers would benefit from management with Biopad®.