Improved Outcomes with a Microcurrent Generating Dressing on Diabetic Ulcerations in a Tribal Community Healthcare Facility

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BACKGROUND
It is well-known that patients of Native American ancestry have the highest prevalence of diabetes among all U.S. racial and ethnic groups, with staggering rates of lower extremity amputation 3 to 4 times higher than those for the general population (1-2). While research has shown that an estimated 50% of lower-extremity amputations could be prevented through the improvement of lower-extremity care in the diabetic population (3), the alarming escalation of amputation rates brings to focus deficiencies with existing standard of wound care and the unmet need for efficacious wound treatment modalities that expedite healing in diabetic ulcerations, reduce infectious complications and reduce incidence of further surgical interventions. Published literature has pointed to the benefits of electrical stimulation in the acceleration of ulcer repair (4). A microcurrent generating antimicrobial device (MCD) (5) that generates 2-10 microcurrents of current on the surface has been observed to reduce healing times in both acute and chronic wounds (5-7).

METHODS
The device was assessed in our clinic in a case series of patients presenting with wounds of varying etiology. Used as a primary contact layer, the device was secured in place with standard secondary dressings and changed 1-3 times per week. Wound healing assessments were performed at clinic visits.

RESULTS
A substantial reduction in time to healing was observed in the patients treated with the microcurrent generating dressing. Case #1 achieved complete wound closure with the MCD in 2 weeks following 4 months of standard wound management principles. Of significance, amputation was avoided in both case #2 and #3; in case #2, the wound achieved full closure in 85 days with the application of MCD in conjunction with standard care, following failure to respond to 147 days of advanced wound care modalities, including antimicrobial, collagen matrix dressings, NPWT, etc. Case #3, a complex wound on a BKA with surrounding skin retracted to close to all secondary dressings, achieved full closure at 191 days, without a scheduled AKA.

CONCLUSION
The implications and costs – both financial and social – associated with failure to intervene with efficacious wound management solutions at early stages of diabetic wound healing is far too great. Positive experience with the energy-based device in a series of patients at an Native American health facility demonstrates its potential to improve wound healing outcomes and address the unmet needs of a high risk patient population, making it a cost effective option for a new standard in wound care.

REFERENCES

Case #1: Ulcer to the right foot TMA stump

Co-morbidities:
DM with nephropathy, HTN, TMA amputation, atriope kidney, CKD, neuropathy, GORD, arterial disease on foot history of exacerbating factors on the plant.

Wound History:
50 year old male presented with ulcerations 10/17/12 on the sole of the right foot, measuring 10x12 cm and 7x7.4 cm. There was a smaller but no excessive drainage, redness or other signs of infection. Initial treatments included cadexomer iodo cryogel dressing (6), SDF and K-wire for offloading. The patient performed his own dressing change and was told all of his appointments but walked at least 1.5 miles a day, and presented with full-elastic and braced shoe dressing at follow-up visits. The ulcers improved by 2nd visit at day 9 and were pronounced almost healed. The patient was enrolled in a walking loading program. The patient performed his own dressing changes and came to follow-up appointments but walked at least 1.5 miles a day, and presented on the chest.

Wound Measurement:
126 Days SOC, 6 Days MCD, 14 Days MCD

METHODS:
On 9/17/12, MCD was applied as sole treatment method and maintained with standard secondary dressing change observed at day 3, with 90% reduction in day 4 and complete re-epithelialization at day 14. Patient and staff involved in his care were all surprised at the rapid progress and epithelialization of the wound. Patient was pleased and grateful, and stated that his senior is the past typically took a year to heal. To date, the wound has remained healed.

DAY 7

DAY 11

DAY 14

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

Case #2: Ulcer to the left metatarsal head

Co-morbidities:
DM with nephropathy, Big TMA residual nodule 6M foot ulcer and atherosclerosis, ischemic heart disease, HTN, kidney transplant due to renal disease, complication.

Wound History:
46 year old male reported a blisters during exercise on 8/22/2012 and was first seen in our clinic on 8/23/12, with wound care as seen on the left metatarsal head. Patient was initially treated with hydrogel (4), hydrocolloid dressing, 3 times, collagen matrix dressing (3), collagen matrix dressing, collagen sponge (4), and SDF, antimicrobial dressing (2), and hydrocolloid dressing (2). Patient presented to hospital 1/10/12 for revascularization of arteries that were in shock state. The 11/11/12, wound edges approximated and internal closed, and patient was hospitalized 4 days later due to amputation of 5th metatarsal head. Wound closed 11/26/12 then replaced with conventional dressings and increased in size to 3x3cm. MCD returned 12 days but held present due to infection.

TREATMENT & OUTCOMES:
Following 147 days at SOC, MCD initiated at day 42, with reduction in wound volume observed in day 30. MCD and hydrocolloid used as sole treatment method at 3/15/13, with full closure on 4/17/13. Patient was fully compliant with care and mostly remained overweight. Patient was grateful for the pain relief and overall reduction in activity. Patient was very pleased with the product. Wound has remained closed to date.

CASE #2:

CASE #2:

CASE #2:

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

Case #3: Right side BKA non-healing wound

Co-morbidities:
DM with peripheral vascular insufficiency and peripheral polyneuropathy, HTN, CKD (3) angio, ray amputation 4th toe left foot.

Wound History:
50 year old male had a non-healing right foot ulcer due to vascular insufficiency and infection. Patient was scheduled to have a TMA amputation on 7/10/12 before being seen here by MCD at 6/14/12. He was admitted again to hospital again on 12/13/12 due to infection and increasing necrosis and underwent a revision of the stump. This patient also had a need revised to skin issues, which were very sensitive to dressing applications. Hints to a place on 12/31/12 but wound deflected centrally on 2/4/13, with signs of infection present, and AKA planned. Initial wound dimensions 10x10cm.

TREATMENT & OUTCOMES:
Despite standard standard care and minimal dressing change at follow-up visits, we observed slight tissue healing at all if dressing was removed. “Drying off” the wound, MCD dressings were applied at each visit. NPWT applied in conjunctive with MCD was not removed due to dry infections. MCD was applied alone and in conjunctive with other standard dressings on 6/13/12 with significant wound size reduction and complete epithelialization. Patient even expressed interest in leaving at times of visits. One of our struggles with this patient is that he is have trod greatly, including painless bone edges, ridge, stenosis, NPWT dressings, grove dressing and new dressing and again the patient repeatedly wanting to find a way to cover this wound and prevent the surrounding tissue breakdown. The patient strongly desired adherence and fear slightly that the wound had and the patient has been able to use these products successfully in conjunction with MCD.

DAY 12 MCD

DAY 14 MCD

DAY 164 MCD

DAY 182 MCD

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time

% Change in Volume Over Time