Use of Larval Debridement Therapy in Wound Bed Preparation

A 3 Case Series of Contrasting Wound Etiologies

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Introduction

In chronic wounds, the sequence of wound healing becomes disrupted due to the presence of necrotic tissue, hypoxia, high bacterial burden, corrupt matrix, or senescent cells within the wound bed. The chronic phase is characterized by elevated protease activity (EPA) of metalloproteinases and serine proteases like the human neutrophil elastase which interferes with collagen synthesis and growth factor release and action. EPA and inflammatory factors present in the wound bed such as IL-1, IL-6, and TNF-α account for the catabolic state of non-healing ulcers.[1-3]

Wound bed preparation through debridement accelerates endogenous healing and facilitates the effectiveness of other therapeutic measures. Biologic debridement is a reemerging technique of debridement by use of maggots. Most commonly used are sterile larvae of the *Lucilia sericata* fly which secrete powerful enzymes to break down dead tissue without harming healthy granulation tissue. Maggot therapy has been shown to have antimicrobial enzymes that destroy bacteria, which reduce biofilms, disinfect wounds[5], and regulate protease levels.[6]

Methods

Patients were selected whose fibrotic wounds had failed sharp and autolytic debridement. In each of the cases, wounds were cleansed and a thin layer of zinc oxide was applied to the periwound. Maggots were applied in the bag, directly onto the wound bed. Saline gauze was placed over top, then 4x4, kerlix and tape, taking care to leave breathing room. Dressings were changed daily for the duration of treatment.

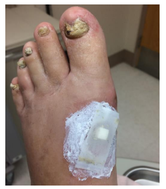
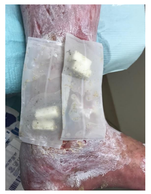


Figure 1



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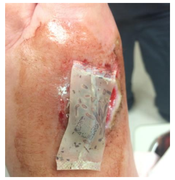

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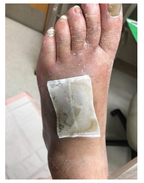


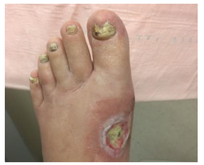
Figure 4

Figures 1-4: 1 & 2: Initial application of the bagged maggots with protective periwound barrier . 3 &4: Maggots remain in bag and are viable after 4 days.

Case 1: Iatrogenic Pressure Ulcer

80 y/o male with NIDDM2, peripheral neuropathy, ESRD on dialysis, anemia, Charcot foot, CAD, PVD, HTN, HLD, and anxiety. ABIs are non-compressible.

Following a tight ACE wrap, the patient developed a deep tissue injury to the left foot that opened to an ulcer two weeks later. Daily collagenase was implemented and continued for two months. Two applications of maggots were used for three and five days, respectively. Ten days after beginning maggot therapy the wound base was ready for an advanced product. Wound was treated with injectable amniotic graft and collagen.



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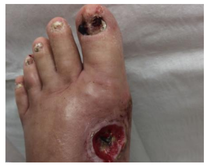

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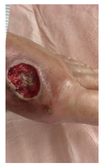


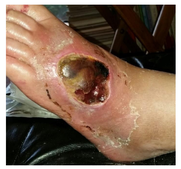
Figure 7

Figures 5-7: 5. Pressure ulcer prior to therapy. 6. Granular base after first application. 7. After second application.

Case 2: Traumatic Ulcer

76 y/o male with PVD with a traumatic ulceration secondary to walker injury. ABIs to ulceration site 0.88 initially, but 0.55 on repeat. Patient was revascularized 3 months after maggot therapy.

Patient sustained a blunt trauma to the dorsal left foot from a walker during physical therapy. Following trauma, a hematoma developed and was debrided by a local podiatrist. Subsequent infection was treated by IV antibiotics. Local wound care of two weeks manuka honey and four weeks collagenase failed. Two applications of maggots were used at five and four days, respectively. Thereafter, the wound base was ready for an advanced product after 15 days of initiation of maggot therapy.



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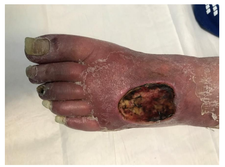

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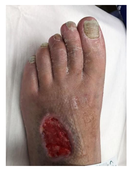


Figure 10

Figures 8-10 (from left to right): 8: Initial presentation of traumatic ulcer. 9. Minimal improvement after 6 weeks of enzymatic debridement. 10. After first application.

Case 3: Pyoderma Gangrenosum

63 y/o male with HTN, COPD, AKI and long-standing history of clinically diagnosed pyoderma gangrenosum. Patient presented with patent arterial flow and without venous system compromise. Previous treatments including Humira, chemical debridement and topical oxygen were unsuccessful.

Three applications of maggots were utilized. After each treatment the patient was given a two to three day break due to increasing pain that was managed with tramadol. At 19 days the wound base was ready for an advanced product. The patient was subsequently started on topical and oral prednisone.

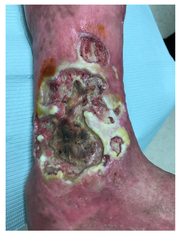
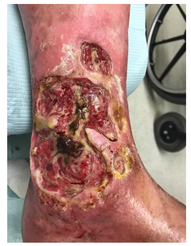


Figure 11



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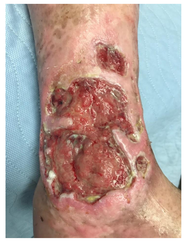

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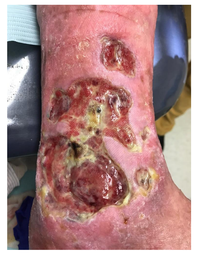

Figure 14

Figures 11-14 (from left to right): 11: Initial presentation. 12: After 1st application . 13: After 2nd application. 14: After 3rd application.

Discussion

Wound bed preparation through debridement is important in the management of exudate and decreases bacterial proliferation in order to accelerate endogenous healing and facilitate the effectiveness of other therapeutic measures. In chronic wounds, debridement should remove all non-viable tissues, reduce wound contamination and the dysfunctional cell population and may help to stimulate cytokines and growth factors to restore the physiological healing process. Biologic debridement involves the reemerging technique of debridement by use of maggots. There are currently 5 methods of wound debridement available: autolytic, enzymatic, sharp surgical, mechanical and biologic.

Biologic debridement involves the reemerging technique of debridement by use of maggots which started as far back as World War I. Maggot therapy has been shown to have antimicrobial enzymes that destroy bacteria, disinfect of wounds,[5] and regulate of protease levels.[6] There is evidence suggesting these secretions degrade biofilms and eradicate different bacteria including those colonized with Staphylococcus aureus and Pseudomonas aeruginosa[6] as well as methicillin-resistant Staphylococcus aureus.[4]

Currently, there are two methods of application for maggot therapy: traditional free range application of crawling maggots and bagged maggot therapy dressings. The free range application requires the practitioner to construct a fence to contain the maggots and is topped with a porous net. The bagged maggot dressings are already contained and sealed. There is no need for construction of a fence, but a topped porous dressing is recommended .[7]

It has been shown that maggot therapy is safe and cost effective compared to surgical debridement. Many studies have reported reduced length of stay for a person treated with maggot therapy versus surgical debridement. It also has been reported that patients treated with maggot therapy have a reduced need for amputation.[7]

Bagged maggot therapy can be applied easily compared to traditional free cage method and can effectively debride the wound with minimal cost to the patient and hospital. It requires very little in the way of resources, cost, or skilled personnel. We believe larval therapy is a viable option for wound bed preparation.

References

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**Biobag*, BioMonde Innovation Hub at UF, Gainesville, FL.