

The Use of Ovine Collagen Extracellular Matrix and Gentian Violet and Methylene Blue Antibacterial Foam Dressings in the Effective Treatment of Wounds with Exposed Tendon and Bone in the High Risk Diabetic Foot

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Objective:

Demonstrate the use of ovine collagen extracellular matrix (CECM)* and gentian violet/methylene blue (GV/MB) antibacterial foam dressings as an adjunct therapy in the treatment of wounds with exposed tendon and bone in diabetic limbs.

Introduction:

Diabetes has become more prevalent in our society, affecting 29.3 million Americans and more than 415 million people worldwide.¹ If Diabetes was a country, it would be the 3rd largest in the world.² An estimated 15% of patients with diabetes will develop a lower extremity ulcer during the course of their disease.^{3,4} Foot ulcerations are the precursor to many lower leg amputations in persons with diabetes. This is a large concern in the care of the diabetic. The field of wound care is ever expanding with many advances in technology. Advanced modalities such as skin substitutes, biologic wound products and growth factors help facilitate healing.⁵ There are other wound care dressings, such as CECM with an extracellular matrix (ECM), that help promote tissue granulation⁶ and provide a temporary scaffold to help cells migrate, leading to tissue epithelialization for final wound closure.^{7,8} GV/MB antibacterial foam dressings may support autolytic debridement.^{9,10} The broad-spectrum antibacterial activity helps provide bioburden management and the dressing helps maintain moisture balance.^{9,10} Tendon and/or bone exposure in a wound increases the complexity and provides challenges in healing the wound. These severe wounds may increase the likelihood of amputation, therefore requiring the need for aggressive and advanced wound care.

Methods:

These cases involve high risk diabetic patients with diabetic foot ulcers (DFUs) that were Wagner 3 or greater, with tendons and/or bone exposed. The wounds were surgically debrided, patients placed on IV antibiotics, and advanced wound care modalities such as hyperbaric oxygen therapy (HBOT) were used, in conjunction with CECM to prepare the wound bed for more advanced modalities. GV/MB polyvinyl alcohol (PVA)** antibacterial foam dressing was used to support autolytic debridement and reduction of biofilm. GV/MB polyurethane (PU)*** antibacterial foam dressing was also used depending on exudate level of wound. CECM was used prior to skin graft placement and again two weeks after skin graft to complete healing. Dressings were removed prior to HBOT weekly therapy.

Conclusion:

In the cases provided, the combination of CECM and GV/MB antibacterial foam dressings were implemented throughout the entire course of treatment. This form of treatment showed favorable results in preparation of these wounds with exposed tendon and/or bone. This wound care management approach in conjunction with other modalities, skin grafts and skin substitute application was also shown to be favorable.

Case Study 1

Patient: 63 year-old male presented with skin graft with exposed bone after a great toe amputation

Past medical history:

- Diabetes, hypertension, gangrene



Initial Visit Wound measurement:
4.0 cm x 4.0 cm x 1.5 cm

Wound Description:
Non-healing chronic full thickness surgical wound with muscle and bone exposed, large amount of sanguineous drainage.



Week 5 Wound measurement:
6.6 cm X 4.0 cm X 0.2 cm
(before sutures were placed)

Wound Description:
Wound sutured together after debridement

Wound Management:
CECM applied to wound bed covered by GV/MB PU antibacterial foam dressing and HBOT



Week 10
Wound closure

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- *Endiform™ dermal template - Distributed by Hollister Incorporated.
**Hydrofera Blue™ classic foam dressing - Distributed by Hollister Incorporated.
***Hydrofera Blue READY™ foam dressing - Distributed by Hollister Incorporated.
- Financial Disclosure: The author received an honorarium from Hollister Incorporated.

Case Study 2

Patient: 57 year-old male status post-amputation to the right 4th and 5th toes/rays

Past medical history:

- Type II diabetes, heart disease, hypertension, congestive heart failure



Initial Visit Wound measurement:
8.5 cm x 2.4 cm x 0.6 cm

Wound Description:
Wound dehiscid with sutures intact

Wound Management:
No previous wound care



Week 6 Wound measurement:
3.4 cm X 1.2 cm X 0.3 cm

Wound Description:
Wound remains fibrotic and can still probe to bone

Wound Management:
Debridement, CECM applied to wound bed covered by GV/MB PVA antibacterial foam dressing and HBOT



Week 15 Wound measurement:
2.0 cm X 0.5 cm X 0.1 cm

Wound Description:
No exposed bone and no longer able to probe to bone, no fibrotic tissue, and granular base

Wound Management:
Continued with previous protocol



Week 1 Wound measurement:
8.5 cm X 2.4 cm X 0.8 cm

Wound Description:
Fibrotic tissue at the distal aspect of the wound with depth and probing to bone; little granulation; moderate drainage

Wound Management:
Collagenase covered by GV/MB PVA antibacterial foam dressing for one month. Changed to CECM applied to wound bed covered by GV/MB PVA antibacterial foam dressing and HBOT. Applied 1-2 times per week



Week 10 Wound measurement:
3.0 cm X 1.0 cm X 0.3 cm

Wound Description:
Fibrotic and granulation tissue

Wound Management:
Application of cellular tissue product (CTP) every other week. Application of CECM in between CTP applications covered by non-adherent dressing and a dry sterile dressing secured with rolled gauze



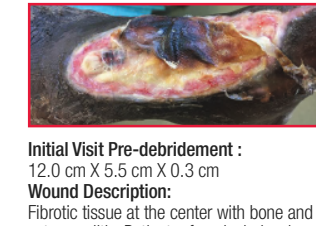
Week 21
Wound closure

Case Study 3

Patient: 46 year-old male right foot non-healing wound

Past medical history:

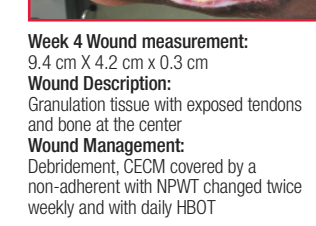
- Type II diabetes, hypertension, end stage renal disease, hemodialysis



Initial Visit Pre-debridement :
12.0 cm X 5.5 cm X 0.3 cm

Wound Description:
Fibrotic tissue at the center with bone and tendon exposed. X-rays are consistent with osteomyelitis. Patient refused a below knee amputation

Wound Management:
Debridement, collagenase and HBOT



Week 4 Wound measurement:
9.4 cm X 4.2 cm x 0.3 cm

Wound Description:
Granulation tissue with exposed tendons and bone at the center

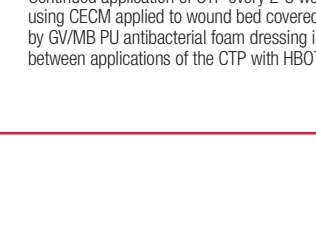
Wound Management:
Debridement, CECM covered by a non-adherent with NPWT changed twice weekly and with daily HBOT



Week 12 Wound measurement:
7.0 cm X 3.5 cm X 0.2 cm

Wound Description:
100% granulation tissue, no exposed tendons or bone

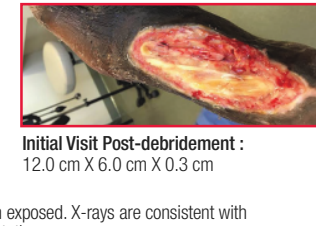
Wound Management:
Debridement, CECM applied to wound bed covered by GV/MB PVA antibacterial foam dressing and HBOT



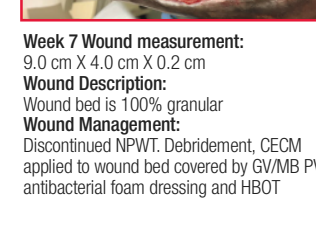
Week 17 Wound measurement:
4.0 cm X 2.0 cm X 0.1 cm

Wound Description:
100% granulation tissue

Wound Management:
Continued application of CTP every 2-3 weeks using CECM applied to wound bed covered by GV/MB PU antibacterial foam dressing in between applications of the CTP with HBOT



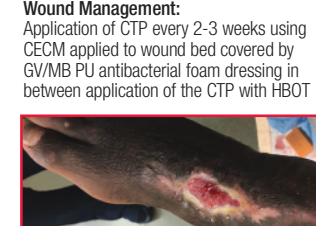
Initial Visit Post-debridement :
12.0 cm X 6.0 cm X 0.3 cm



Week 7 Wound measurement:
9.0 cm X 4.0 cm X 0.2 cm

Wound Description:
Wound bed is 100% granular

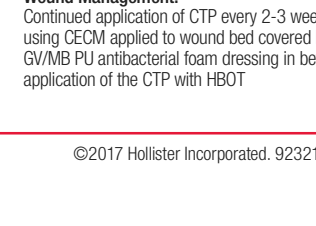
Wound Management:
Discontinued NPWT. Debridement, CECM applied to wound bed covered by GV/MB PVA antibacterial foam dressing and HBOT



Week 14 Wound measurement:
6.5 cm X 3.3 cm X 0.2 cm

Wound Description:
100% granulation tissue

Wound Management:
Application of CTP every 2-3 weeks using CECM applied to wound bed covered by GV/MB PU antibacterial foam dressing in between application of the CTP with HBOT



Week 18 Wound measurement:
3.0 cm X 1.5 cm X 0.1 cm

Wound Description:
100% granulation tissue. Wound size reduction of 93.75%

Wound Management:
Continued application of CTP every 2-3 weeks using CECM applied to wound bed covered by GV/MB PU antibacterial foam dressing in between application of the CTP with HBOT