

Copper dressings substitute debridement and skin grafting in full thickness skin necrosis (Eschar) in diabetic patients



Eyal Melamed¹, Jihad Dabbah¹, Alexei Rovitsky¹, Ilana Kan¹, Tohar Roth², Gadi Borkow²
¹Foot and Ankle Service, Rambam Health Care Campus, Haifa, Israel. ²MedCu Technologies Ltd.



Introduction

Dry eschar is a solid denaturalized proteins that coalesced after skin and subcutaneous tissue necrosis. It can be regarded as a “biological dressing” since it confers protection from bacterial invasion. Nevertheless, the eschar shrinks and the interface between intact skin and the eschar becomes a portal of entry for bacteria. The dry eschar often becomes wet and infected, resulting in cellulitis or other form of spreading infection. Treatment typically includes debridement, means to promote granulation tissue formation and skin grafting. Copper dressings (COD) convey antimicrobial protection and promotes angiogenesis, debridement, granulation tissue formation and epithelization. The goal of the current work is to describe the effect of COD on a cohort of patients with skin and subcutaneous necrosis who present with eschar.

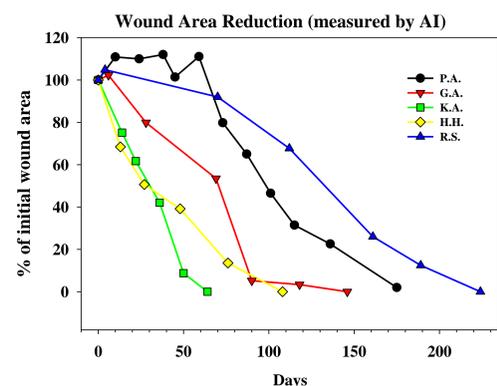
Methods

We present five cases of diabetic patients in whom eschar wounds were treated with copper dressings from the beginning to full closure.



Results

All patients had type II diabetes mellitus (DM). The locations of the wounds were on the dorsum of the foot/anterior ankle (3 pts.) and transtibial amputation stump (2 pts.). The causes of the eschar were tight bandages (2 pts.), infection (2 pts.) and chemical burn (1 pt.). Original wound area was $15.0 \pm 3.1 \text{ cm}^2$. Time to closure was 22.8 ± 3.6 weeks with average 29.6 dressing changes. There were no infectious episodes throughout the treatment period and no antibiotics was prescribed.



Discussion

In all patients the healing process comprised of eschar shrinkage with debridement (liquification) of the underlying necrotic tissue and granulation tissue formation, all happening simultaneously. Epithelization of the granulation tissue ensued and was followed by skin maturation resulting in mature, normal or near normal appearing skin. This pathway is in line with the “continuum of care” concept (from skin rupture to skin closure) known to happen with copper dressings.

Case No.1 (P.A): 60 years old diabetic patient developed full thickness skin and subcutaneous tissue necrosis in front of the ankle secondary to infection from IV catheter in the ankle. CT (upper left corner) demonstrated the depth on the infection down to the extensor tendons.

The infection was eradicated with antibiotic treatment and debridement surgery was contemplated for the eschar, to be followed by skin grafting. Home treatment with COD was without antibiotic treatment for the whole period. The eschar peeled away gradually, and the necrotic tissue underneath was auto-debrided by the growing granulation tissue. Epithelization happened almost from the beginning, with skin growth underneath the eschar first, and then over the granulation tissue.

At 5 months the wound was closed. COD was continued on the dry healed skin to promote maturation and a smaller eschar. It is noteworthy that the extensor tendons were never exposed as granulation crawled over them, thus their full function was preserved. Melamed, E., Rovitsky, A., Roth, T., Borkow, G. (2022) Archives of Clinical and Medical Case Reports 6: 501-510.



Case No.2 (G.A): 64 y.o. man with type 2 DM suffered chemical burn to the dorsal aspect of the foot 3 weeks prior to arriving to our clinic. The dry eschar measured 85x25 mm without signs of infection. Ultrasound revealed damage to the skin and subcutis fat, not involving the extensor foot tendons. COD were applied. Skin crawled into the wound, the eschar peeled away at first on the lateral side, where the damage was more superficial. In the medial aspect wound closure was preceded by granulation tissue. At 4.5 months the wound was closed. No infection occurred throughout the healing period.



Case No.3 (R.S): 62 y.o. man with type 2 DM and PVD (ABI = 0.72 & 076, TP & DP) developed pressure injury on the dorsomedial aspect of the foot, apparently as a result of tight bandage after lateral ray resection. The wound turned into dry black eschar measuring 55x37mm, without infection or discharge. Adhesive copper bandage were applied and replaced every 5-7 days. After 4 months the eschar detached and trimmed away, revealing mixed white necrotic and granulation tissue. The necrosis was replaced by red granulation tissue, which in term was exchanged by invading epithelium. At 8 months the wound was closed. One year follow up revealed firm closed wound with some scarring in the center or the original eschar. Although healing was slow, due to the poor blood supply, the copper dressing was very convenient and inexpensive, and conferred full antibacterial protection without infectious episodes or need for an antibiotic.

