The Mechanism of Action of the Vacuum-assisted Closure Device

Reference:

Scientific Literature Review

Reviewed by: Annie Xu, DPM
Residency Program: Inova Fairfax Hospital Podiatric Surgical Residency Program

Podiatric relevance:
This study investigates the individual components’ contribution to the success of vacuum-assisted closure device on diabetic wounds.

Methods:
Five study groups were created using either semi-occlusive covering (OD) alone, semi-occlusive covering with suction at 125mmHg (suction), semi-occlusive covering with polyurethane foam (foam), semi-occlusive covering with foam and 170g/cm2 compressive force (foamc), and semi-occlusive covering with foam and suction at 120mmHg (VAC). Ten diabetic mice with full-thickness dorsal wounds measuring 1cm² were placed in each dressing group. A 0.2cm thick duoderm dressing was applied to the borders of all wounds to prevent deformation. Dressings were changed on day 2 and 4. On the 7th day, the entire wound was excised for histologic inspection.

Results:
Significant differences were found between all three groups using foam compared to OD and suction groups in the degree of cellular and vascular proliferation. Macroscopically, the VAC group exhibited the most brightly undulated granulation bed which is a 2-fold increase compared to OC, suction, and foamc groups. The wound sizes for all groups progressively decreased starting on day 4 except foamc which increased up to 131% by day 7. Furthermore, the VAC group showed the most surface deformation by exhibiting 60% more strain compared to OC, suction, and foam groups.

Conclusions:
The wound and foam interface is the crucial mechanism in the vacuum-assisted closure device that requires further studying. The current study suggests the polyurethane foam is primarily responsible for stimulating angiogenesis rather than the suction force or mechanical stress.