VACUUM ASSISTED WOUND CLOSURE
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Key Points:
- Vacuum assisted closure (VAC) is most efficacious during the proliferative phase of wound healing
- Once an adequate granulation bed is present, VAC is no longer required
- VAC is not a substitute for aggressive wound debridement
- Approximate cost of VAC on a wound is $150.00-$200.00/day

Background and Indications
Vacuum assisted wound closure (VAC), or negative pressure wound therapy, is the application of subatmospheric pressure (-125 mmHg) to a wound bed through open cell foam. This process has been heralded as an effective method of speeding granulation tissue formation, enhancing wound contraction, decreasing bacterial load, and removing peri-wound edema. Through the reduction in edema, collapsed vessels are restored, allowing for re-establishment of the basement membrane, and enhanced granulation. Mechanical stresses on the wound environment also enhance proliferation and granulation, and the VAC can help remove cytokines and other substances detrimental to wound healing.

Wound selection is paramount for success of any modality. The VAC is most suitable for chronic wounds that have been slow to granulate, or acute contaminated wounds to enhance the removal of bacteria and support effective granulation. The VAC should not be applied to large bore vessels, directly to organs, or over necrotic wounds that would benefit from further surgical debridement. The open cell foam assures that the vacuum is applied equally to the entire wound surface. Cyclical application of the vacuum has been shown to be more effective in human studies, but more painful as well. Therefore, for veterinary applications, continuous suction is recommended. The choice of -125 mm Hg suction has been demonstrated to cause the greatest increase in blood flow to the wound, increasing it 4x above baseline.

Veterinary evidence includes excellent success when used for distal extremity shear wounds, a case of tissue necrosis from subcutaneous urine extravasation, and a large intentional burn. One of the most recent papers published regarding this technique was a controlled study of antebrachial wounds down to the bone. Each dog served as its own control, with a second wound treated with traditional bandaging. The wounds with the VAC showed more uniform granulation tissue significantly earlier than the wounds treated traditionally, and there were no cases of exuberant granulation. However, wound contraction was inhibited by the VAC. VAC use is therefore most appropriate prior to and during the formation of a healthy granulation bed. If a wound is expected to heal by second intention, the VAC should be discontinued as soon as a suitable granulation bed is formed.

With the development of a smooth, regular granulation bed in a rapid fashion, the VAC may be most useful for preparing wounds for application of a flap or graft. The VAC has demonstrated efficacy in holding and immobilizing full-thickness skin grafts and flaps to shear wounds.
Application

Necessary equipment includes open cell foam (400-600 µm pore size), an egress vacuum tube, adhesive spray, stoma paste, and occlusive adhesive dressing. A suction device capable of applying the necessary pressure and collection container are also required. The first VAC bandage is placed in a sterile manner, and then clean bandage changes are employed every 48 hours. Timing is critical, to prevent granulation tissue ingrowth into the foam. Should this occur, surgical debridement may be necessary. Most dogs will tolerate bandage changes with mild sedation, whereas general anesthesia is required for initial debridement and VAC application.

Sterile lubricant is used to generously fill the wound bed, thereby protecting it from contamination as the surrounding hair is clipped. The clip is liberal, as it is essential to achieve an air-tight seal for the VAC to function properly. The wound and surrounding skin are then scrubbed as if for surgery. If necessary, the wound is sharply debrided and a tissue culture is collected. Next, the open cell foam is cut to size. The foam should not be trimmed over the wound bed, as this may result in small pieces of foam being incorporated into the wound and acting as a foreign body nidus. The foam should fill the entire wound bed, without overlapping the normal surrounding skin.

The skin around the margin of the wound is treated with alcohol to remove residual oils, thereby improving the seal. If available, a spray adhesive can be used on the skin prior to adhesive drape placement. The adhesive drape is similarly cut to size, allowing for a large area of overlap. An assistant holds the foam in the wound bed, while a second person applies the drape. It is extremely important that the drape contacts the skin uniformly, without wrinkles. Stoma adhesive can be extremely helpful when applying the drape around bony prominences, or in areas of high movement to improve the airtight seal between the drape and the skin. If used, it is applied circumferentially, approximately 3 centimeters from the wound edge.

Once the drape is secure, a small hole is cut centrally, above the open cell foam. The egress tubing is attached to this area, connected to the collecting vessel, and the vacuum is applied. The foam should quickly and evenly compress onto the wound surface, and the vacuum should easily maintain -125 mmHg.

The dressing can be covered with an additional bandage, T-shirt, or other protective garb. The VAC dressing is changed every 2-3 days. Depending on individual hair growth, it may be necessary to clip the hair again, to preserve the seal. Again, once a healthy bed of granulation tissue is noted, the VAC is discontinued in favor of additional means of closure.

Cost

- VAC unit - $9450.00
- Open cell foam with a single drape - $275.00
- Silver-impregnated open cell foam with a single drape - $325.00
- Canister - $90.00
- Egress tubing - $45.00
- Daily usage fee - $50.00
- Average daily fee for VAC use - $150-200
Complications

Complications of VAC therapy are generally minor but include loss of the airtight seal and local dermatitis associated with adhesive drape removal. More significant complications can occur if the dressing is left in place for greater than 3-4 days, as granulation tissue may grow into the open-cell foam and require surgical debridement. Hemorrhage can occur if a vessel wall is eroded, and other common complications of wound drainage such as hypoproteinemia can be seen.