



surgery NOTES

7 Cs of Wound Management

When treating wounds, we always proceed in the same order:

- **Cover** the wound until the patient is evaluated and stabilized; this prevents further desiccation or contamination of the wound.
- **Clipping** of the wound edges and surrounding hair (minimum of 3-5 inches around the wound – the more, the better); sterile lube can be placed into the wound to trap unwanted hair and the lube can be wiped out once clipping is complete
- **Cleaning** or debridement of the wound – including removal of gross debris as well as grossly infected/necrotic tissue. Our general rule is to leave tissue if you are not completely sure of its viability as it can always be removed at a later date.
- **Copious** lavage with sterile saline with or without dilute chlorhexidine. There is no such thing as too much lavage!
- **Culture** of the wound AFTER cleaning and copious lavage but BEFORE starting antibiotics (if possible).
- **Coapt** or bandage the wound. A splint may be necessary on a distal limb or a tie-over bandage over the trunk. A VAC bandage would be a great option in many cases as well.
- **Closure** of wound after its clear of infection. Sometimes closure is delayed until a healthy bed of granulation tissue has formed.

Updates in Wound Management: Vacuum-Assisted Closure (VAC)

Wound management can be a complicated and time-consuming task. Daily (or even twice-daily) sedation and bandage changes can be difficult for the patient and the veterinarian. Bandage materials can be costly, especially for large wounds, and keeping the outside of a bandage clean and dry can, at times, be as difficult as the wound management. In addition, waiting for formation of infection-resistant granulation tissue can take days, sometimes weeks, which further increases costs to the client as bandage charges accumulate. Vacuum-Assisted Closure, or VAC, bandages can be lower in cost and maintenance than standard bandages as they do not need to be changed as frequently and can speed wound healing. In addition, VAC bandages are very versatile and can be used on a variety of wounds including avulsion and degloving wounds, wounds over bone and over skin grafts. Placement of a VAC bandage can be relatively quick and requires little equipment while allowing for constant wound drainage. While VAC is not needed or appropriate for every wound, it can be a very useful wound management tool.

How does VAC work?

Initially, the '7 Cs' of wound management are performed on all wounds (Figure 1). Once the wound is free of gross debris and necrosis as well as gross infection, a large piece of sterile foam (with an ideal pore size of 400-600 μ m) is placed in the wound (Figure 2). The foam is usually tucked under the wound edges but can overlay them. A sterile adhesive drape is then placed over the wound and foam (Figure 3); a spray adhesive is used around the wound edges to ensure a tight seal. Finally, suction tubing is secured over the adhesive drape and foam (Figure

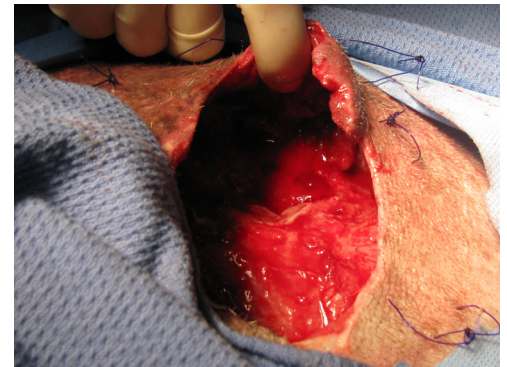


Figure 1: Large pocketing inguinal wound initially treated with wet-to-dry tie-over bandage until gross contamination was cleared.

4). The tubing is connected to a suction unit that is set to -125 mmHg and the suction is turned on (Video). While studies have shown that alternating 5 minutes of suction with 2 minutes off suction is ideal, the initiation of suction can be painful so suction is continuously maintained. Portable suction units are available that can be taken outside with a patient as needed. Additionally, the suction tubing can be clamped and unplugged from non-portable suction units for short periods of time.

Vacuum-assisted closure of wounds was initially developed for human wound care but, as with many things in human medicine, the initial studies were performed in animals, namely pigs. Researchers found that -125 mmHg was the ideal pressure for VAC as higher levels were actually detrimental to wound healing^a.

Commercially available foam, adhesive drapes, tubing and suction units are available from Kinetic Concepts, Inc. (KCI).

Where can VAC be used?

Vacuum-assisted closure can be used on any wound that does not contain obvious





Faculty Spotlight: Dr. Tige Witsberger

Dr. Tige Witsberger is a 2006 graduate of the University of Illinois, College of Veterinary Medicine. He completed his rotating internship at the University of Missouri-Columbia in 2007 and his small animal surgical residency at Texas A&M University in 2010. He joined the Texas A&M University small animal surgical faculty as a full-time Lecturer in Soft Tissue and Orthopedic surgery after

completion of his residency and became a Diplomate of the American College of Veterinary Surgery in 2011. Dr. Witsberger has a strong clinical interest in minimally invasive surgery including laparoscopy and thoracoscopy as well as arthroscopy and minimally invasive fracture repair. He is an instructor at TAMU's Annual Laparoscopy and Thoracoscopy Wet Lab held in May.



Figure 2: Inguinal wound after placement of open-cell foam.

infection or necrotic tissue. VAC does require a seal with a sterile adhesive drape (approximately 3-4 cm minimum borders around the wound) so VAC usage can be difficult (but not impossible) around body openings. VAC can be used over bone to promote granulation tissue formation^b. VAC can even be used in cases of septic abdominal and thoracic cavities; sterile dressing is placed over the abdominal or thoracic opening and the sterile foam and adhesive drape are placed on top, allowing for drainage from the body cavity. Vacuum-assisted bandaging can be very useful with skin grafting as well allowing for removal of wound fluid that can lift a graft from its underlying bed. In addition, VAC can be useful for skin avulsions or 'physiologic degloving' injuries.

VAC cannot be used over major blood vessels as the vacuum could cause erosion of the vessel wall. VAC also cannot be used in the face of gross infection or necrosis as the vacuum is unable to remove necrotic tissue and may promote growth of anaerobic bacteria if the tissue has poor blood supply.

What are the benefits of VAC?

Vacuum-assisted closure has many benefits over standard wound care. The negative pressure has been found to decrease tissue edema and remove excess wound fluid, promoting a healthier wound environment^c. The vacuum can also remove bacteria from the wound and decrease wound size. In addition, the negative pressure promotes increased blood flow resulting in

faster formation of infection-resistant granulation tissue. Vacuum-assisted bandages can be left on for 48-72 hours resulting in lower wound management time and costs.

What are the risks and disadvantages of VAC?

Loss of suction can result in wound fluid accumulation and dermatitis. Use of VAC over large vessels or necrotic tissue can result in significant hemorrhage and anaerobic infection, respectively. Vacuum-assisted closure should never be used on hemorrhagic wounds to prevent excessive blood loss. Vacuum should also not be used over wounds with possible malignant cells (for example, after large mast cell tumor removal). If VAC is deemed necessary, a wet-to-dry bandage can be maintained while awaiting biopsy results and VAC can be initiated once margins are declared clean. Granulation tissue in-growth into the foam can occur if bandage change intervals are too long. In many cases, it is best to change the bandage in 24-48 hours the first time (or two) to gauge how quickly granulation tissue forms. Unfortunately, VAC bandages can only but used in hospital and do not allow for the patient to return home for daily bandage changes.

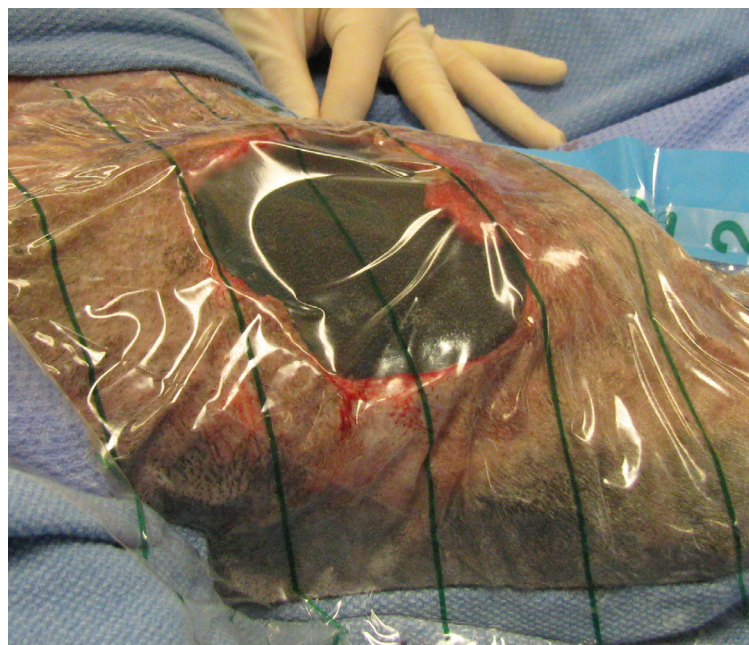


Figure 3: Placement of sterile adhesive drape over wound and foam (after application of surgical adhesive to wound margins to prevent air leakage).

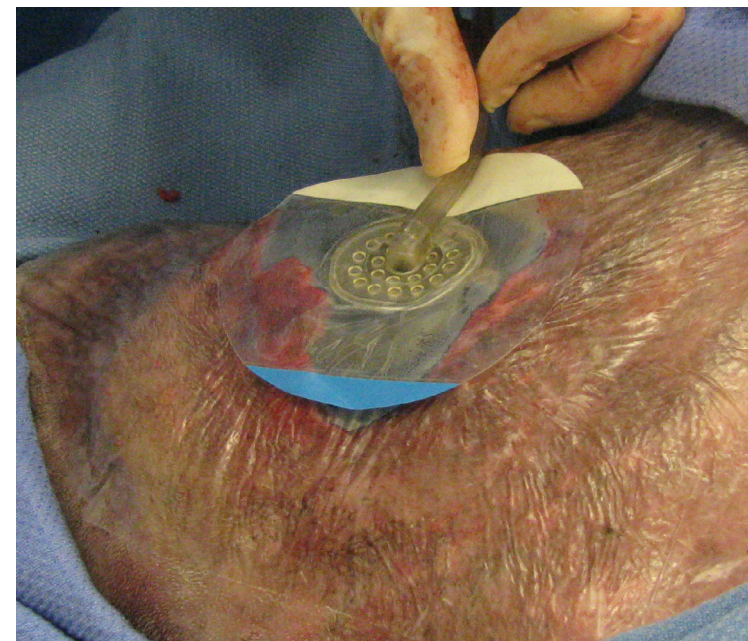


Figure 4: Placement of suction tubing over foam and adhesive drape.

Wound care using VAC can be very rewarding and can save both time and money. The technique is very versatile and is able to treat a large variety of wounds. The largest cost is usually associated with the suction unit while the foam, tubing and sterile adhesive is relatively inexpensive. We have been very pleased with our use of VAC and we are excited about the ability to offer VAC bandaging to our patients.

^aMorykwas MJ, Faler BJ, Pearce DJ et al. Effects of Varying Levels of Subatmospheric Pressure on the Rate of Granulation Tissue Formation in Experiments Wounds in Swine. *Ann Plast Surg.* 2001 Nov;47(5):547-51.

^bBen-Amotz R, Lanz OI, Miller JM, et al. The Use of Vacuum-Assisted Closure Therapy for the Treatment of Distal Extremity Wounds in 15 Dogs. *Veterinary Surgery* 2007 36:684-690.

^cKirkby KA, Wheeler JL, Farese JP, et al. Vacuum-Assisted Wound Closure: Application and Mechanism of Action. *Compend Contin Educ Vet.* (December) 2009. 31(12):568-76



Initiation of suction with a VAC placed over inguinal wound. (Click image to watch video.)

Did You Know?

Texas A&M's Veterinary Medical Teaching Hospital is offering discounted package pricing for select soft tissue surgeries. Package pricing does not include charges incurred on other services (such as Emergency or Oncology) prior to transfer to Soft Tissue Surgery (except for C-sections). Package pricing does include pre-operative diagnostics, anesthesia, surgery and routine post-operative care performed on Soft Tissue Surgery. Packages are for uncomplicated cases that require no further treatment than the listed surgical procedure.

Surgical package procedures included are:

- 1) Cystotomy — \$1500
- 2) Anal saccullectomy (unilateral or bilateral; does not include abdominal ultrasound, if needed) — \$1000
- 3) Unilateral total ear canal ablation (uncomplicated cases only, includes CT scan if needed) — \$1800
- 4) Forelimb or hindlimb amputation (uncomplicated cases only) — \$1500 for ≤50 lbs and \$2000 for > 50 pounds
- 5) Cesarean section — care is limited to 24 hours of hospitalization; however, initial ER costs ARE included — \$1000

In addition, we are offering package pricing on select laparoscopic procedures as well. Prices for these procedures include all charges (surgery, anesthesia, hospitalization) except for any pharmacy charges. Please call ahead to schedule — by appointment only.

- 1) Lap-Assisted ovariectomy (OVE) — \$275
- 2) Lap-Assisted OVE and gastropexy — \$400
- 3) Lap-Assisted gastropexy — \$250
- 4) Lap-Assisted gastropexy and neuter — \$350
- 5) Lap-Assisted gastropexy and cryptorchid neuter — \$375

For further information or questions regarding our package pricing, please contact the Soft Tissue Surgery service at (979) 845-2351.

Packages are for a limited time and may discontinue without notice.

To learn more about Soft Tissue Surgery or wound care at the VMTH, visit us on the web at vetmed.tamu.edu/services/soft-tissue, or call us at 979.845.2351.