Vacuum-Assisted Wound Closure – the Evidence

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Key Points:

- Vacuum-assisted closure (VAC) or negative pressure wound therapy (NPWT) originally developed for chronic wounds, is now used in many other medical applications.
- NPWT or VAC places the wound under a controlled, constant, intermittent or variable negative pressure, which appears to reduce interstitial edema, stimulate fibroplasia and enhance angiogenesis.
- Veterinary studies have shown that negative pressure wound therapy promotes the early appearance of smooth granulation tissue, and improves free graft survival in dogs.
- Further studies will refine protocols for different species and determine which indications are best suited for its application.

A shear wound that was clipped, cleansed, sutured, and then managed with negative pressure wound therapy for 6 days until a healthy bed of granulation tissue had formed. The wound was then allowed to heal via second intention through contraction and epithelialization.

Introduction:

The management of degloving and shear injuries are a continuous challenge in veterinary medicine. Frequent dressing changes over a prolonged period until the wound is suitable for reconstruction or until the wound has healed by second intention has been standard-of-care for centuries. Over the last decade, several mechanical adjuncts have been developed to enhance wound healing, including electrophysiological stimulation, magnetic therapy, ultrasound therapy, low-intensity laser, hyperbaric oxygen therapy, compression therapies, and negative pressure therapy. Of these, negative pressure wound therapy has shown the most clinical promise.

VAC/NPWT was originally developed and marketed to ameliorate the healing of chronic wounds. Following its introduction to human wound care, the modality rapidly penetrated into traumatic wound care and other surgical applications, such as free skin grafts, compromised flaps, incisional dehiscences, cysto-cutaneous sloughs, abdominal drainage, orthopedic trauma, and burns. VAC is now the first line of therapy to address complex soft tissue wounds sustained in the military arena, facilitating transport to a military hospital while the wound is protected and immobilized. There are many case reports and series in human medicine, and several randomized clinical trials. Shorter hospitalization and lower overall treatment costs have been documented with this modality in human medicine.

Mechanisms of Action:

Several mechanisms of action of VAC/NPWT have been investigated, mostly regarding fluid movement and the mechanical effects of strain on cellular behavior. It has been shown to decrease interstitial edema, thus increasing hydrostatic pressure within the capillaries and increase perfusion to the wound and around the wound. The mechanical strain of the negative pressure on fibroblasts appears to stimulate them to divide and increase collagen synthesis. The mechanical deformation of other cells within and around the wound and shear forces that deform the extracellular matrix are thought to result in a higher mitotic rate and increased production of granulation tissue. This leads to earlier appearance of granulation tissue with a markedly smoother appearance.

The Veterinary Experience:

The use of NPWT in veterinary medicine is promising, with the advantage of prolonged time between dressing changes (up to 72 hours). This timing compares favorably to the traditional wet-to-dry or dry-to-dry dressing for wounds still in the inflammatory phase. However, for this modality to be accepted and validated in veterinary wound care, randomized, controlled, and experimental comparisons in companion animals are needed.

In contrast to the overabundance of publications in the human medical literature, veterinary NPWT has been reported intermittently by case reports until recently. Individual case reports reveal that in addition to dogs, NPWT has been used in horses, cats, a tiger, a tortoise, and a rhinoceros. Two clinical case series and two controlled studies have been undertaken on the effect of NPWT, and these are summarized below:


Effects of NPWT on acceptance of free cutaneous grafts in dogs. Stanley BI, Pitt KA, Wader CD, et al: Vet Surg 2013;42:511-522: This experimental study of 10 wounds with full thickness, meshed sheet skin grafts on the ante-brachia of dogs concluded that NPWT can be used to optimize graft survival, and may be especially valuable for large grafting procedures where immobilization is challenging.

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Ryan Demianiuk

Join us in welcoming our new surgeon!

Ryan M. Demianiuk, DVM, Practice Limited to Surgery

Dr. Ryan Demianiuk graduated from the University of Wisconsin-Madison School of Veterinary Medicine in 2008. Following graduation, Dr. Ryan completed both a rotating internship, as well as a surgical internship at the Fox Valley Animal Referral Center. Dr. Ryan departed the Fox Valley Animal Referral Center in 2010 to pursue a research opportunity in the Collaborative Orthopedic Research Laboratory of Dr. Loic Dejardin at the Michigan State University College of Veterinary Medicine. After a year of research, Dr. Ryan began his residency training in small animal surgery at Michigan State University.

While at Michigan State University, Dr. Ryan assisted teaching several courses, while also lecturing and presenting his research at local, state and national meetings. In doing so, he received awards for his research and was recognized for his excellence in teaching by Michigan State University. Ryan is an active member of both the Veterinary Society of Surgical Oncology (VSSO), as well as the Veterinary Orthopedic Society (VOS). Ryan's professional interests include surgical oncology, neurosurgery, and orthopedics with specific interests in minimally invasive fracture repair, complex angular limb deformities and total joint replacement.

Away from the clinic, Dr. Ryan's time is filled with faith, family and adventure. He and his wife have two young daughters and the family enjoys an active lifestyle of camping, swimming, biking, and running. Regardless of where you may find Dr. Ryan, he encourages all clients and referring veterinarians to introduce themselves. He and his family intend the Valley to be their forever home.

Continuing Education Opportunities

28th Annual Feline Conference

Topic: Beyond the bloodwork: Making the diagnosis with cytology and radiography.
Date: September 13, 2014 Time: 9:00 am - 4:05 pm
Place: Sheraton Madison Hotel
Speakers: Bruce Dell, RPh
More information: www.vetmed.wisc.edu/ce

Taking Everyday Dentistry to the Next Level

Date: September 16, 2014 to October 4, 2014
Place: University School of Veterinary Medicine, Madison, WI

More information: www.vetmed.wisc.edu/ce

Grand Rounds

Speakers: Ryan M. Demianiuk, DVM, Practice Limited to Surgery
Topic: Principles of Surgical Oncology
Date: September 24, 2014 Time: 6:30 - 8:00 pm
Place: Fox Valley Animal Referral Center
RSVP: by September 12th to Lyn Schuh at lscuh@horizondvm.com or (920) 882-4304

WVMA/WVPMA/WVTA Annual Meeting

Blazing New Trails
Date: October 9-12, 2014
Place: Alliant Energy Center, Madison WI

More information and registration at: www.wvma.org

Lunch ‘n Learns
Contact Lyn Schuh at lscuh@horizondvm.com or (920) 882-4304.
Our CPR talk is RACE approved. This is a great way to keep up-to-date on current CPR guidelines.

Community News

Fox Valley Humane Association Tailgate
Enjoy a night out sampling food and beverages from area restaurants along with a silent auction.
Place: Grand Meridian, Appleton, WI
Date: September 18, 2014
Time: 5:30 pm - 9 pm
More information and tickets: www.foxvalleypets.org

Oshkosh Animal Humane Society Walk for the Animals featuring the Purple Pride Parade
Place: Sunnyview Expo Center, Oshkosh, WI
Date: September 27, 2014
Time: 9 am - Noon
More information: www.oahs.org

Neenah Animal Shelter Furry Flurry Walk for Pets
Place: Riverside Park, Neenah, WI
Date: October 5, 2014
Time: 9 am - Noon
More information: www.neenahanimalshelter.org

Bay Area Humane Society BrewFest
Enjoy a night of sampling brews, wines, and food from local eateries along with a silent auction.
Place: KI Center, Green Bay, WI
Date: October 25, 2014
Time: 6 - 10 pm
More information at: www.bayareahumanesociety.com

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S T A F F B I O G R A P H I E S

VAWC – THE EVIDENCE CONTINUED

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Negative Pressure Wound Therapy: Experience in 45 dogs. Pitt KA, Stanley BI: Vet Surg 2014;43:389-387: A retrospective case study of NPWT in 45 dogs to determine if it was feasible to use in veterinary hospital practice. It concluded that NPWT is applicable to a wide variety of canine wounds, is well tolerated, allows for several days between dressing changes, and can be used to optimize the wound bed for surgical closure or second intention healing.

In summary, it appears that NPWT will play a beneficial role in veterinary medicine, and it has been validated in several applications in veterinary medicine. Advantages of NPWT include early appearance and improved-quality of granulation tissue, decreased frequency of dressing changes, elimination of strike-through, and decreased overall cost (due to earlier time to reconstruction). Further investigations are indicated to determine optimal protocols in different species.

As we welcome Ryan Demianiuk, DVM to the surgical team at Fox Valley Animal Referral Center, we are excited about expanding therapeutics for our patients. We expect to have negative pressure wound therapy (NPWT) in the near future and will continue to provide the best in medical and surgical care for your patients and ours.