

# Vacuum Assisted Wound Closure:

Negative Pressure, Positive Results

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A Granulation Bedtime Story

# Singlement and Presentation:

- Zena, a 6 year old female spayed Miniature Pinscher
- Presented for multiple dog bite wounds on the sternum, perineal region, tailhead, caudal thigh and right pelvic limb



# Physical Exam

- BAR, painful
- Heart rate = 160bpm
- Respiratory rate = 36bpm
- Anisocoria
- Pink mucus membranes, normal CRT
- Multiple bite wounds, most severe over the tailhead, caudal thigh and right pelvic limb

# Diagnostic Tests

- Quick Assessment Tests: WNL
- Pulse Ox: WNL
- Blood Pressure: WNL
- ECG: WNL

# Diagnostic Tests

- CBC: severe inflammatory response with leukopenia and severe neutrophilic degenerative left shift
- Chem Panel: elevated liver (ALT, AST, Alk-Phos) and muscle enzymes (AST, CK)
- Radiographs were not performed at the owner's request

# Initial Management: Plan A

- Sedation
- Intravenous Fluids
- Intravenous Antibiotics: (ampicillin – Unasyn®)
- Analgesia: (hydromorphone) and fentanyl patch



# Initial Management: Plan A

- Wounds clipped and cleaned
- Larger wounds and wounds near the anus closed with suture
- Two Penrose drains placed
- Bandaged
- Hot pack wounds
- E-collar
- Drains removed after two days and she was discharged on oral Clavamox<sup>®</sup>, a fentanyl patch and carprofen (Rimadyl<sup>®</sup>)

# Zena's Wounds Bite Back! Plan A Fails



- Two days after Zena was discharged there was extensive tissue loss over the tailhead and right lateral thigh.

# Plan B

- Wet-to-dry bandages were applied over the wound and changed twice a day for three days
- Continued oral antibiotics and analgesics



# Plan B Fails

- After three days of wet to dry bandaging, Zena's wound appeared infected.



- QATS: mild anemia (PCV 27%), hypoproteinemia (TP 6g/dl), elevated blood glucose (292mg/dl) and mild azotemia (15-26mg/dl)

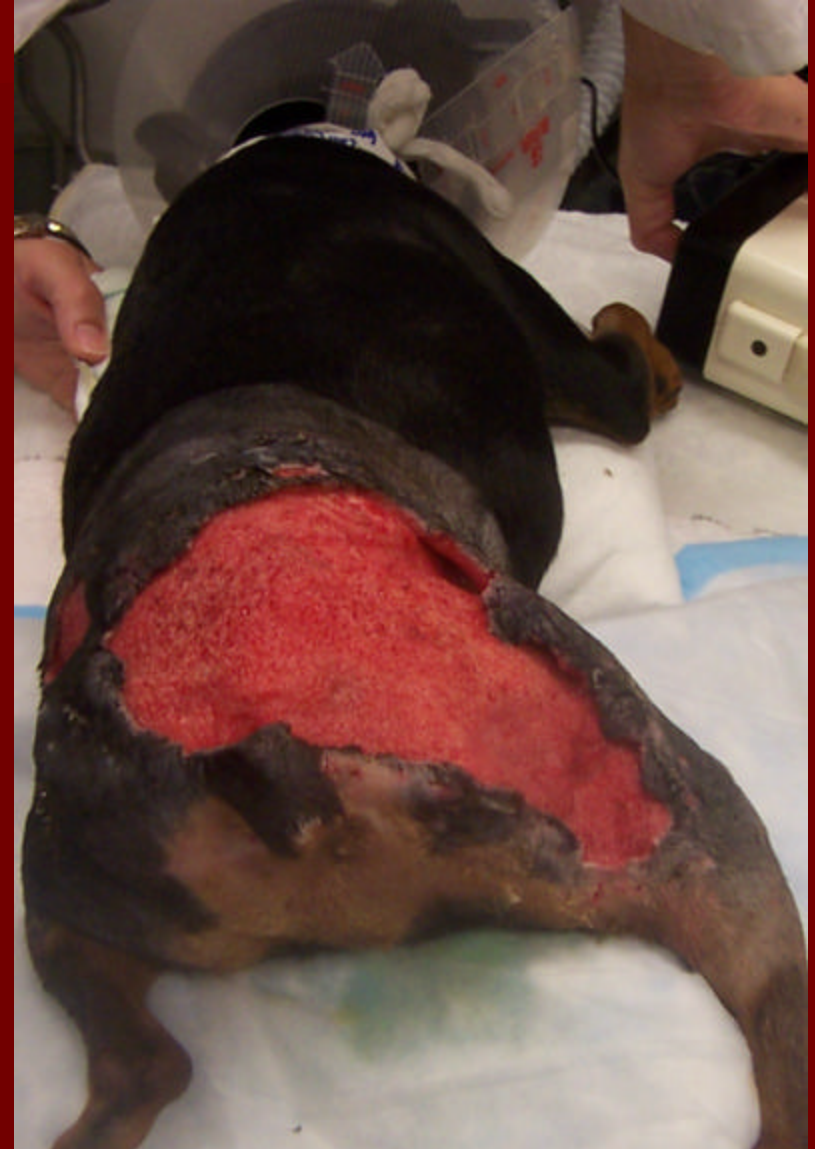
# Plan C

- Zena was admitted to the hospital
- Anesthetized for wound debridement and flushing
- Wet-to-dry bandage placed
- Intravenous fluids
- Intravenous antibiotics
- Analgesia



# Plan C is Promising!

- The next day both wounds had healthy beds of granulation tissue and moderate amounts of purulent discharge
- IV fluids discontinued and switched to oral antibiotics



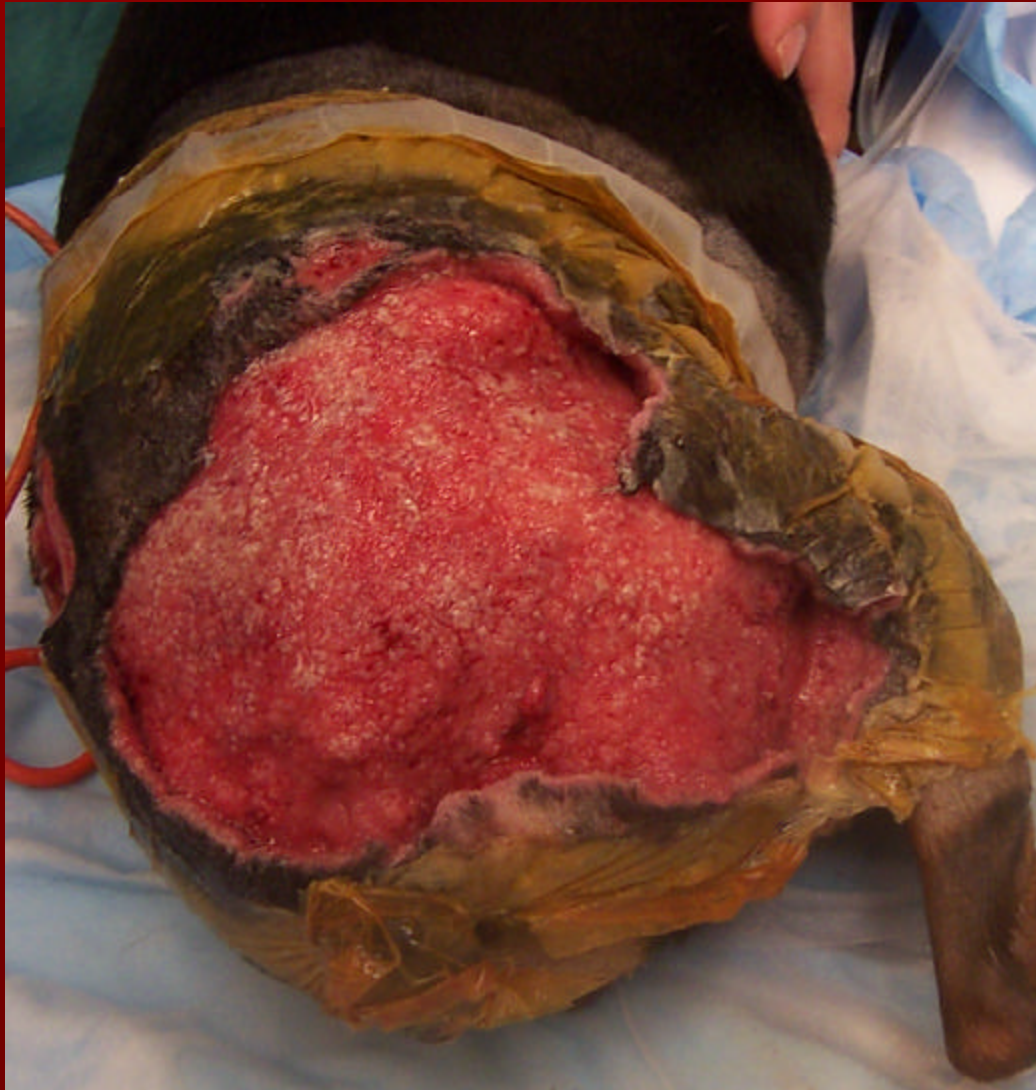
# Never mind, Plan C Fails

- The next day at bandage change, a suspicious green purulent discharge and noxious odor suggestive of *Pseudomonas* infection was seen
- An Aerobic culture was taken which later confirmed our suspicions as she was positive for *Proteus vulgaris*, *Enterococcus faecalis* and *Pseudomonas aeruginosa*

# Time for Plan D! (Trust me, this one is going to suck)

- Zena was sedated and a vacuum assisted closure (VAC) bandage was applied.
- She was moved to ICU where constant suction was applied.
- Antibiotics were discontinued.

# Plan D is Very Impressive



- The next day, the VAC bandage is changed and considerable proliferation of granulation tissue is noted, only moderate exudate is collected



Zena's only  
concern.....  
Does this VAC  
bandage  
make my butt  
look big?

# Just One Small Setback...

- Zena became slightly dehydrated and anorexic but IV fluids turned her around quickly
- Continued proliferation of granulation and decrease in exudate was seen.

Have you ever seen anything so pretty?



# Closing Time

- After 7 days of VAC, Zena was anesthetized and the wound was closed
- Subcutaneous walking sutures and tension-relieving stents were placed in areas of considerable tension
- Two penrose drains were also placed



# Continued Care

- Antibiotics (Clavamox for skin healing and Baytril according to culture and sensitivity results)
- Bandage changes twice daily
- Analgesia (Meloxicam®)
- Stent and drain removal after one day.
- Discharged two days after surgery

Ten days Later...

After Closure #1



Before Closure  
#1



# Ok, so Plan D wasn't perfect...On to Plan E!



- Zena was re-admitted to Cornell ten days after her first surgery.
- A mesh graft was harvested from her dorsal thorax and placed over the remaining skin defect
- VAC bandage was reapplied
- IV antibiotics and analgesia was started

Now we're getting somewhere



# Three Days Post-Op

- The VAC bandage was changed three days after surgery and the graft had taken except for an area on the lower portion of her right leg and along some edges of the graft-skin interface



# Six Days Post-Op

- The VAC bandage was removed along with the graft sutures, a few small areas remained to be epithelialized.
- Vaseline and a bandage are applied and Zena was discharged.
- Her bandaged was changed on an outpatient basis for the next two days and then discontinued all together

# Zena Today



# What's a VAC bandage anyway?

Official VAC: (KCI, San Antonio, TX)

- Medical-grade reticulated polyurethane ether foam dressing
- Noncollapsible evacuation tube embedded in dressing
- Adhesive drape
- Remote collection canister



Official VAC System

Cornell Style:

- Autoclaved speaker foam
- Red rubber feeding tube with fenestrations incised into it with a scalpel
- Ioban drape
- Wall suction

Cornell Style



# Why Things that Suck are Good

- Increase vascularity and granulation formation
- Removal of excess interstitial fluid
  - Decrease tissue turgor
  - Decrease capillary afterload for better capillary circulation and better inflow
  - Elimination of MMPs (collagenases and elastases)

# Why Things that Suck are Good

- Decrease in Bacterial Colonization
  - Decreased superficial purulence, slime formation and odor
  - Increases in local circulation and tissue oxygen levels enhance resistance of tissue to infection and reduce potential for anaerobic colonization
  - Studies show bacteria counts less than  $10^2$  or  $10^3$  per gram of tissue. ( $<10^5$  necessary for healing)

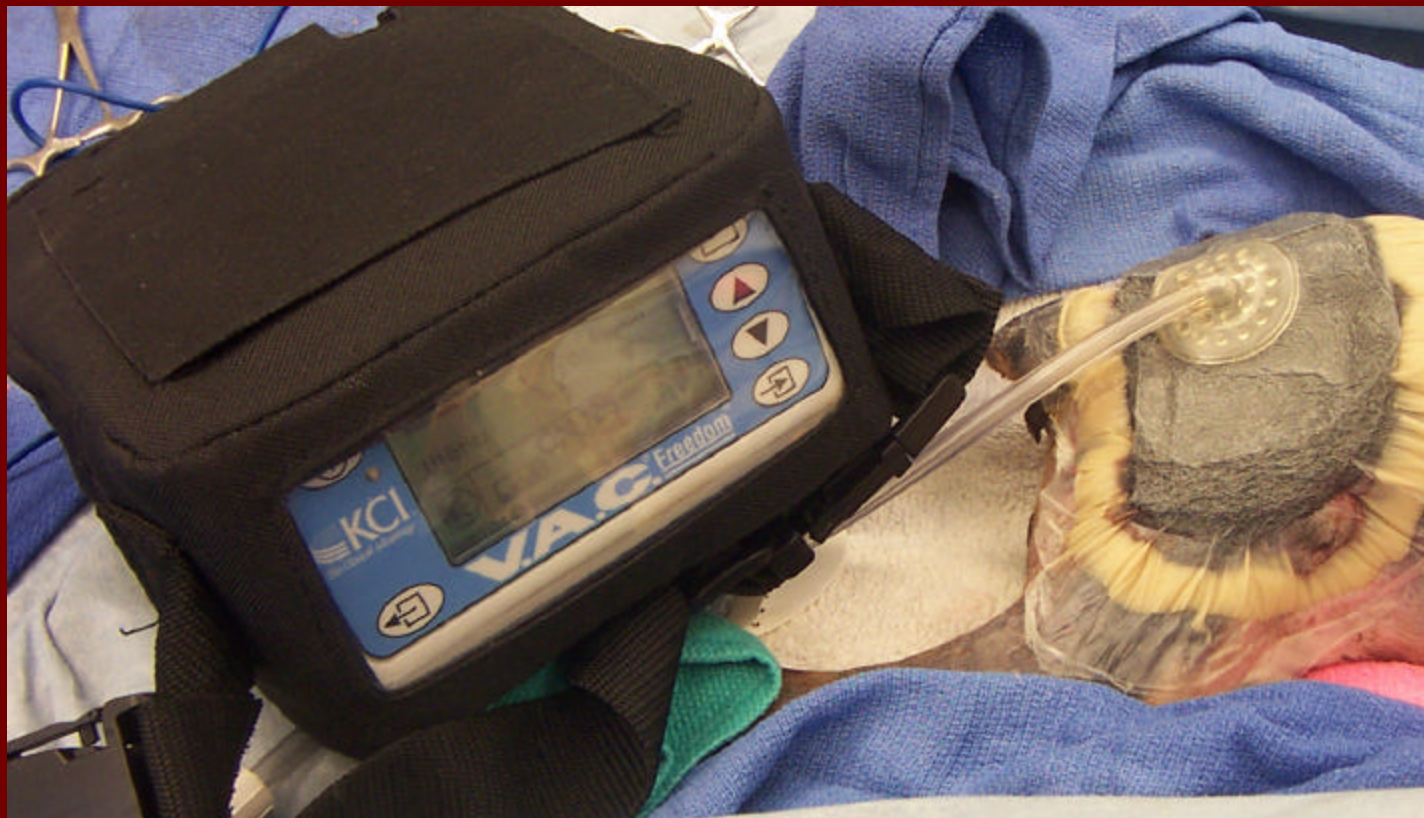
# Why Things that Suck are Good

- Responses of the tissues around the wound to mechanical force
  - Increased mitosis
  - Increased rate of angiogenesis
  - Contraction of the wound



# Why Things that Suck are Good

- Decreased number of bandage changes
- VAC system is portable



# Contraindications and Disadvantages

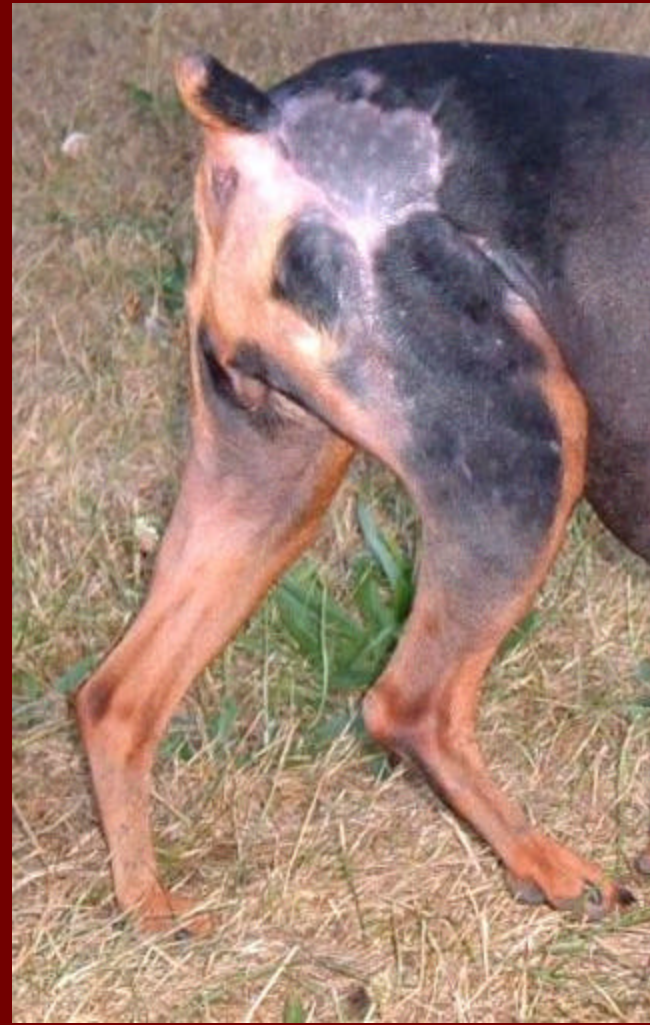
- Malignancy in the Wound
- Untreated osteomyelitis
- Non-Enteric and Unexplored Fistula
- Necrotic Tissue with Eschar Present
- Over Exposed Blood Vessels or Organs
- Patient has to be in ICU or attached to VAC system at all times

Have to monitor to be sure suction  
is ALWAYS on



Loss of suction can lead to bacterial proliferating, fluid  
accumulation and abscess formation

# Bottom Line: Negative Pressure, Positive Results



# The End



Thank You

Dr. Krotscheck

Dr. Little

Dr. Steffey

Carly Bloom

A black and tan dog, possibly a Doberman Pinscher, is standing in a field of dry, yellowish-brown grass. The dog is facing right and has its head lowered. A bright red cloth is tied around its neck, with the ends hanging down. The word "QUESTIONS?" is overlaid in the center of the image in a bold, yellow, sans-serif font.

QUESTIONS?