# Tips and Tricks for Treatment of Wounds

Daniel J. Adams, VMD, DACVS-SA Staff Surgeon Cape Cod Vet Specialists



# **OVERVIEW**

#### Review of the basics

- Wound healing
- Immediate wound care

Interactive session with case examples

- Decision making
- Bandages and drains
- Wound closure techniques





# REVIEW OF WOUND HEALING



### INFLAMMATORY PHASE (Days 0-3)

- Hemostasis Platelet aggregation Coagulation cascade Early inflammation DEBRIDEMENT Late inflammation Continued debridement
  - Cell recruitment





### PROLIFERATION PHASE (Days 4-12)

- Angiogenesis
- Fibroblast migration
- Collagen synthesis
- GRANULATION TISSUE
- Contraction
- Epithelialization







### MATURATION PHASE (Days 12-14+)

- Strengthening of the wound
- Collagen synthesisREMODELING
- Wound strength approaches 70-80% over several months







# Accurate recognition of wound healing phases guides decision making for treatment



# **SPECIES DIFFERENCES**

#### Cats vs. Dogs

- Later and less granulation tissue development
- Slower epithelialization
- Significantly less breaking strength after closure





# **OTHER PATIENT FACTORS**

- Age
- Sex?
- Breed?
- Comorbidities
- Medications







# IMMEDIATE WOUND CARE



# The seven C's and the Ab's

- <u>C</u>lip
- <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavage
- <u>C</u>ulture (+/-)
- <u>C</u>over
- <u>C</u>oaptation (+/-)
- <u>Antibiotics</u>







- <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavage
- □ <u>**C**</u>ulture (+/-)
- <u>C</u>over
- <u>C</u>oaptation (+/-)
- <u>Antib</u>iotics

Clip <u>wide</u>





# <u>C</u>lip <u>C</u>lean

#### □ <u>C</u>ut

- <u>C</u>opious lavage
- <u>C</u>ulture (+/-)
- <u>C</u>over
- <u>C</u>oaptation (+/-)
- <u>Antibiotics</u>





### *Cleanse periwound skin*

Chlorhexidine <u>solution</u> (diacetate) Povidor < 0.05% (

Povidone iodine  $\underline{solution}$ 0.1 - 0.5%

- □ <u>C</u>lip □ <u>C</u>lean
- <u>C</u>opious lavage
- <u>C</u>ulture (+/-)
- <u>C</u>over
- □ <u>**C**</u>oaptation (+/-)
- <u>A</u>nti<u>b</u>iotics



### Judicious debridement



- □ <u>C</u>lip
- □ <u>C</u>lean
- □ <u>C</u>ut

### <u>C</u>opious lavage

- <u>C</u>ulture (+/-)
- <u>C</u>over
- □ **C**oaptation (+/-)
- <u>Antibiotics</u>

Balanced/buffered crystalloids > saline 16 – 22 ga needle 1 L fluids, 300 mmHg



- □ <u>C</u>lip
- □ <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavage
- <u>C</u>ulture (+/-)
- <u>C</u>over
- <u>C</u>oaptation (+/-)
- <u>Antibiotics</u>



#### ORIGINAL ARTICLE – CLINICAL

#### Pretreatment aerobic bacterial swab cultures to predict infection in acute open traumatic wounds: A prospective clinical study of 64 dogs

Lauren E. Hamil DVM, Daniel D. Smeak DVM, DACVS 🔀, Valerie A. Johnson DVM, MS, DACVEEC, Steven W. Dow DVM, PhD, DACVIM

First published: 20 April 2020 | https://doi.org/10.1111/vsu.13420 | Citations: 9

Funding information: American College of Veterinary Surgeons; Shipley Foundation (to V.J)

#### Utilize culture/sensitivity strategically

- □ <u>C</u>lip
- <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavag
- <u>C</u>ulture (+/-)
- <u>C</u>over
- <u>C</u>oaptation (+/-)
  <u>A</u>nti<u>b</u>iotics







### Get creative!

- □ <u>C</u>lip
- □ <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavage
- □ <u>**C**</u>ulture (+/-)
- □ <u>C</u>over

# <u>C</u>oaptation (+/-)

<u>Antibiotics</u>

#### *Open fractures Joint instability High motion areas*

Johnston and Tobias: Veterinary Surgery, 2<sup>nd</sup> edition







- □ <u>C</u>lean
- □ <u>C</u>ut
- <u>C</u>opious lavage
- □ <u>**C**</u>ulture (+/-)
- <u>C</u>over
- □ <u>C</u>oaptation (+/-)
- <u>Antibiotics</u>



### **Broad spectrum**

### **INTERACTIVE SESSION**



# **DECISION MAKING**

**Primary closure?** 

#### Delayed primary closure?

# When in doubt, leave it open!



Second intention healing?



## DELILAH

- 8 yo FS Chihuahua
- Attacked by German
   Shepherd 1 week ago
- Initial wound care with primary care vet
- Owner notices odor and discharge











# **CONTACT LAYER OPTIONS**

#### HYPEROSMOTIC DRESSINGS

- Indicated during inflammatory +/- early repair phases
- Antimicrobial activity due to hyperosmolar properties
- Reduces interstitial edema
- Promotes drainage/discharge



### **Hypertonic Saline**

- Used as wet-to-dry or dampto-dry dressing
- Caution: non-selective
   mechanical debridement
   during bandage change
- Falling out of favor, better options available





### **Table Sugar**

- Unique properties wound nourishment?, <u>cheap and easy</u>
- Apply generous layer to wound bed
- 2. Cover with damp dressing (lap sponges, 4x4s, etc.)
- 3. Cover bandage with tertiary layer





### **Medical Honey**

- Similar application to sugar
- Unique properties:
- H<sub>2</sub>O<sub>2</sub> production (glucose oxidase)
- Free radicals
- Acidic pH
- Antibacterial phytochemicals





# **CONTACT LAYER OPTIONS**

#### MOISTURE RETENTIVE DRESSINGS

- Indicated during inflammatory +/- early repair phases
- Moist wound healing
- Autolytic debridement
- Granulation tissue formation
- Epithelialization
- High absorptive capacity for very effusive wounds







#### Hydrocolloids





# **CONTACT LAYER OPTIONS**

#### DEBRIDEMENT DRESSINGS



Maggots



Enzymatic products



Johnston and Tobias: Veterinary Surgery, 2<sup>nd</sup> edition

### **TIE-OVER BANDAGE**

#### Tips

- Large suture (0, 2-0)
- Sutures > 1-2" from wound
- Impermeable tertiary layer
- Tie tight tension relaxation
- Parallel rows of suture



### **IOBAN BANDAGES**







# KODA

- 3 yo FS shepherd mix
- Ran into tree 3 hours prior to presentation







# PRIMARY CLOSURE

 En bloc debridement
 Convert contaminated wound into clean wound





### When to consider primary closure:

- Lacerations
- Minimal contamination
- Adequate healthy skin
- "Golden Period" < 6 hours</p>



# HANK

- 8 yo MC American Bulldog mix
- Attacked by coyote
- Several days of open wound management
   Wound pocketing in axillary region





# **PASSIVE DRAINS**

#### Pros

- Cheap
- Simple client management
- Useful for small wounds

#### Cons

- Messy
- Requires
   bandage
- Unable to quantify drainage
- Must exit wound ventrally



# **GUIDELINES**

- Exit separate incision
- Exit most dependent aspect of wound
- Secure ventrally
- Cover with bandage
- <u>No</u> tacking sutures dorsally
- <u>No</u> fenestrations
- <u>No</u> dorsal exit



# **ACTIVE DRAINS**

#### Pros

- Negative
   pressure
- Dead-space
   management
- Quantify
   drainage
- Cleaner
- Versatile

#### Cons

- Cost
- Client
   management





### **"Natural" Drainage** A drain may not always be necessary!







# HOKE

- 7 yo MC Aussie mix
- Large lipoma removed 10 days ago
- Drainage, scabbing, and sores noted at home













CAP

### NEGATIVE PRESSURE WOUND THERAPY





### **NEGATIVE PRESSURE WOUND THERAPY**



C. Huang et al. (2014). Current Problems in Surgery, 51: 301–331





# Follow tension lines for simplest closure





Johnston and Tobias: Veterinary Surgery, 2<sup>nd</sup> edition

#### Walking sutures





Al Benna et al. (2014). Journal of Cutaneous Medicine and Surgery, 18(5).

#### Tension Relieving Sutures

- Cruciates, mattress sutures, NFFN, FFNN
- Large gauge suture (0, 2-0)
- □ 1-2" from edge of closure
- Stents, prevent pressure necrosis





#### **Relaxing Incisions**

- Multiple rows of ~1 cm incisions
- 1 cm apart
- 1 cm between rows
- Bandage





Johnston and Tobias: Veterinary Surgery, 2<sup>nd</sup> edition

# BAXTER

- 5 yo M Pitbull MixHBC
- Proptosis OD
- Mild neuro deficits
- Calvarium intact
- No other injuries





### ADVANCEMENT FLAP



# **SUB-DERMAL PLEXUS FLAPS**

#### Guidelines

Elevation of flap with SC tissue/muscle
 Flap base > flap length
 Converging incisions



# ROSE

- 5 yo FS Greyhound
- Slipped off deck and scraped stifle
- Open wound management in hospital for 4 days









# **AXIAL PATTERN FLAPS**

- Direct cutaneous artery
- Better survival compared to local flaps?
- All flaps are NOT equal





# ACKNOWLEDGEMENTS

Dr. Grace P. Lai, DVM, DACVS-SA

#### Dr. Ashley E. Iodence, DVM



# **QUESTIONS?**

#### danieladams@capecodvetspecialists.com



# NOTICE

CE credit certificates & presentation slides will be emailed to you. If you do not receive an email with this information within a week, contact Nichole *nicholemanfredi@capecodvetspecialists.com* 

