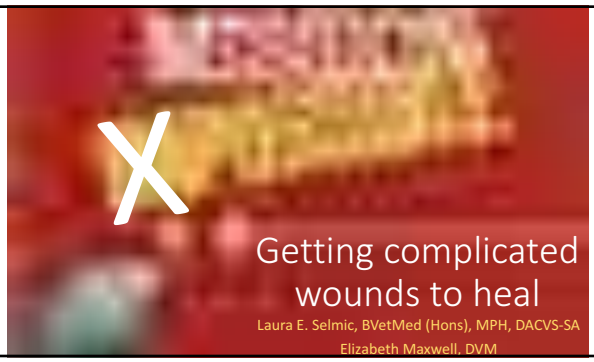

Getting complicated wounds to heal

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Lecture objective:

- Natural continuation from Wounds Part 1
- Explores common problems with complex wounds and options for management through case examples in an interactive format with i-clickers.

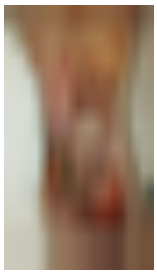
Common problems with complex wounds:

- Loss of tissue →
  - Slow second intention wound healing
  - Wound closure with tension or inability to close primarily

Degloving wound example:

Contaminated wound:

- Original wound contaminated and left open
  - Typical example is degloving wound
- Delay in granulation tissue coverage of wound due to exposed tendons or bone
- What are your options to accelerate granulation tissue formation and wound healing?



Management to accelerate granulation tissue formation:

- Vacuum assisted wound therapy
- Forage bone- but can fracture

Vacuum-Assisted Closure (VAC):

- Systems:
  - KCI USA Inc., San Antonio, TX
  - Venturi, Talley Medical, Lansing, MI
- KCI system comprises of:
  - Polyurethane open cell foam sheet trimmed to conform to wound surface
  - Firm plastic tube that attaches to foam pad
  - Vacuum pump with fluid reservoir
  - Plastic adhesive sheet overlaps foam and tubing forming airtight seal over entire wound
  - Then tube connected to vacuum pump to generate subatmospheric pressure to wound

VAC concepts:

- Subatmospheric pressure distributed uniformly to wound
- Draining and retaining fluid in its matrix
- Pressure applied (-50 to -200mmHg) either continuous or intermittently
- -125mmgHg most commonly used
- Need to debride necrotic or devitalized tissue before application
- 2-3 applications often needed before wound closure

Advantages of VAC:

- Removal of extracellular fluid can significantly improve tissue microcirculation
- Increased bacterial clearance
- Accelerated formation of granulation tissue bed

Complications associated with VAC

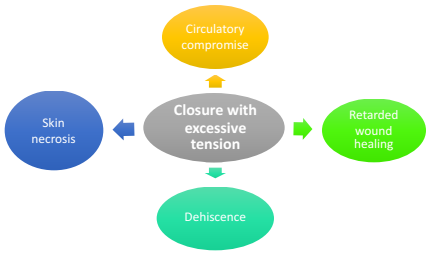
- Ingrowth of granulation tissue and foam becoming imbedded in wound
  - Bleeding
  - More common if dressing left on for > 3 days
- Large air leaks negate use of VAC
- Small air leaks can dry adjacent skin

Costs of system

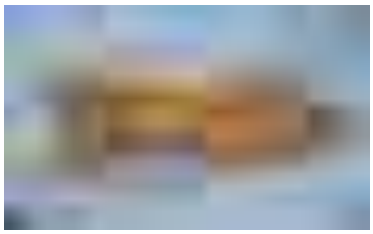
- Can lease or purchase
- Patients often require continuous supervision and hospitalization to ensure proper function
- Changes every 2-3 days reduce costs associated with bandage changes compared to every day.

Closure with tension case examples

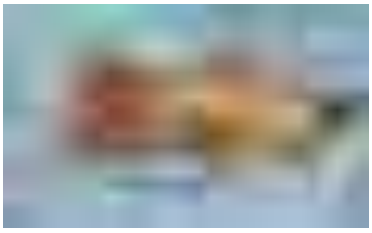
Wound healing fail= excessive tension



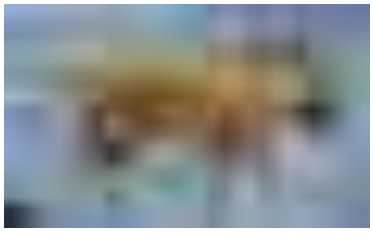
Dorsal View tension Lines



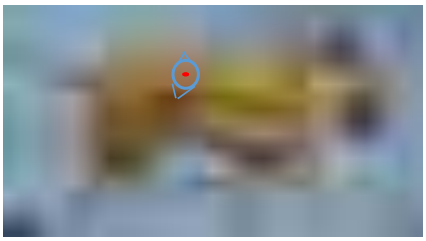
Ventral View Tension Lines



Lateral View Tension Lines



Closure of wound parallel to tension lines

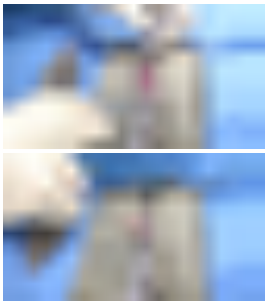


If ellipse- need to place parallel to tension lines

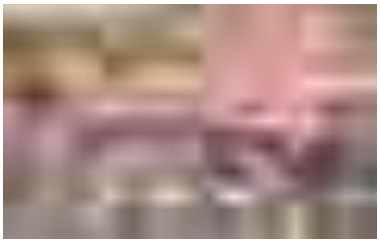
Minimizing tension

- Very important
- Multilayer closure
  - Minimize tension on skin
  - Skin tensile strength only 10-15% of normal at 14 days

Deep subcuticular simple interrupted

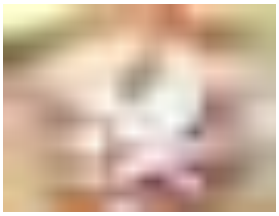


Mattress sutures +/- stents



Other tension relieving techniques

- Undermining- increases deadspace, beware of tourniquet effect
- Walking sutures
- Skin stretching



Skin-Stretching Concepts

- Closure of wounds relies on inherent elasticity of skin
  - Varies due to:
    - Species
    - Individual animals
    - Body regions
    - Patient age
    - Body conformation
    - Pathology of skin

Key skin characteristics

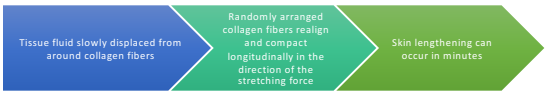
Mechanical creep

=Characteristic of skin whereby it can extend further than its inherent elasticity with the application of stretching or tension force over time

Stress relaxation

=Is the progressive reduction in force required to keep the stretched dermal collagen fibers at a given length

During process of mechnical creep and stress relaxation….



Key skin characteristics

Biologic creep

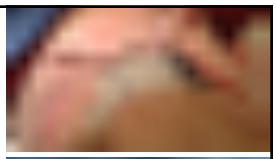
= slower enlargement of skin surface area due to tissue accommodation

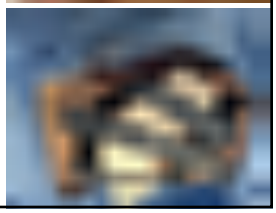
Examples:

- Advanced pregnancy
- Obesity
- Slow expansion of large subcutaneous neoplasms

Options for skin stretching

- Presuturing
- Skin stretchers
  - Homemade = velcro
  - Manufactured skin stretchers

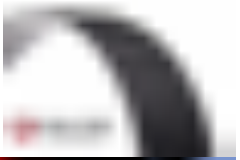




Homemade Skin Stretchers

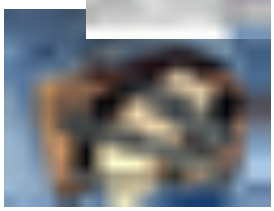
What you need:

- Velcro straps (often heavy duty)
  - Apply adherent skin pads or anchors to opposing sides of wound
  - Use adjustable, elastic tension straps or cables to engage the skin pads across wound



Applying velcro for skin stretchi

1. Clip hair and clean skin with surgical soap and isopropyl alcohol
2. Allow skin to dry
3. Apply pad (hook part of velcro), can use cyanoacrylate
4. When dry and attached, apply elastic cabes (pile pad part of velcro) to

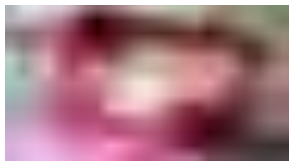


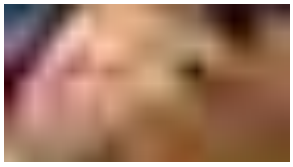
Using velcro for skin stretching

1. Attached pile pad cable to one side of wound pad then stretch skin under tension and attach to other side
2. Mark on pile pad surface where you are starting
3. Adjust/tighten cable tension every 6-8 hours and mark progress

How long?

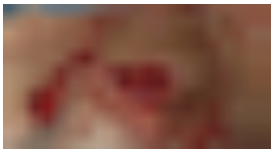
- Normally sufficient skin can be recruited within 48 hours but can be maintained up to 96 hours
- After stretching remove cables and skin pads- sometimes glue solvent needed. Or can leave pads to peel off as skin desquamates





Next close wound….

- Recruited skin often sufficient to close wound
  - Generally little or no undermining needed
- Can use velcro set up post-op for 2-5 days to offset incisional tension



Questions?

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