SUTURING SKILLS & TECHNIQUES

LISA M. ARELLO, MS, ANP, RNFA
None of the planners or presenters of this session have disclosed any conflict or commercial interest.
Suturing Skills and Technique

OBJECTIVES:

1. Identify proper suture material as indicated by wound.
2. Demonstrate proper basic suturing techniques.
OVERVIEW

- Phases of Wound Healing
- Factors Affecting Wound Healing
- Principles of Wound Closure
- Instrumentation and Suture
- Suturing Techniques
Phases of Wound Healing

- Phase 1: Hemostasis and Inflammation
  - Days 1-5
  - Vasoconstriction and platelet aggregation
  - Angiogenesis occurs in 48 hours
  - Poor tensile strength
  - Wound closure and healing dependent on suture and good approximation
Phase 2

- Fibroplasia and Proliferation
  - Days 5 to 14
  - Inflammatory response ends
  - Neutrophils remove cellular debris and release cytokines
  - Fibroblasts populate the wound to secrete collagen and elastin (wound matrix)
  - Wound contracture and strength begins
Phase 3

- Maturation and Remodeling
- Day 14 to one year
- Formation and cross-linking of collagen fibers
- Fibrous connective tissue forms
- Scar formation and increased tensile strength
Wound Maturation & Strength

- 20% at 2 weeks
- 50% at 5 weeks
- 80% at 10 weeks
- Remodeling and maturation continues for 1 year, minimum in adults, longer in kids
  - [http://www.bumc.bu.edu/suturing-basics](http://www.bumc.bu.edu/suturing-basics), W. LaMorte, MD
Why Suture?

- Facilitate healing and repair of tissues
- Close dead space and provide tensile strength
- Goal of wound closure is to achieve healing with normal function, absence of infection, and cosmetic/aesthetic result

THE SKIN IS YOUR FRIEND
Major Factors Affecting Healing

- Age
- Weight and obesity
- Nutritional status and dehydration
- Blood and O2 supply
- Edema, vascular disease
- Smoking
- Immune status
- Chronic disease, radiation treatments
Principles of Wound Closure

- Tissue handling; Do No Harm
- Hemostasis
- Minimize bacterial contamination
- Removal of foreign body and debris
- Irrigation and tissue hydration
- Wound approximation
Wound Assessment

- Nature and mechanism of injury
- Size of wound
- Location of wound
- Time of injury
- Contamination?
- Nerve, vessel, muscle, tendon involvement (prior to anesthesia)
- Debridement required?
- Health factors
Needles

- Taper needles
  - Smooth needle that gradually tapers to a point
  - Less tissue tearing for delicate suturing
    - Bowel, fascia, blood vessels
Needles

- Cutting needles
  - Cutting edge on inside curve
  - Better tissue penetration
  - Skin closure

- Reverse cutting needles
  - Cutting edge on outside of curve
  - Puncture directed away from wound edge may decrease tissue tearing
Other Instrumentation

• **Forceps**
  - Smooth vs toothed
  - Avoid crushing skin edges
  - Create counter tension on the skin
  - Facilitate needle passage

• **Needle Driver**
  - Traditional vs. Gilleys
  - “Palm it” for better control in awkward closures or thick skin
  - Use fingers to support instrument and increased control
## Suture

<table>
<thead>
<tr>
<th>Absorbable</th>
<th>Non-Absorbable</th>
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<tbody>
<tr>
<td>• Natural and synthetic</td>
<td>• Natural and synthetic</td>
</tr>
<tr>
<td>• Easily broken down by enzymatic hydrolysis</td>
<td>• Not readily broken down and can be left indefinite</td>
</tr>
<tr>
<td>• Loss of tensile strength in less than 60 days</td>
<td>• Maintain tensile strength for minimum of 60 days</td>
</tr>
<tr>
<td>• Plain/chromic Cat gut, Monocryl, Vicryl, PDS</td>
<td>• Silk, cotton, prolene, nylon, ethibond</td>
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## Suture

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<th>Multifilament</th>
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<td>• Single strand of material</td>
<td>• Multi-strands, twisted or braided</td>
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<td>• Less resistance, trauma</td>
<td>• Greater strength and flexibility</td>
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<td>• Harbor less bacteria</td>
<td>• Can be coated to reduce drag</td>
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<td>• Tie down easily, but easily crimp</td>
<td>• Less knot slippage</td>
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<td>• Exception: Quill</td>
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- Monofilament is a single strand of material that offers less resistance and trauma, harbors less bacteria, and ties down easily, but can be easily crimped. Exceptions include Quill.

- Multifilament is made of multiple strands, twisted or braided, offering greater strength and flexibility, can be coated to reduce drag, and has less knot slippage.
Considerations for Successful Suturing

- Create right angles, enter perpendicular
- Hold instruments properly
- Right suture, right forceps
- Wound edge eversion and approximation, avoid tissue strangulation
- Do not touch or bend the needle
Considerations for Successful Suturing

- Correct needle holder grasp and needle placement: 2/3 rule
- Running sutures for long incisions save time and create equal tension
- Retention sutures for extra strength
- Good, square knot tying
- Consider suture removal
  - Children, location of wound, type of suture
Forcep Placement
Scissor Placement
Needle Holder and Needle Placement
Enter Perpendicular to Skin
Subcuticular Suture Placement
Simple Interrupted Suture
Knot Tied Correct Placement and Tension
Suturing Techniques

- Simple interrupted
- Running or continuous
- Vertical mattress
- Horizontal mattress
- Subcuticular running or continuous
- Buried suture


