SUTURING SKILLS & TECHNIQUES

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No Conflict of Interest

No Commercial Support
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
  - Vasodilatation and platelet aggregation
  - 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
  - Fibroblasts populate the wound to secrete collagen and elastin
  - Wound contracture 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
- [http://www.bumc.bu.edu/suturing-basics](http://www.bumc.bu.edu/suturing-basics), W. LaMorte, MD
Why Suture?

- Facilitate healing and repair 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
Factors Affecting Healing

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

- Tissue handling
- 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. Gilles
  - “Palm it” for better control in awkward closures or thick skin
  - Use fingers to support instrument and increase control
# Suture

## Absorbable
- Natural and synthetic
- Easily broken down by enzymatic hydrolysis
- Loss of tensile strength in less than 60 days
- Plain/chromic Cat gut, Monocryl, Vicryl, PDS

## Non-Absorbable
- Natural and synthetic
- Not readily broken down and can be left indefinite
- Maintain tensile strength for minimum of 60 days
- Silk, cotton, prolene, nylon, ethibond
# Suture

<table>
<thead>
<tr>
<th>Monofilament</th>
<th>Multifilament</th>
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<tbody>
<tr>
<td>• Single strand of material</td>
<td>• Multi-strands, twisted or</td>
</tr>
<tr>
<td>• Less resistance, trauma</td>
<td>braided</td>
</tr>
<tr>
<td>• Harbor less bacteria</td>
<td>• Greater strength and</td>
</tr>
<tr>
<td>• Tie down easily, but easily</td>
<td>flexibility</td>
</tr>
<tr>
<td>crimp</td>
<td>• Can be coated to</td>
</tr>
<tr>
<td>• More throws to knot</td>
<td>reduce drag</td>
</tr>
<tr>
<td></td>
<td>• Less knot slippage</td>
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Considerations for Successful Suturing

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

- Correct needle holder grasp
- 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
Suturing Techniques

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


References
