Basic Wound Closure & Knot Tying

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Objectives

- Provide basic information on commonly used suture materials
- Review general principles of wound closure
- Provide a general overview of basic surgical knot tying
Suture Material

- Generally categorized by three characteristics:
  - Absorbable vs. non-absorbable
  - Natural vs. synthetic
  - Monofilament vs. multifilament
Absorbable Suture

- Degraded and eventually eliminated in one of two ways:
  - Via inflammatory reaction utilizing tissue enzymes
  - Via hydrolysis
- Examples:
  - “Catgut”
  - Chromic
  - Vicryl
  - Monocryl
  - PDS (polydioxanone suture)

http://ecatalog.ethicon.com/sutures-absorbable
Non-absorbable Suture

- Not degraded, permanent
- Examples:
  - Prolene (polypropylene)
  - Ethibond (polyester/Dacron)
  - Nylon
  - Stainless steel
  - Silk*

(*not a truly permanent material; known to be broken down over a prolonged period of time—years)
Natural Suture

- Biological origin
- Cause intense inflammatory reaction
- Examples:
  - “Catgut” – purified collagen fibers from intestine of healthy sheep or cows
  - Chromic – coated “catgut”
  - Silk
Synthetic Suture

- Synthetic polymers
- Do not cause intense inflammatory reaction
- Examples:
  - Vicryl
  - Monocryl
  - PDS
  - Prolene
  - Nylon
Monofilament Suture

- Grossly appears as single strand of suture material; all fibers run parallel
- Minimal tissue trauma
- Resists harboring microorganisms
- Ties smoothly
- Requires more knots than multifilament suture
- Possesses memory
- Examples:
  - Monocryl, PDS, Prolene, Nylon
Multifilament Suture

- Fibers are twisted or **braided** together
- Greater resistance in tissue
- Provides good handling and ease of tying
- Fewer knots required
- Examples:
  - Vicryl (braided)
  - Chromic (twisted)
  - Silk (braided)
<table>
<thead>
<tr>
<th>Suture Material</th>
<th>Method of Degradation</th>
<th>Time to Degradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Catgut”</td>
<td>Proteolytic enzymes</td>
<td>Days</td>
</tr>
<tr>
<td>Vicryl, Monocryl</td>
<td>Hydrolysis</td>
<td>Weeks to months</td>
</tr>
<tr>
<td>PDS</td>
<td>Hydrolysis</td>
<td>Months</td>
</tr>
</tbody>
</table>
Suture Size

- Sized according to diameter with “0” as reference size
- Numbers alone indicate progressively larger sutures ("1", "2", etc)
- Numbers followed by a “0” indicate progressively smaller sutures ("2-0", "4-0", etc)

Smaller ←---------------------------------------------→ Larger

.....”3-0”...”2-0”...”1-0”...”0”...”1”...”2”...”3”.....
Needles

- Classified according to shape and type of point
  - Curved or straight (Keith needle)
  - Taper point, cutting, or reverse cutting
**Needles**

- **Curved**
  - Designed to be held with a needle holder
  - Used for most suturing

- **Straight**
  - Often hand held
  - Used to secure percutaneously placed devices (e.g. central and arterial lines)
Needles

- Taper-point needle
  - Round body
  - Used to suture soft tissue, excluding skin (e.g. GI tract, muscle, fascia, peritoneum)
Needles

- Cutting needle
  - Triangular body
  - Sharp edge toward inner circumference
  - Used to suture skin or tough tissue
Suture Packaging
Wound Closure

Basic suturing techniques:
- Simple sutures
- Mattress sutures
- Subcuticular sutures

Goal: “approximate, not strangulate”
Simple Sutures

- Simple Interrupted
  - Single stitches, individually knotted (keep all knots on one side of wound)
  - Used for uncomplicated laceration repair and wound closure
Mattress Sutures

**Horizontal Mattress**
- Provides added strength in fascial closure; also used in calloused skin (e.g. palms and soles)
- Two-step stitch:
  - Simple stitch then,
  - Needle reversed and 2nd simple stitch made adjacent to first
  - same size bite as first stitch
Mattress Sutures

- **Vertical Mattress**
  - Affords precise approximation of skin edges with eversion
  - Two-step stitch:
    - Simple stitch made – “far, far” relative to wound edge (large bite)
    - Needle reversed and 2nd simple stitch made inside first – “near, near” (small bite)
Subcuticular Sutures

- Usually a running stitch, but can be interrupted
- Intradermal horizontal bites
- Allow suture to remain for a longer period of time without development of crosshatch scarring
Steri-strips

- Sterile adhesive tapes
- Available in different widths
- Frequently used with subcuticular sutures
- Used following staple or suture removal
- Can be used for delayed closure
Staples

- Rapid closure of wound
- Easy to apply
- Evert tissue when placed properly
Two-Hand Square Knot

- Easiest and most reliable
- Used to tie most suture materials

(click image to start video)
Instrument Tie

- Useful when one or both ends of suture material are short
- Commonly used technique for laceration repair

(click image to start video)
References


- Edgerton, MT. The Art of Surgical Technique. Baltimore: Williams & Wilkins; 1988 (Excellent resource for technical details of surgery)


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