

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)

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)

Suture Degradation

Suture Material	Method of Degradation	Time to Degradation
"Catgut"	Proteolytic enzymes	Days
Vicryl, Monocryl	Hydrolysis	Weeks to months
PDS	Hydrolysis	Months

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

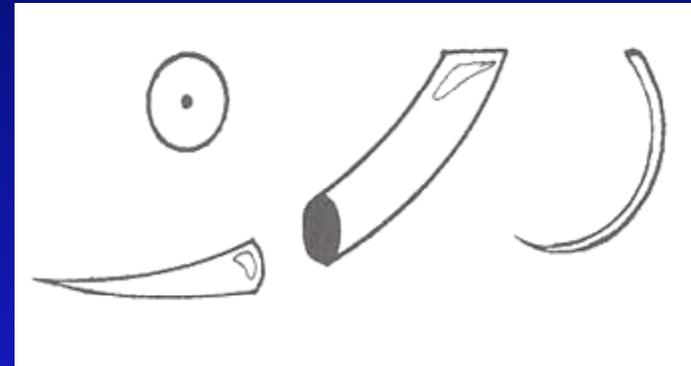
- Designed to be held with a needle holder
- Used for most suturing

■ Straight

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

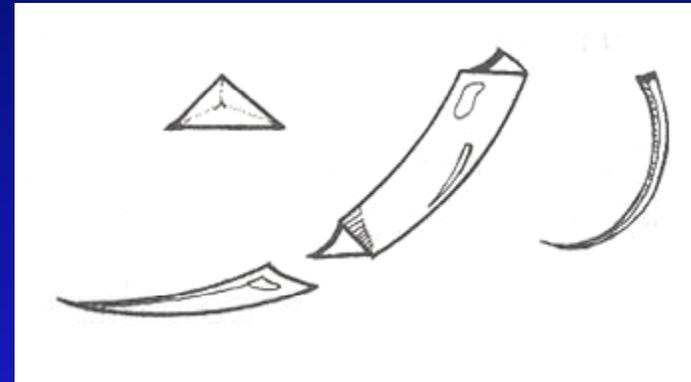
Needles

- 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

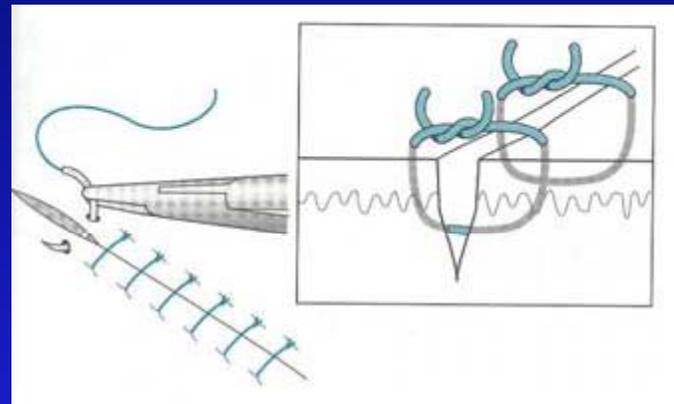


Wound Closure

- Basic suturing techniques:
 - Simple sutures
 - Mattress sutures
 - Subcuticular sutures
- **Goal:** “approximate, not strangulate”

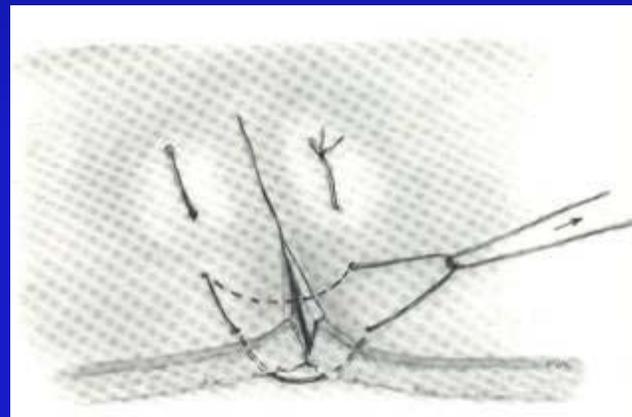
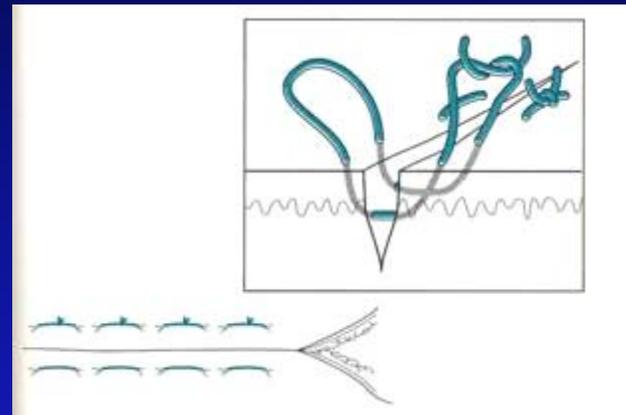
Simple Sutures

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



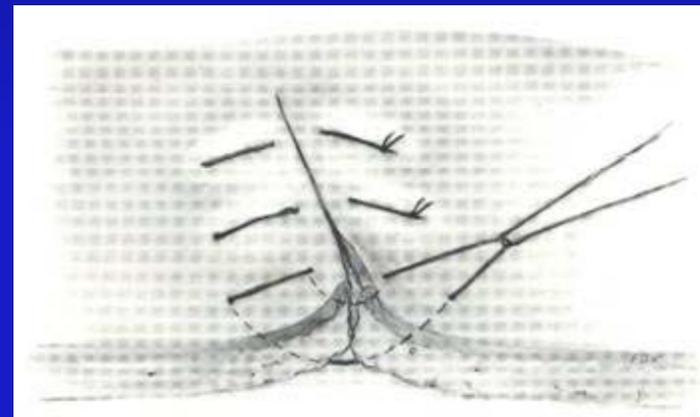
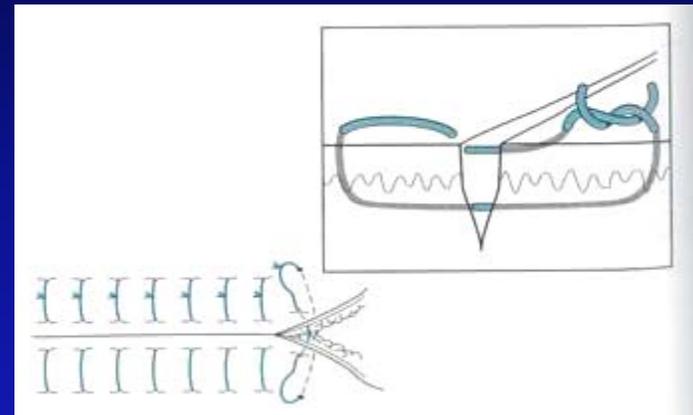
Mattress Sutures

- **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



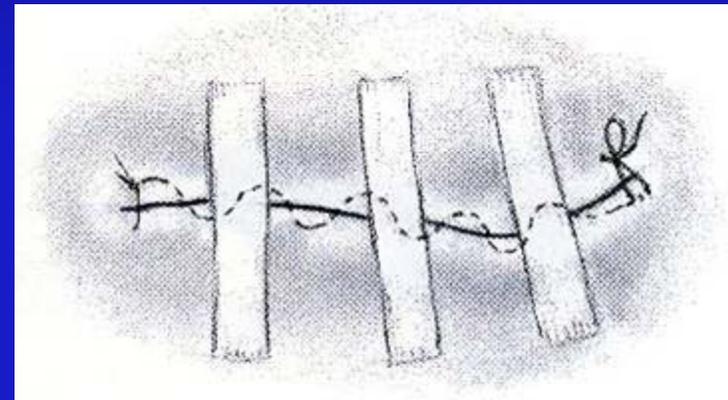
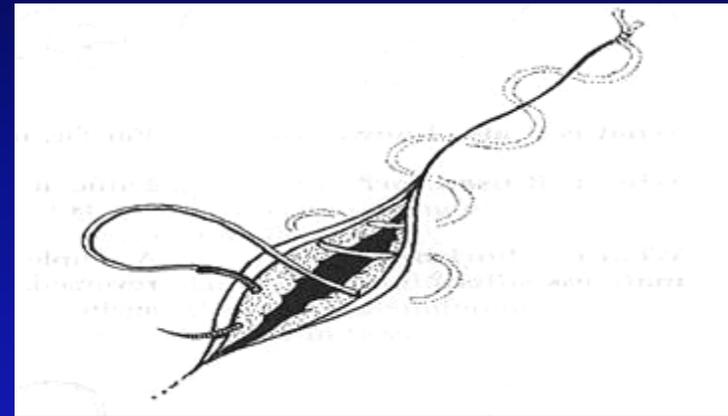
Mattress Sutures

- 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



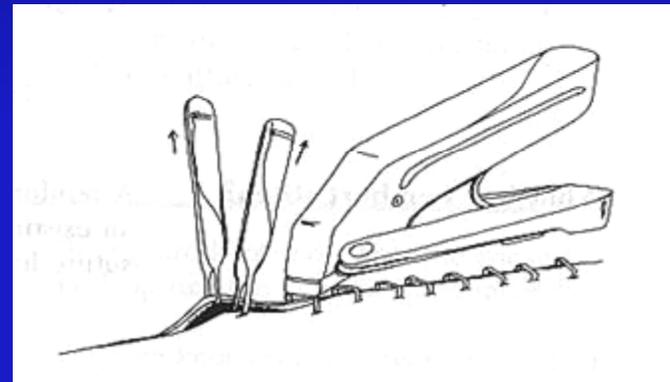
Steri-strips

- 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

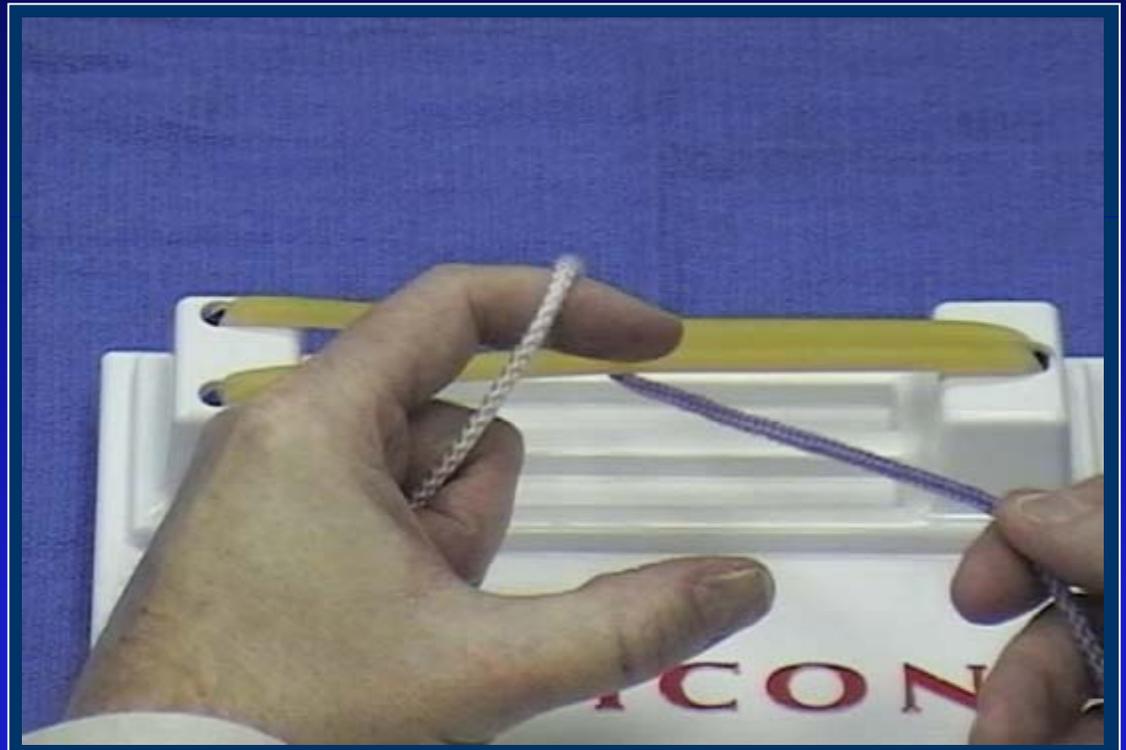
- Rapid closure of wound
- Easy to apply
- Evert tissue when placed properly



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

- Encyclopedia of Knots provided by Ethicon; available at www.jnjgateway.com/public/USENG/5256ETHICON_Encyclopedia_of_Knots.pdf
(More extensive overview of knot tying with photos for those interested in surgery)
- Blackbourne, LH, editor. Surgical Recall. 2nd ed. Baltimore: Lippincott Williams & Wilkins; 1998
- Cameron, JL, editor. Current Surgical Therapy. 7th ed. St. Louis: Mosby; 2001
- Edgerton, MT. The Art of Surgical Technique. Baltimore: Williams & Wilkins; 1988
(Excellent resource for technical details of surgery)
- Gomella, LG, Haist, SA. Clinician's Pocket Reference. 9th ed. New York: McGraw-Hill Medical Publishing Division; 2002 *(Useful book for anyone doing clinical rotations!)*

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