Suture Course: Enhancing Your Emergency Care Skills

Jackie and Gene Autry Orthopedic Center CHLA Sports Medicine Conference
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Conflict of Interest

I have no conflict of interest associated to this presentation

No financial or other affiliations with companies that are related to this topic/content of this presentation

Disclosure

Completion of this workshop does not results in certification of suturing

Be aware of your own state practice acts prior to incorporating suturing techniques into your practice

Objectives

Upon completion of the program, participants will be able to:

- Prepare a wound for suturing
- Identify the use of antibiotics/tetanus
- Demonstrate the use of suturing tools
- Recognize different wound closure techniques

2020 CAATE

Standards for Accreditation of Professional Athletic Training Programs

Standard 70: Evaluate and manage patients with acute conditions, including triaging conditions that are life threatening or otherwise emergent. These include (but are not limited to) the following conditions: Cardiac compromise (including emergency cardiac care, supplemental oxygen, suction, adjunct airways, nitroglycerine, and low-dose aspirin), Respiratory compromise (including use of pulse oximetry, adjunct airways, supplemental oxygen, spirometry, meter-dosed inhalers, nebulizers, and bronchodilators), Conditions related to the environment: lightning, cold, heat (including use of rectal thermometry), Cervical spine compromise, Traumatic brain injury, Internal and external hemorrhage (including use of a tourniquet and hemostatic agents), Fractures and dislocations (including reduction of dislocation), Anaphylaxis (including administering epinephrine using automated injection device), Exertional sickling, rhabdomyolysis, and hyponatremia, Diabetes (including use of glucometer, administering glucagon, insulin), Drug overdose (including administration of rescue medications such as naloxone), ***Wounds (including care and closure),****Testicular injury, Other musculoskeletal injuries*

History of Suturing

- Earliest seen in Egyptian mummies 3000 B.C
- Hippocrates⟶ first recorded wound suture
- Catgut ⟶ Aulus Cornelius Celsus
  - Plain & chromic catgut
- Carl Thiersch in 1874
  - Improve wound healing and avoid infection
  - Plastic surgery
  - No post op removal

Wound care and Healing

Wound Care Preparation

- History & Physical Exam
- Foreign body
- Primary v delayed closure

- Location of wound
- Patient Risk factors
  - Diabetes
  - Obesity
  - Malnutrition
  - Immunosuppressants
  - Medications
  - Blood Clotting Disorder

Wound Cleansing

Normal Saline

- *Wound irrigation and Debridement*
- *Pressure of irrigation (> 20 PSI v 5-10 PSI)*

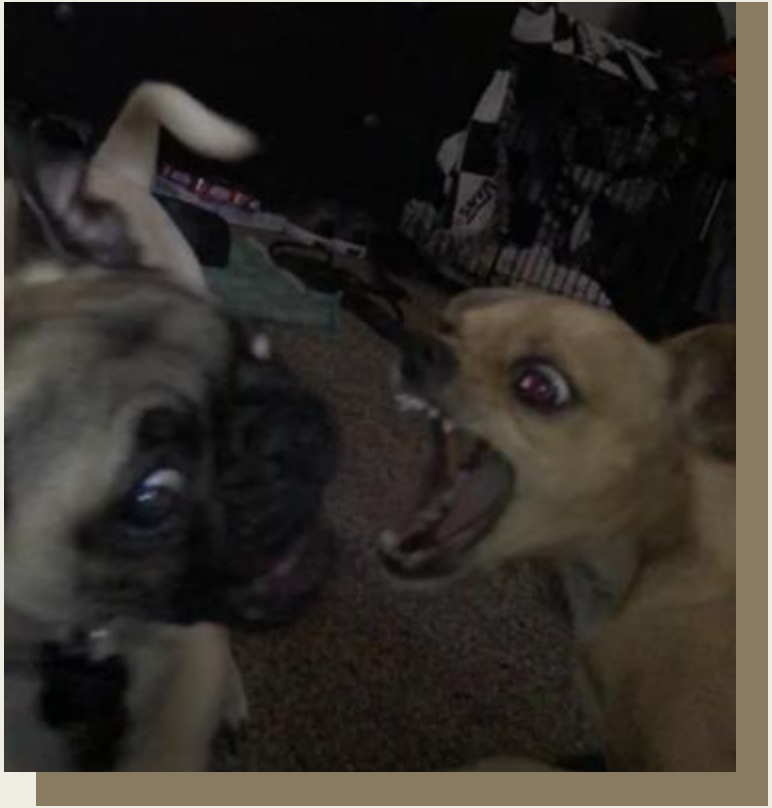
Castile soap vs normal saline

Normal Saline vs Antiseptics

Sterile Gloves vs Non sterile

Animal Bites

- Dog vs Cat bites
- 19% of bite wounds become infected
- Cat Bites worse than Dog Bite
- Antibiotics: Augmentin



Prophylactic Antibiotic

- Prophylactic antibiotic vs none
  - *1,734 patients*
  - *Dog bites*
  - *Crush wounds, contaminated wounds, deep lacerations, tendon or open fractures*
- Tetanus prophylaxis ⟶ >10 years
- Consult with your Supervising Doctor

Guide to tetanus prophylaxis with TIG in routine wound management

History of adsorbed tetanus toxoid-containing vaccines (doses)	Clean, minor wound: DTaP, Tdap or Td†	Clean, minor wound: TIG‡	All other wounds*: DTaP, Tdap or Td†	All other wounds*: TIG‡
Unknown or <3	Yes	No	Yes	Yes
≥3	No§	No	No¶	No

Footnotes

Abbreviations: DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; Td = tetanus and diphtheria toxoids; TIG = tetanus immune globulin

*Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions; and wounds resulting from missiles, crushing, burns, and frostbite.

† DTaP is recommended for children <7 years of age. Tdap is preferred to Td for persons aged 11 years or older who have not previously received Tdap. Persons aged 7 years or older who are not fully vaccinated against pertussis, tetanus, or diphtheria should receive one dose of Tdap (preferably the first) for wound management and as part of the catch-up series; if additional tetanus toxoid-containing doses are required, either Td or Tdap vaccine can be used.

‡ People with HIV infection or severe immunodeficiency who have dirty wounds (including minor wounds) should also receive TIG, regardless of their history of tetanus immunizations.

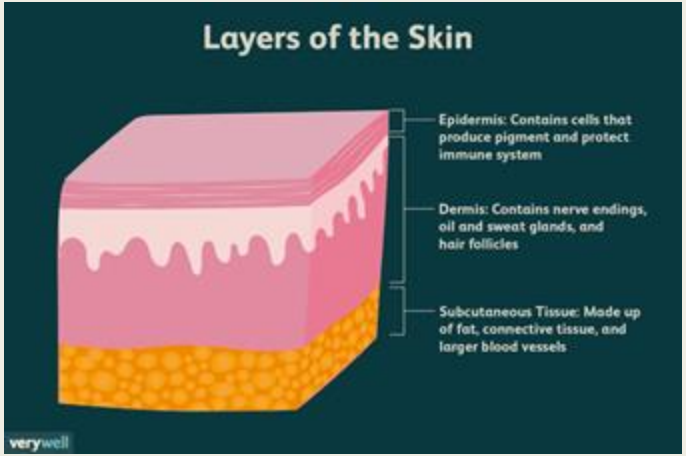
§ Yes, if ≥10 years since the last tetanus toxoid-containing vaccine dose.

¶ Yes, if ≥5 years since the last tetanus toxoid-containing vaccine dose.

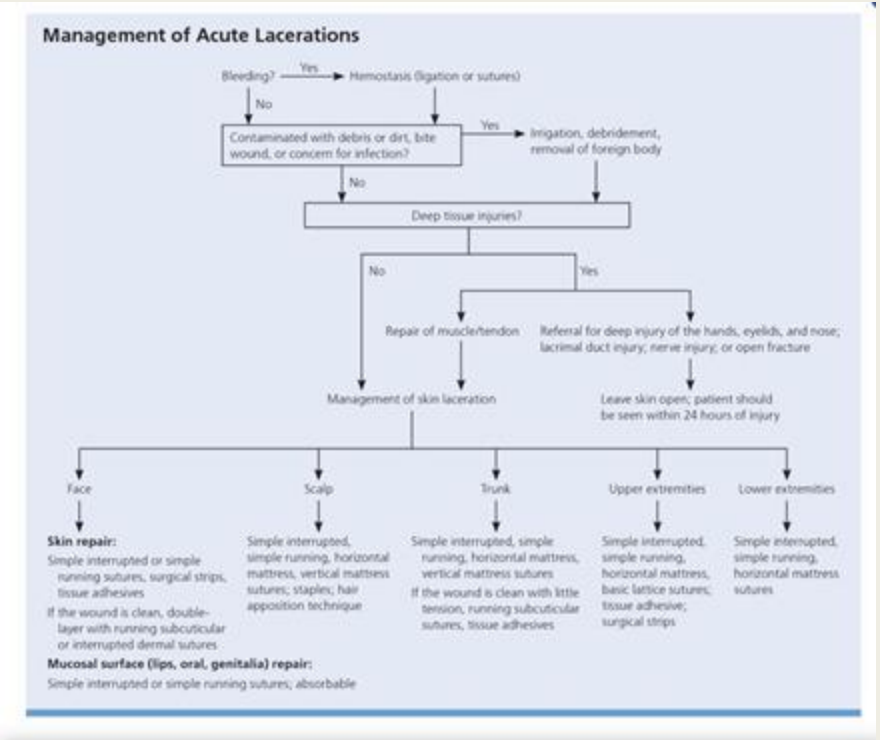
https://www.cdc.gov/tetanus/clinicians.html#
Last Reviewed: August 15, 2024

Types of wounds

- Superficial: epidermis
- Partial thickness: Epidermis & Dermis
- Full Thickness: Dermis, subcutaneous tissue, bone/tendon



To Suture or Not to Suture?



Timing

- *Primary Closure*

Location and depth

- *Eyelid→ referral to ophthalmologist*
  - Eye, tarsal plate, eyelid margin
- *Lip Vermilion border*
  - Reapproximate!!

Other Wound Closures

Dermabond

- No Anesthesia required
- Antimicrobial effect
- Pediatric facial wounds/low tension
- Sloughs off in 5-10 days

Staples

- Good for scalp lacerations
- Better on linear lacerations
- Increase scarring
- Do not use if possible CT
- Removal same as sutures

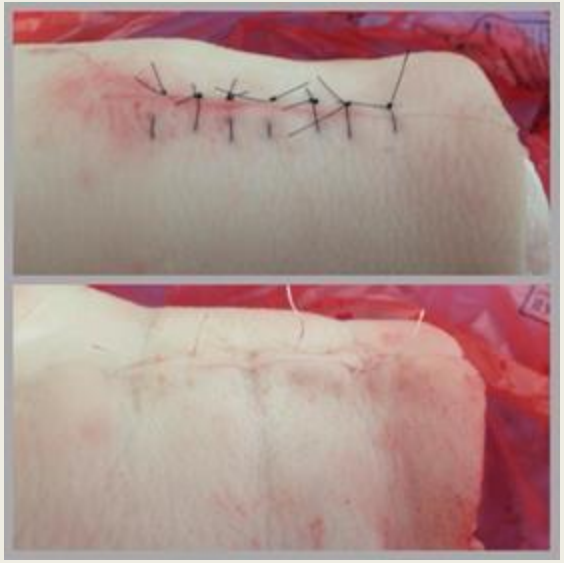
Steri strips

- Superficial, low tension
- Non-invasive
- High possibility of wound dehiscence
- Elderly Patients
- 5-7 days peels off

Suturing Basics

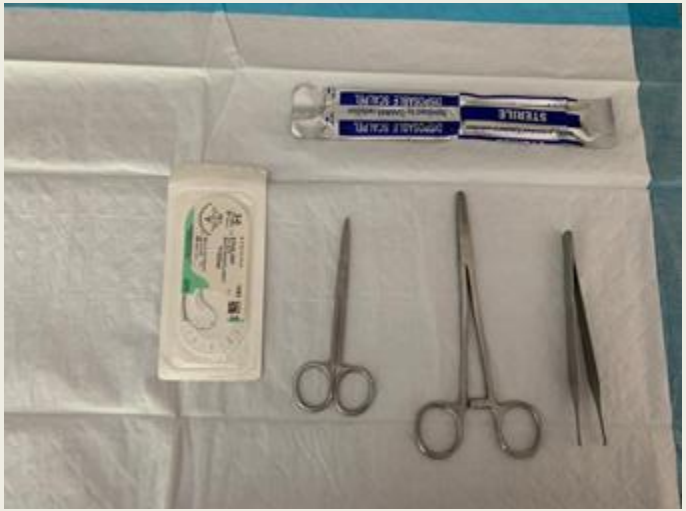
Children's Hospital LOS ANGELES | Keck School of Medicine of USC

Goals to suture repair



- Goals of laceration repair
  - *Achieve homeostasis*
  - *Optimal cosmetic results*
  - *Reduce infection*

Preparing to Suture



- Tetanus Prophylaxis
- Anesthetics
- Suture Material/gloves
- Suture Kits

Suture material & Size

- Nonabsorbable
  - *Nylon or Polypropylene*
  - *Low tension*
  - *Nylon easier*
  - *Propropylene more visible/stronger*
- Absorbable
  - *Vicryl, Dexon or Monocryl*
  - *Deep wounds*
  - *4-8 weeks to absorb*

Wound site	Suture size
Back	2-0 to 3-0
Extremities	4-0 to 5-0
Face	5-0 to 6-0
Scalp	2-0 to 3-0
Torso	3-0 to 4-0

Ricci, Nicole A. RPA-C; Rizzolo, Denise PhD, PA-C Laceration repair, JAAPA: September 2011 - Volume 24 - Issue 9 - p 28-33

Post Suture Care

Wound location	*Timing of removal (days)*
Face	3 to 5
Scalp	7 to 10
Arms	7 to 10
Trunk	10 to 14
Legs	10 to 14
Hands or feet	10 to 14
Palms or soles	14 to 21

Adapted with permission from Forsch RT. Essentials of skin laceration repair. Am Fam Physician. *2008;78(8):950.*

- **Suture Care**
  - Antibiotic ointment v none
  - Keep wound dry
  - Leave dressing on for 24-48 hours
- **Suture Removal**
  - Dehiscence
  - Daily sunscreen x 6 months post healed scab
  - Vitamin E oil

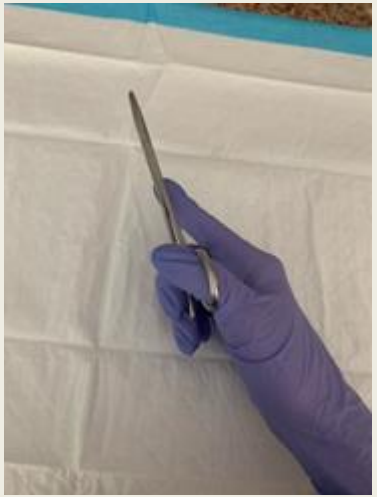
Laceration Closure Techniques

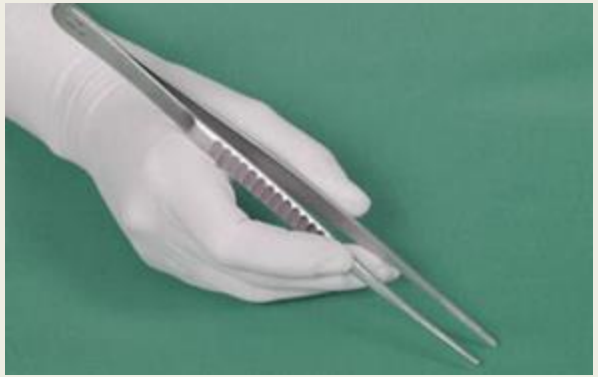
Technique	Comments
Simple interrupted sutures	General tissue approximation Can be used for most wounds
Simple running sutures	Fast and effective for long lacerations All sutures are lost if one suture is cut by mistake or removed for drainage
Horizontal mattress sutures (Figure 1)	Effective for everting wound edges Can cause skin necrosis and excessive scars
Vertical mattress sutures (Figure 2)	Most effective for everting wound edges Can cause skin necrosis and excessive scars
Half-buried mattress sutures (Figure 3)	Most effective in everting triangular wound edges in flap repair
Running subcuticular sutures	Fast and effective in accurate skin edge apposition Does not allow for drainage Suited for closing clean wounds, such as surgical wounds in the operating room
Interrupted dermal sutures	Effective in accurate skin edge apposition and wound eversion Allows for minimal drainage Suited for closing clean wounds
Staples	Fast, creates loose closure Allows for drainage Suited for unclean wounds Should be avoided if cosmetic outcome is important
Wounds adhesive strips	Fast, no anesthesia required Used to approximate clean, simple, small lacerations with little tension and without bleeding
Tissue adhesive	Fast, no anesthesia required Used to approximate clean, simple, small lacerations with little tension and without bleeding

Forsch RT, Little SH, Williams C. Laceration Repair: A Practical Approach. Am Fam Physician. 2017 May 15;95(10):628-636. PMID: 28671402.

Instrument Holds

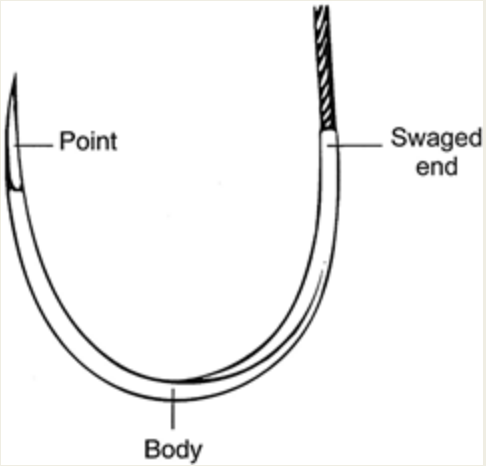
Needle Driver



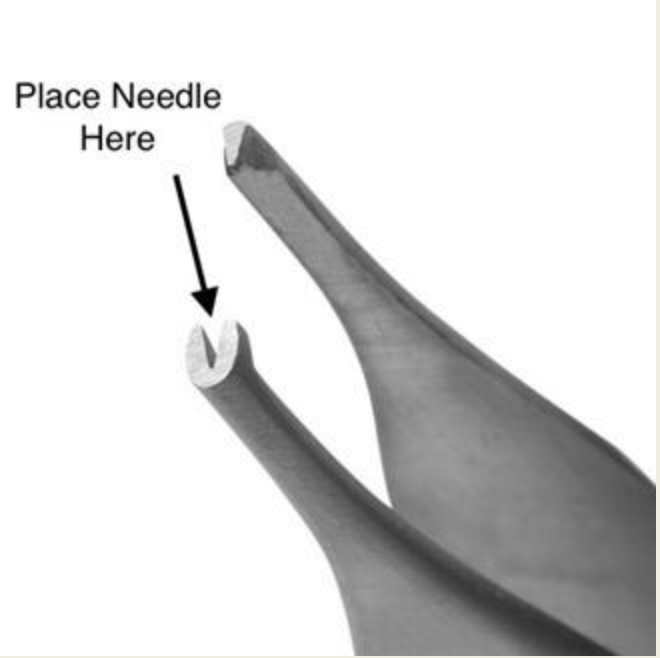


Forceps (Adson or tissue forceps)

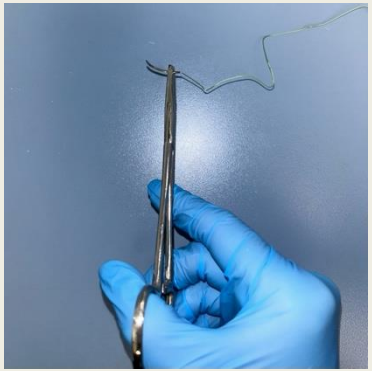
Suture Instruments



Loading Needle



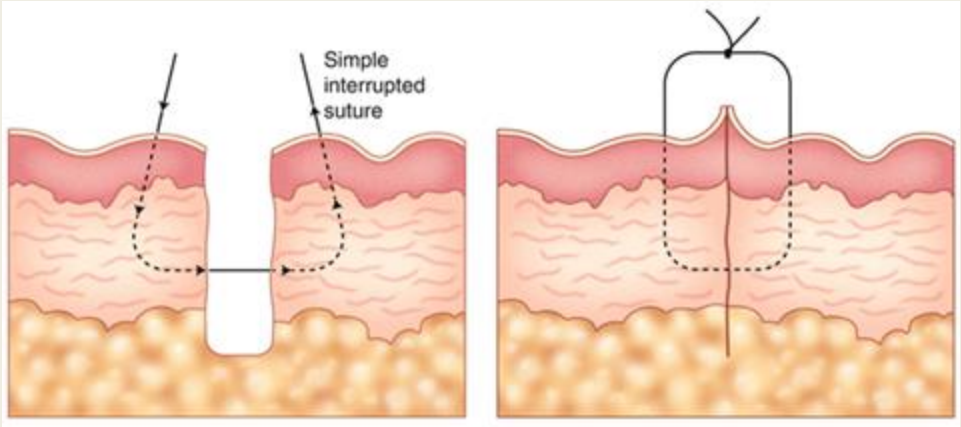
How to Load the needle on the needle driver



- 2/3 rule
- Load the needle perpendicular to the needle driver
- Use forceps to adjust the needle
- Always be aware of where the needle is to prevent needlesticks

NOW LET'S SUTURE

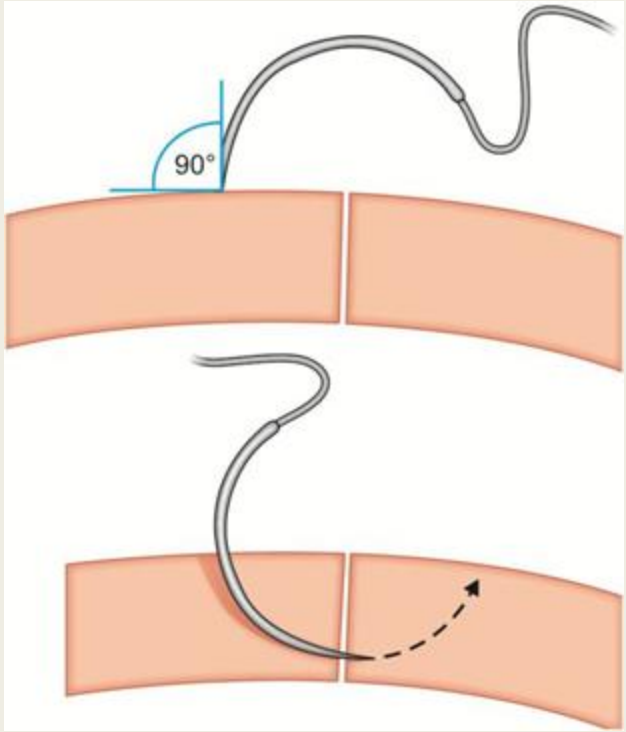
Suture Pearls



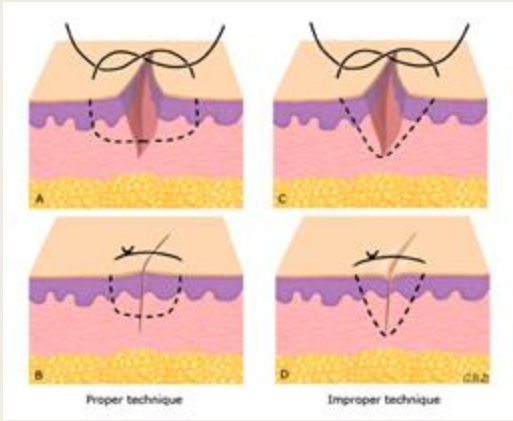
Everting Skin

- Minimizes scar→ evert skin
- Future contracture of the wound
- Avoid dog ears→ start in the center of wound
- Apply deep sutures when appropriate
- Tie as many knot as suture material
    - *Ex: 3-0 → 3 knots*
- When in doubt match up layers

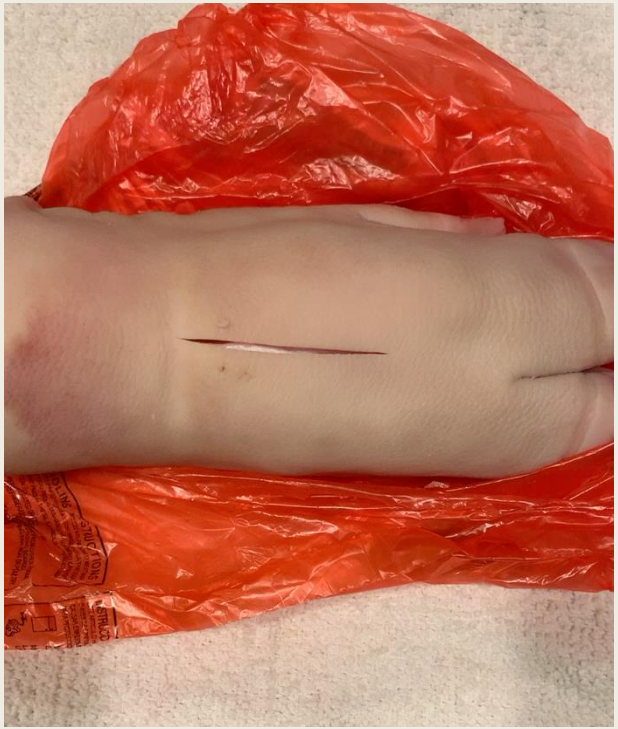
Simple Interrupted



- Needle enters skin at **90 degrees** then turn wrist to follow the curve of the needle to pull suture thru
- Leave a small tail
- Each suture is cut before new one started
- Evert wound edges for a better cosmetic outcome

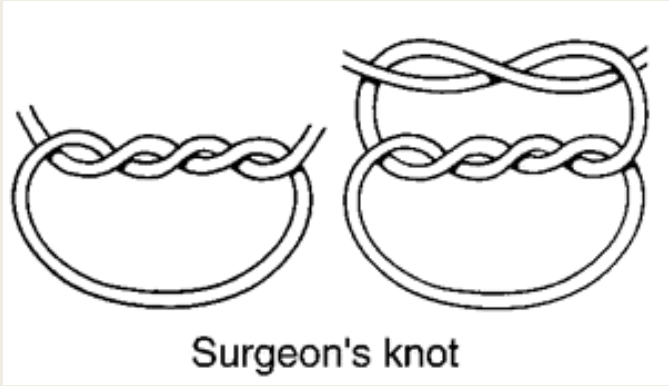


Simple Interrupted

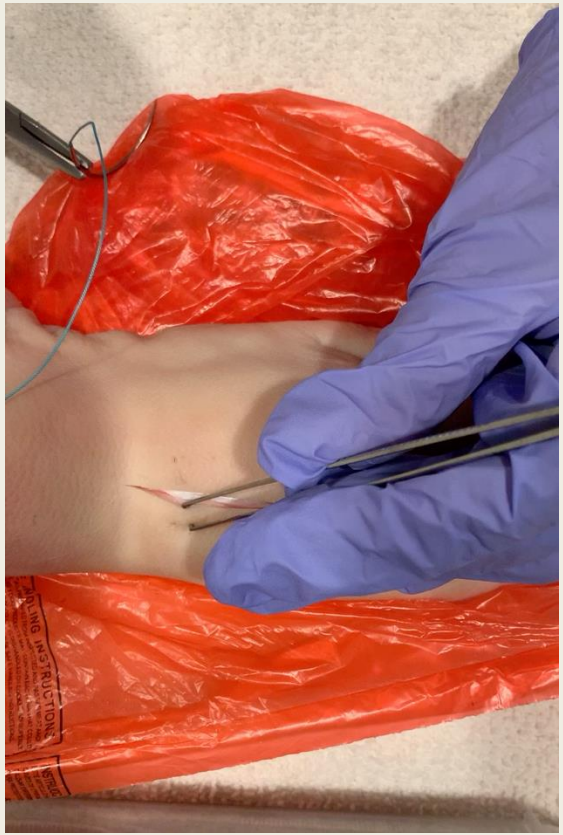


Tie the knot

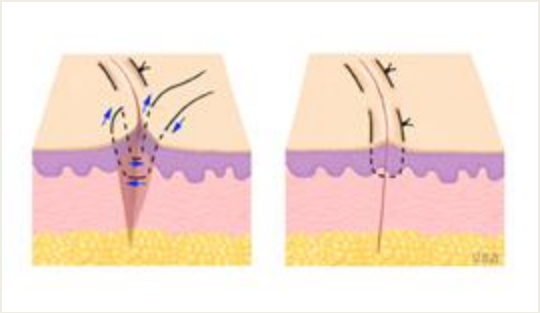
- 1st throw→ 2 passes
- 2nd throw→ 1 pass
- 3rd throw → 1 pass
- Square knots won’t slip
- Keep Knots on same side



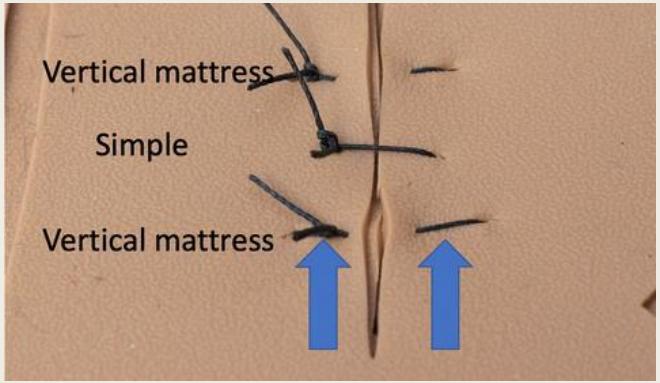
Horizontal Mattress



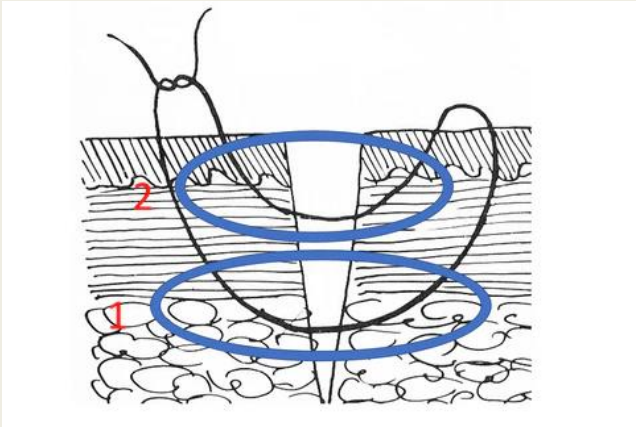
- All enter points and exit points equidistant
- First throw is made perpendicular to the wound
- The suture needle is then loaded in a backhanded fashion, and a second throw is made about 1 cm down the wound edge on the same side and exiting on the side where you began
- The suture is then tied
- Square box shape is created



Vertical Mattress

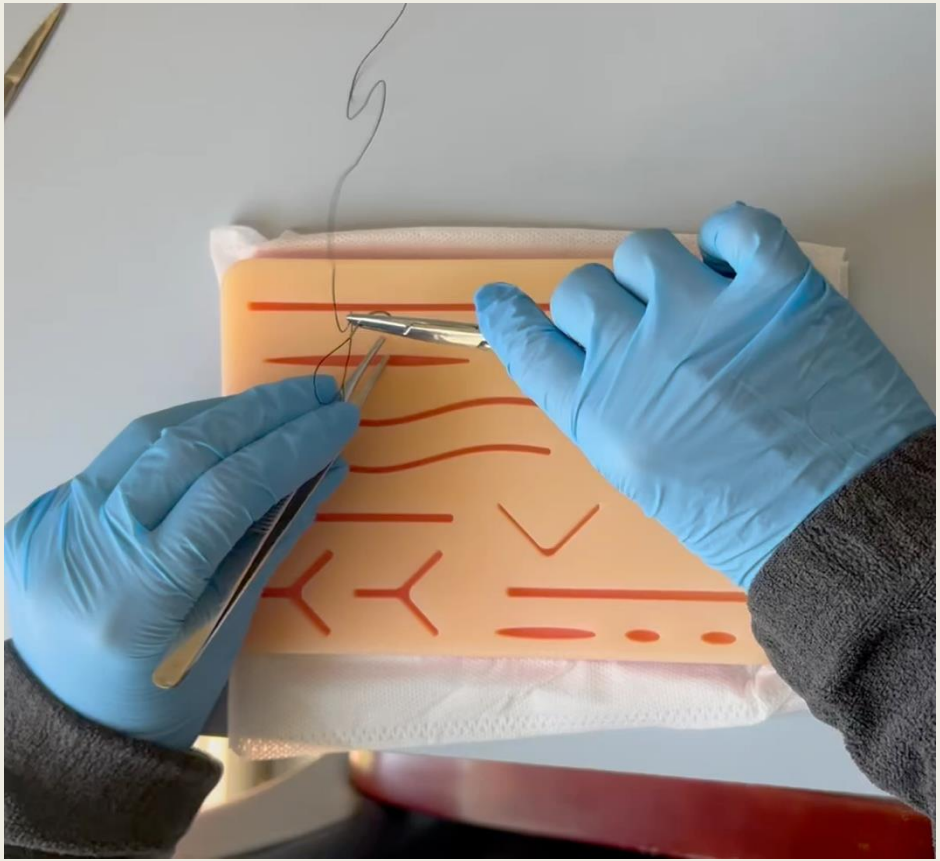


(Naysmith, 2023)



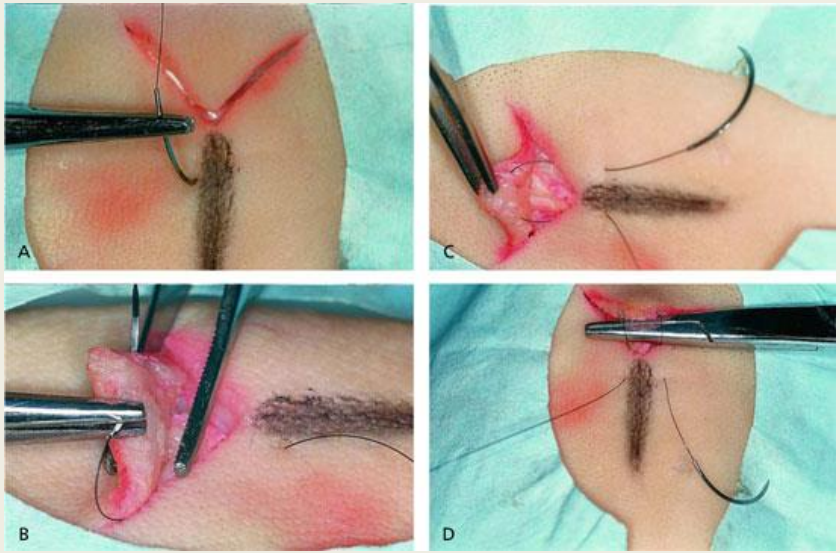
- Start with a simple interrupted but make it wider and deep throw
- Turn the needle around on the needle driver to where the point of the needle faces the wound in a backhanded motion
- Enter into the skin like a simple interrupted but enter superficial compared to the first pass
- Then tie your knot

Vertical Mattress



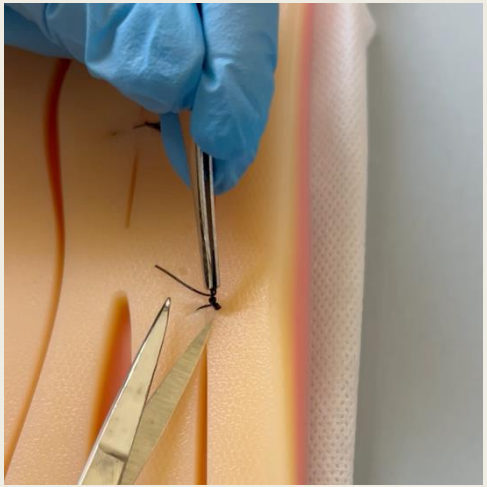
Corner Stitch

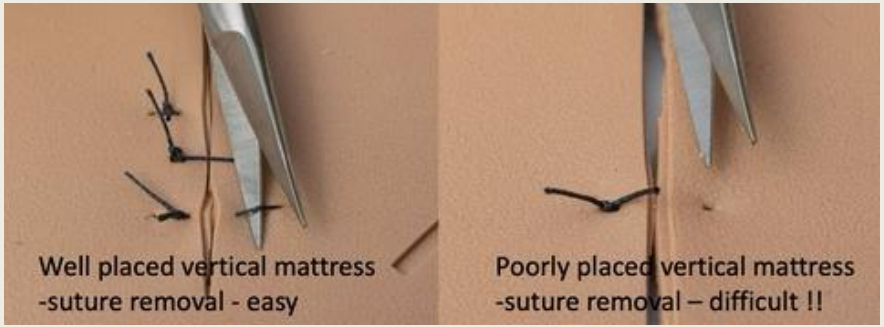
- The needle enters the skin next to the corner then passes through skin and exits at the dermis
- Elevate the corner flap and pass the needle from one edge of the flap to the opposite edge of the flap
- The needle passes through about 4 mm from the corner tip
- Reload the needle backwards and pass at needle equidistance from original entrance on the opposite side
- Tie your knot being careful to allow the tip to fit back



(Zuber, 2002)

Suture Removal





(Naysmith, 2023)

- Hold scissors in dominant hand and pick ups in non dominant hand
- Pull up on knot with forceps and cut right under one side of the knot
- Recommend removing suture every other if unsure of dehiscence
- Count all sutures


THANK YOU

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