

# Basic & Advanced Wound Closure Techniques

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# Wound Management - General Principles

## Phases of Wound Healing

### Phase 1 - Coagulation & Inflammation

Days 1 to 5

Tensile strength of wound ~5% of normal skin

### Phase 2 - Proliferation

Days 5 to 14

### Phase 3 - Remodeling

Day 14 to complete healing

Tensile strength 15-20% at 3 weeks & 60% at 4 months

Continues to increase up to 1 year (70-90% of original)

- Anesthesia

- Lidocaine

- Max dose 5-7mg/kg
    - Duration ~60 mins

- Epinephrine

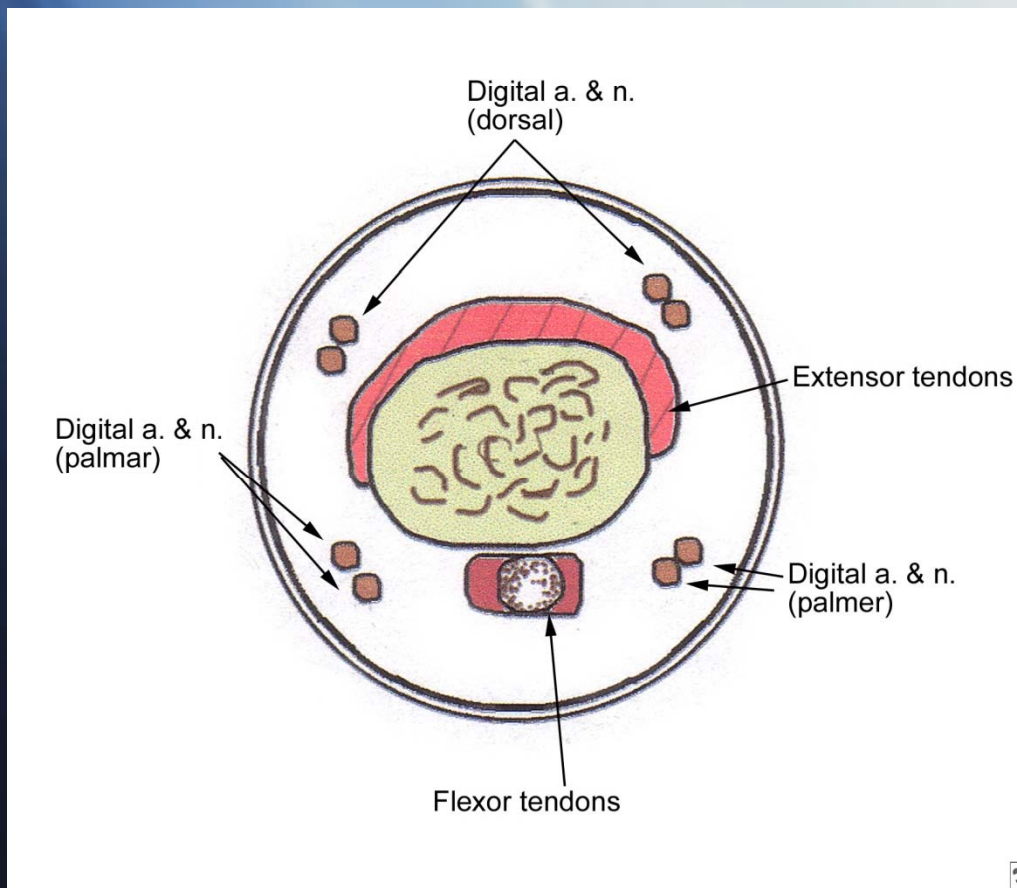
- Prolongs duration, promotes hemostasis and reduces systemic absorption
    - Avoid with Fingers, Nose, Penis, Toes (and Ears)
    - Increases incidence of infection
      - Avoid with contaminated wounds

- Topical

- LET gel - lidocaine/epinephrine/tetracaine
      - Avoid with end artery and contaminated

## Local vs. regional

- Less distortion w regional
- Transthecal (palmar) digital nerve block
  - Uses the flexor tendon sheath for infusion of anesthesia
  - A single injection of 2-3 mL of 1 or 2% epi-free lidocaine through the flexor tendons at the base of the digit
  - Inadequate for thumb and the dorsal aspect of the third digit's proximal phalanx b/c of incomplete anesthesia



- Skin & Wound Preparation

- Skin Cleansing

- Hair Removal

- Eyebrows should never be shaved
    - Plaster hair down if possible

- Wound Irrigation

- Removes contaminants, reduces infection, improves visualization

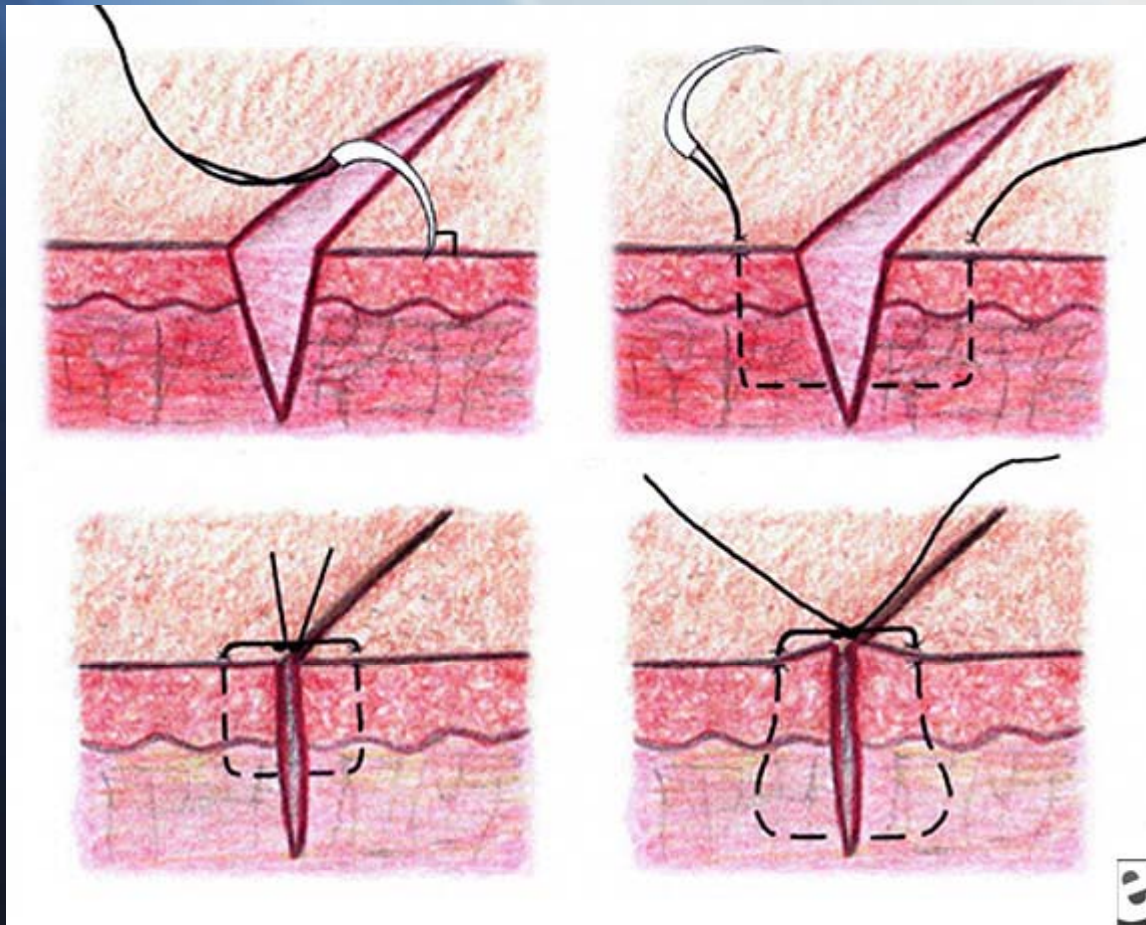
- Wound Debridement

- Wound Excision

- Wound Undermining

- Approximately double the width of the gap
    - Do not undermine contaminated tissue
    - Never on palms, soles or face

# Simple Suture



Close Dead Space

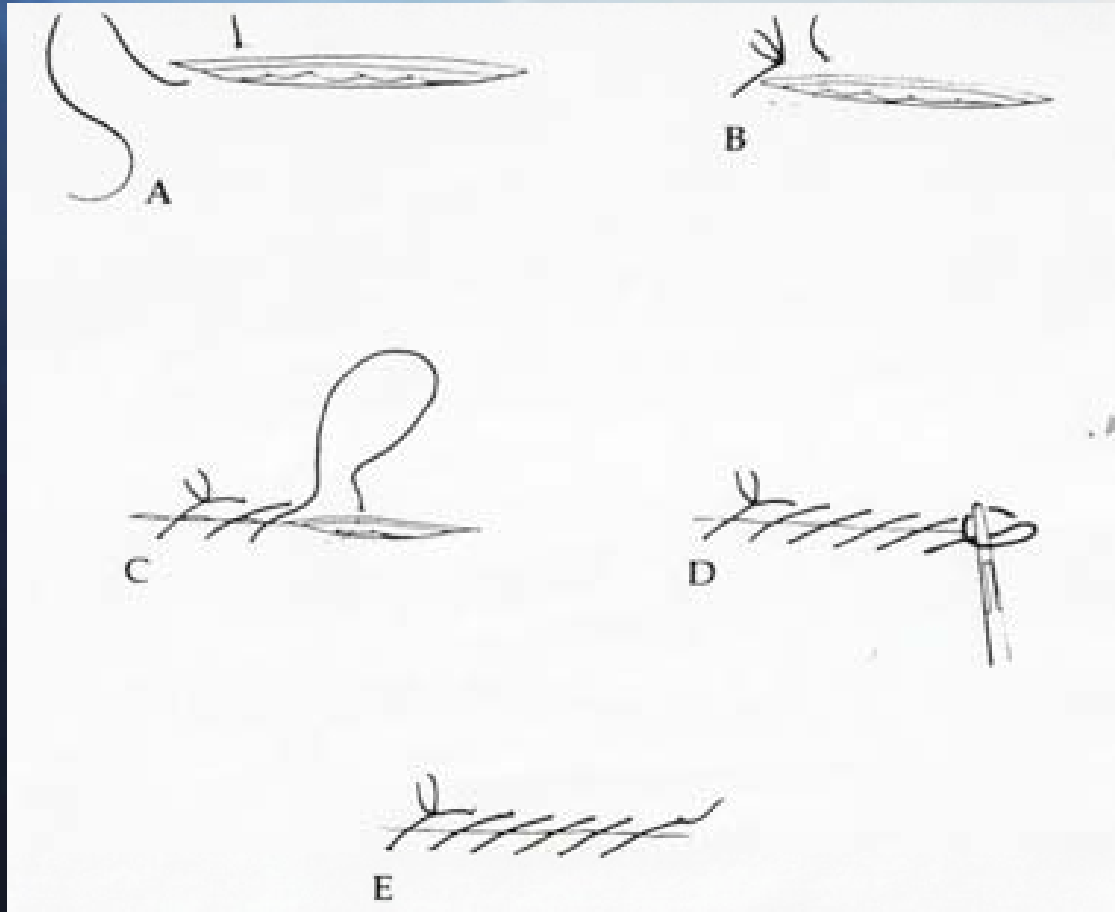
Loosely Approximated

Alignment

Equal Depth

Slight Eversion

# Running Sutures

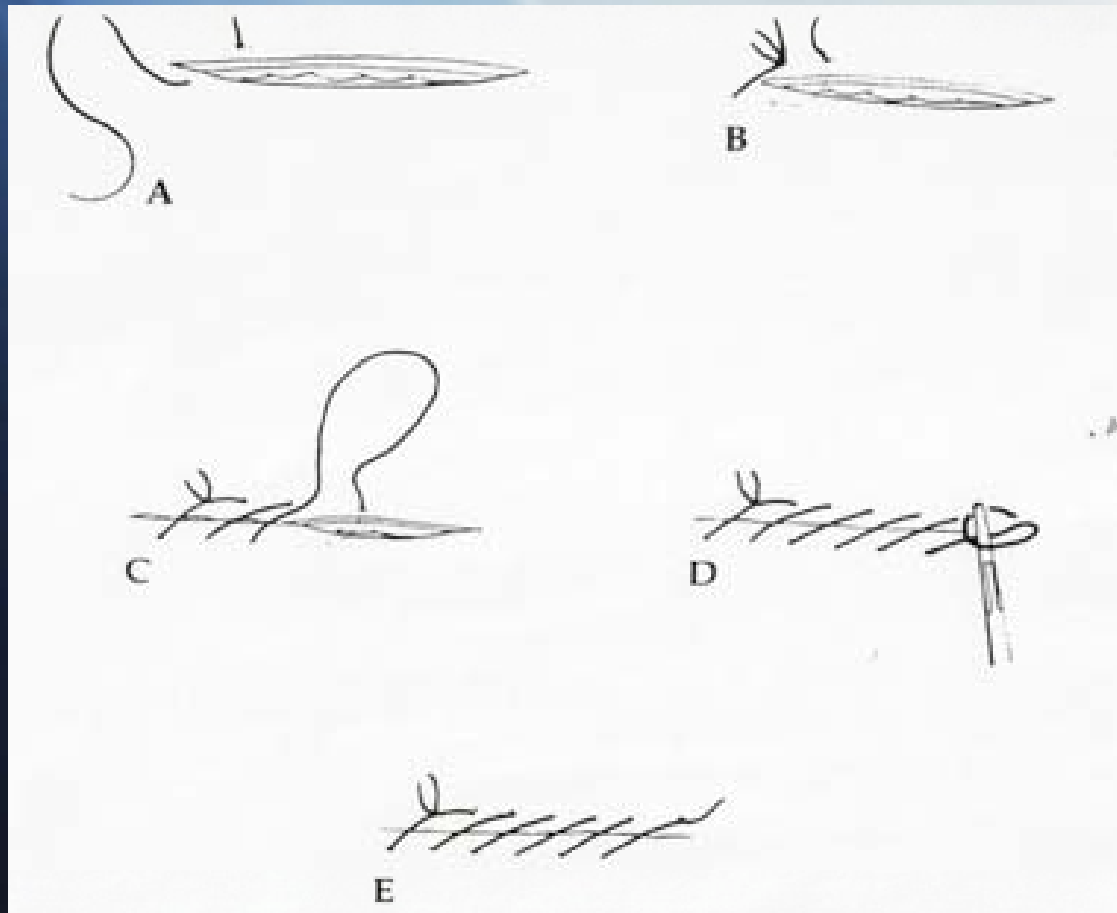


Rapid

Holds in two planes

Not with contaminated wounds

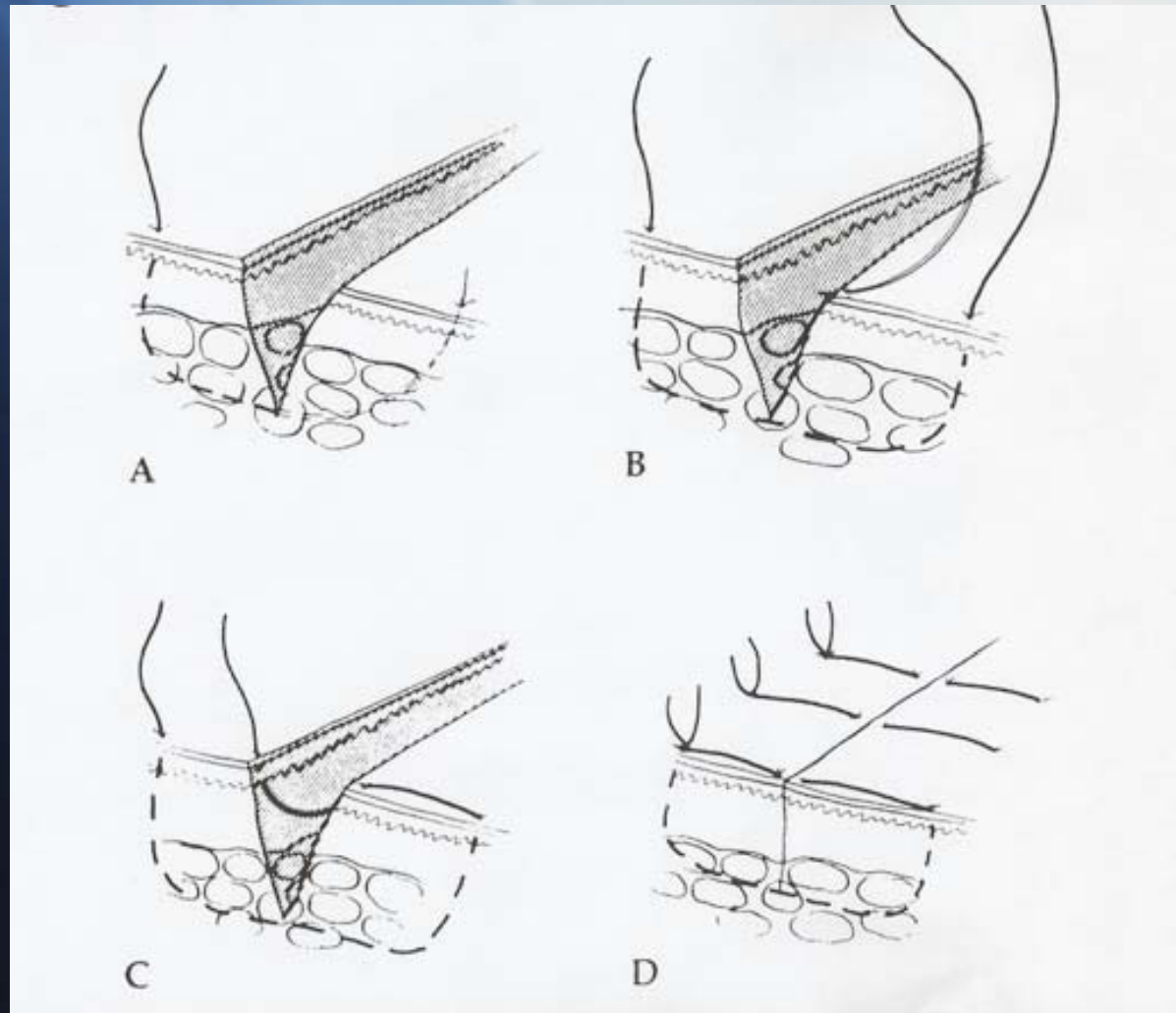
# Running Locked



Great for scalp lacerations b/c of good hemostasis

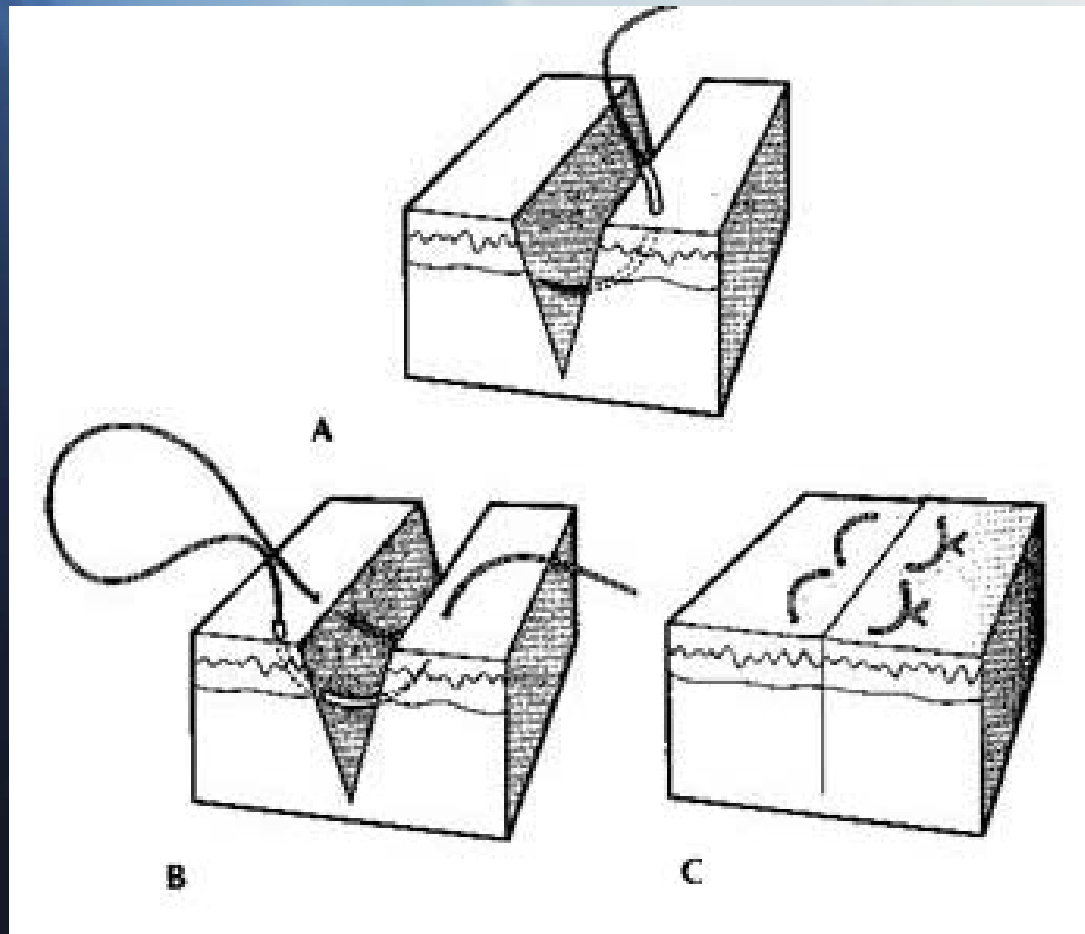


# Vertical Mattress



Ensure wound  
eversion  
Higher risk of  
local ischemia

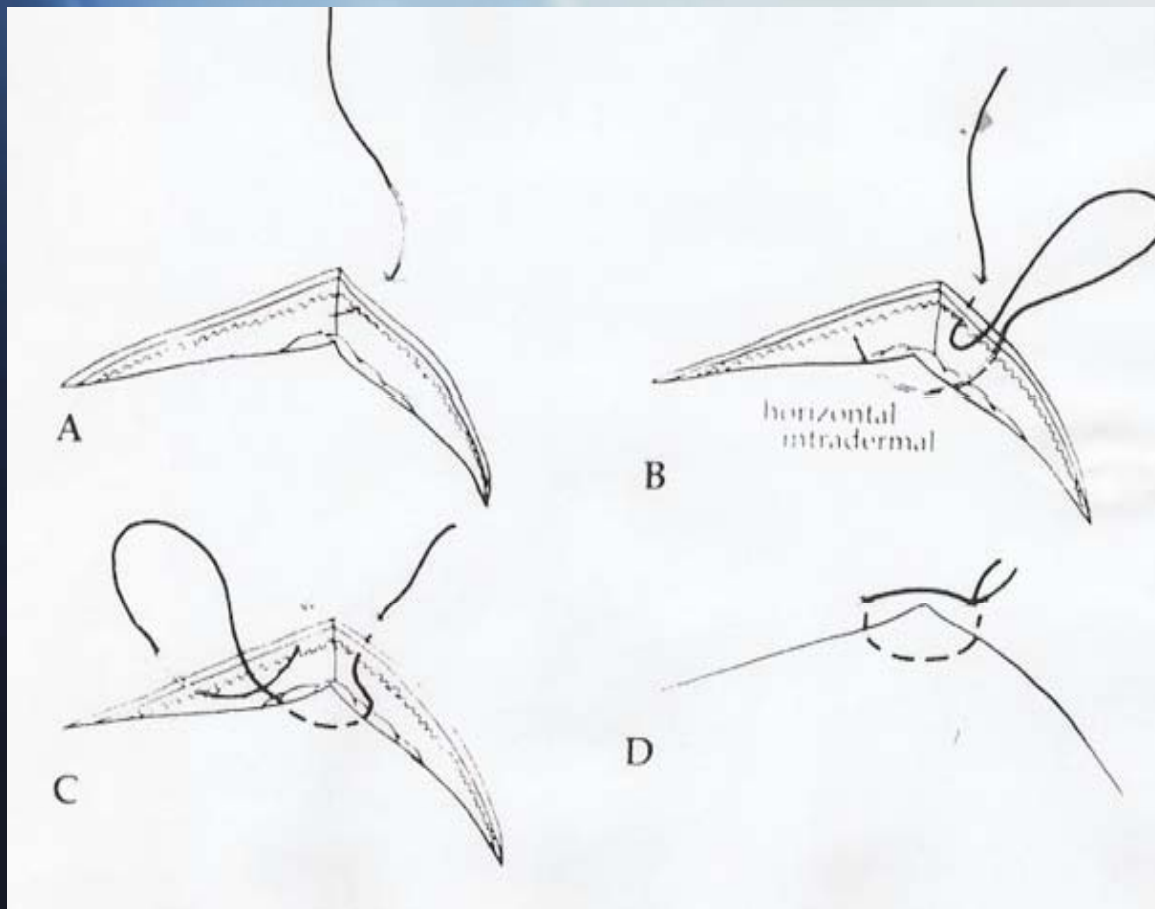
# Horizontal Mattress



Ensure wound  
eversion

Higher risk of  
local ischemia

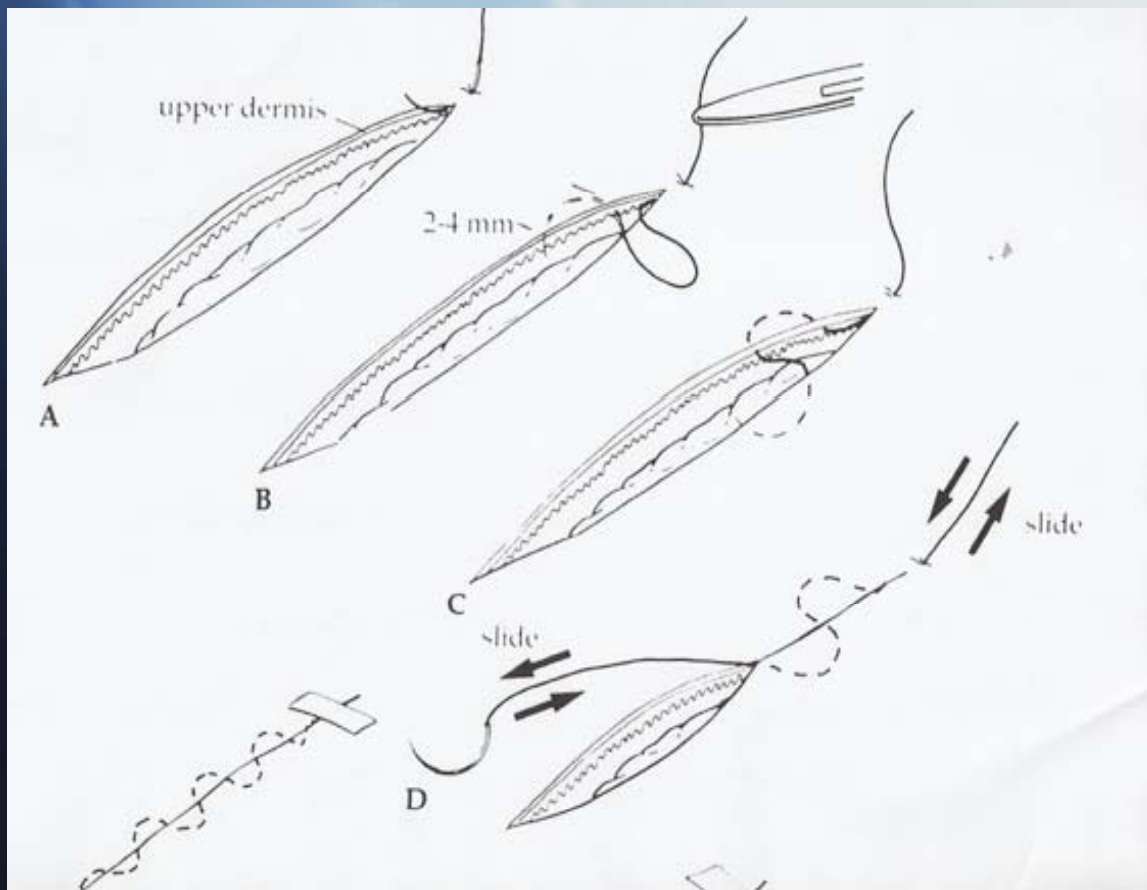
# Half-buried Mattress (Apex)



Used for tips  
and margins of  
flaps

Greater risk of  
mismatch of  
height &  
length

# Sub-cuticular



Skin suture marks  
avoided

Difficult to achieve  
accurate edge  
approximation

- Time of Injury
  - Few studies to determine max time to closure
  - Bacteria count increases dramatically >3-6hrs
  - Face & Scalp - 12 to 24 hours (>48hrs)
  - Other areas - 6 to 12 hours
    - Not heavily contaminated
    - Not in high-risk area (hand or foot)

- Characteristics of Tetnus-Prone Wounds

Clinical Feature	Tetnus-Prone	Non-tetnus-prone
Contaminants	Present	Absent
Devitalized tissue	Present	Absent
Infection	Present	Absent
Ischemic	Present	Absent
Mechanism	Burn,crush,bullet	Sharp & smooth
Wound age	> 6 hours	<6 hours
Wound depth	> 1 cm	< 1 cm
Wound type	Abrasion, avulsion, crush, irregular, stellate	Linear or straight

# Tetanus Prophylaxis

Immunization Hx	Tetanus-prone	Non-tetanus-prone
Hx of adsorbed Td	Td & TIG	Td & TIG
Unknown or <3 doses	Td, TIG & complete series	Td & complete series
Fully Immunized, >5y & <10y	Td	None needed
Fully Immunized, <5 years	None needed	None needed
Fully Immunized, >10 years	Td & TIG	Td

Td, tetanus and diphtheria toxoids; TIG, tetanus immune globin.

## ■ Discharge Instructions

- High risk wounds should be reevaluated in 24hr
  - Bites, hand wounds, heavily contaminated and wounds requiring prophylactic Abx
- One in ten persons develops a wound infection
- RTC if signs of infection develop
  - Wound becomes red or has discharge, streaks develop or patient develops a fever



## ■ Suture Removal

Location	Days	Location	Days
Face	3-5	Neck	3-4
Arm	7-10	Hand	10-14
Chest	7-10	Back	10-14
Buttocks	10-14	Legs	8-10
Foot	10-14	Joints	10-14

Depends on location, amount of tension and healing time of tissue

## Scar Formation

6 to 12 months required to form a mature scar

Adequate immobilization is essential

Of wound not entire anatomic part

### Hypertrophic Scar

Thick and raised scar within original boundaries

### Keloid

Exceeds the boundaries of initial injury

# References

- Emergency Management of Skin and Soft Tissue Wounds.

Ernest N Kaplan MD

Vincent R Hentz MD