

# WOUND TREATMENT



Chorna I.O.

Poltava



# Specific Points Affecting Wound Healing

- Keep wound clean and scab free
- Keep wound moist
- Avoid steroid creams
- Suturing wound splints skin
- Wounds actually shrinks

## Evaluation of the Patient

- Risk of infection or poor wound healing
- Detailed history of medicinal or latex allergies
- Immunization status

# Evaluation of the Laceration

- History of mechanism
- Potential for significant injury
- Potential foreign body
- Possible rabies exposure
- Type of force applied to injury
- Adequate lighting
- Neurovascular assessment







# Classification of Wounds

- Cut or incised wound
- Abrasions
- Lacerations
- Crush wounds
- Puncture wounds
- Avulsions
- Stab wounds
- Contused wound
- Bite wound
- Gunshot wound
- Combination wounds



Different wounds have many specific peculiarities, but its main stages are identical (equal).

# Amputation





# Lacerations





**Puncture wounds**





**Stab wounds**

# **RVB Classification**

Red / Pink – granulation tissue /  
epithelial tissue.

Yellow – sloughy, includes cream,  
ivory and green.

Black – necrotic / dead tissue

# **Main tasks of wound treatment**

- 1. Struggle with early complications.**
- 2. Prophylaxis and treatment of wound infection.**
- 3. Achievement of healing in brief term.**
- 4. Full stabilization of function of damaged organs and tissues.**



# Wound Preparation



- Removal of hair
  - Not eyebrow
- Scrubbing the wound
- Irrigation with saline
  - Avoid peroxide, betadine, tissue toxic detergents

# First Aid

- Eliminate early treating to life of patient complications of wound (bleeding, development of traumatic shock and injuring of life important organs),
- Prevent the further infection of the wound (rightly and timely to perform primary surgical debridement of wound).

# Treatment of operative wound

**Treatment of operative wound starts on the operation table, when the surgeon tries to provide the best condition for it healing.**

**(1) Providing conditions for healing by primary intention** during the operation. Operative wounds are conditionally aseptic, cut. When these wounds occur, all the conditions for healing by primary intention are provided: prophylaxis of infection, safe hemostasis, foreign bodies and necrotic tissues are absent in wound. At the end of operation the margins of the wound are put close together by stitches. If necessary the drainage is in wound. Aseptic bandage is applied at the end of operation.



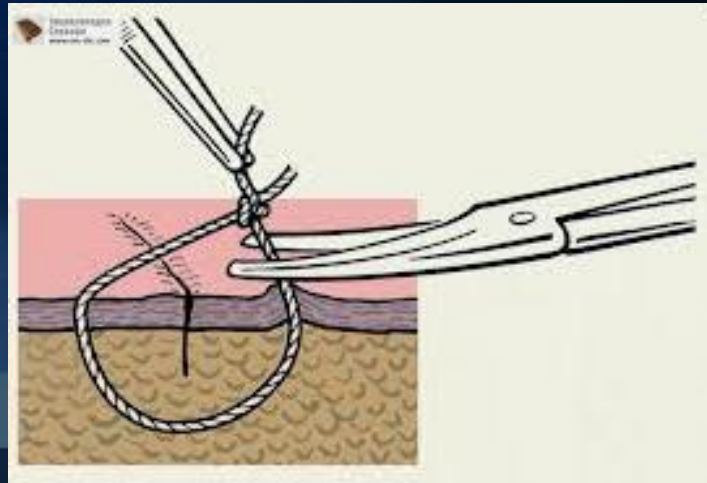
## (2) Treatment of wound during postoperative period

After the operation it is important to solve following **four tasks:**

- **anesthesia or analgesia** (depending on traumaticity of invasion and expression of the pain syndrome.);
- **prophylaxis of secondary infection** (timely change of aseptic bandage, timely remove of drainage);
- **acceleration of healing processes in wound** (for improving blood circulation and metabolic processes early activation of the patient is necessary, physiotherapy is used),
- **correction of general state of patient** (according gravity of patient's state).

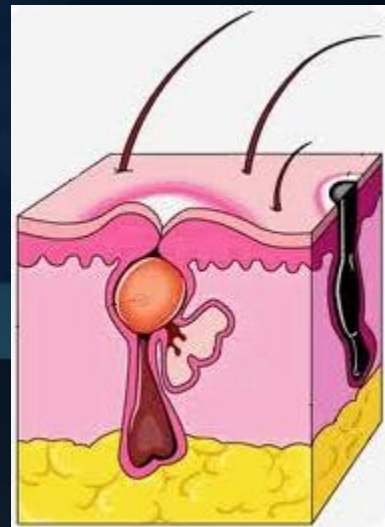
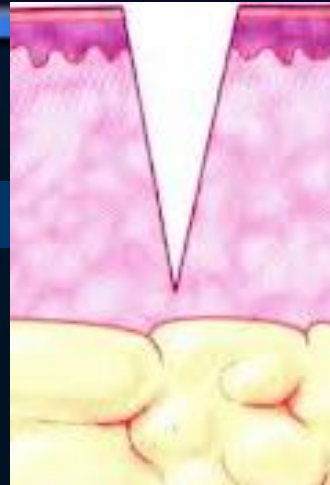
### (3) Healing of wounds and removing stitches

- **Terms of removing stitches** (therefore terms of healing of the wound) are determined by localization of wound and general state of patient.



# Surgical treatment of wound

- Primary surgical debridement (PSD) of wound and
- secondary surgical debridement (SSD) of wound





# Golden period

- “**safe**” time interval from wounding that allows primary wound closure
- The clinical policy for penetrating injury of the extremity supports an 8-12-hour cutoff for primary wound closure.
- 6-10 hours - wounds of the extremities — and up to 10-12 hours or more for the face and scalp

# Treatment of fresh infected wounds



- Accidental wounds are primary infected.  
Tactics of treatment depend of character and localization of the wound, size and term of injury. If such wound occurs, the urgent antitetanus and antirabies vaccination are required.

**Primary surgical debridement (PSD) of wound is main measure in treatment this wounds.**

# (1) Primary surgical treatment of wound

## PRIMARY SURGICAL DEBRIDEMENT OF WOUND

is first surgical operation, performed in aseptic conditions, **with anesthesia**. With help of primary surgical treatment of wound accidental infected wound becomes cut and aseptic. This provides possibility of its fast healing by primary intention. It has following stages:

- **Cutting of wound.**
- **Revision of wound channel.**
- **Refresh (cutting) of margins**, walls and bottom of wound, removing necrotic tissues (Incision by one block on 0,5-2,0 sm for margin of wound).
- **Hemostasis.**
- **Restoration of injured organs integrity** and its structures (stitching of nerves, tendons, vessels, connecting of bones etc).
- **Applying stitches** to the wound with leaving of drainages (according to indications).



# Anesthesia of the Laceration

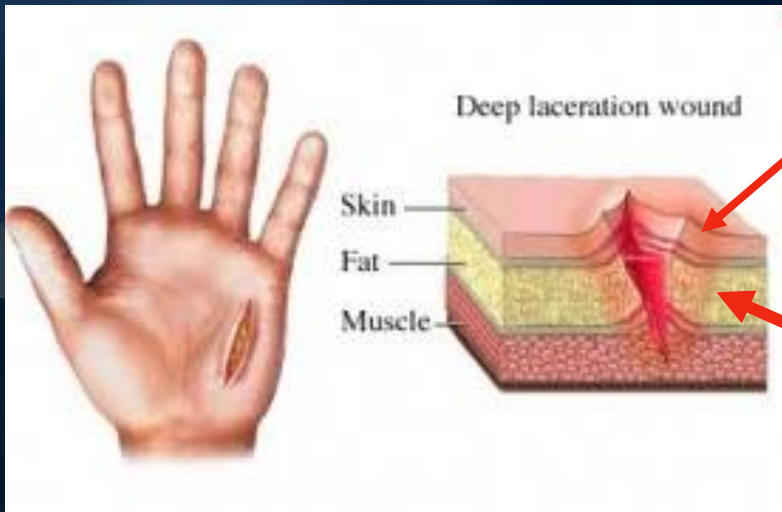
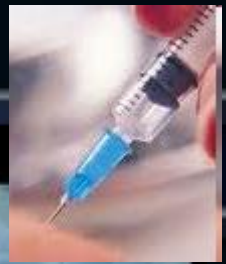


## Anesthesia :

- Local anesthetic injections – or regional
- Topical anesthetics
- Regional anesthetics
- Lidocaine with/out epinephrine, marcaine
- Mechanisms to reduce pain

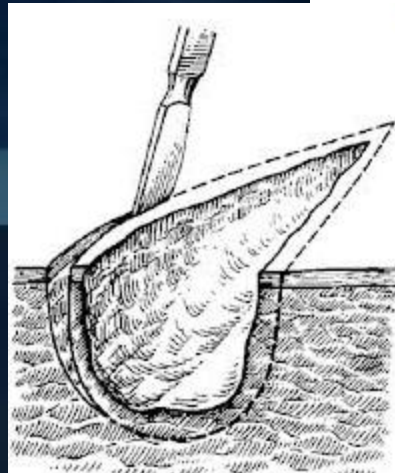
# Methods to reduce pain of Lidocaine local infiltration

- Small-bore needles
- Buffered solutions
- Warmed solutions
- Slow rates of injection
- Injection through wound edges
- Subcutaneous rather than intradermal injection
- Pretreatment with topical anesthetics



# Debridement Methods

- Surgical (**Cutting of wound.**  
**.Refresh (cutting) of margins**)
- Mechanical (**Revision** of wound channel, removing of foren body)
- Enzymatic ( proteolytic enzymes)
- Autolytic
- Maggots



# ENZYMATIC DEBRIDEMENT

- Definition: The use of topically applied chemical agents to stimulate the breakdown of necrotic tissue.
- Common topical agents:
  - collagenase
  - fibrinogen/deoxyribonuclease
  - papain/urea

## MODE OF ACTION

- Directly digesting the components of slough (fibrin, bacteria, leukocytes, cell debris, serous exudate and DNA)
- Dissolving the collagen anchors that secure the avascular tissue to the underlying wound bed



# AUTOLYTIC DEBRIDEMENT

- **Definition:** The process by which the wound bed utilizes phagocytic cells and proteolytic enzymes to remove devitalized tissue.

This process to can be promoted and enhanced by maintaining a moist wound environment

- Use of moisture-retentive dressing
- Slower process than other methods
- Progress should be observed within 72-96 hours
- Wound will increase in length, width, depth
- Attention to peri-wound maceration
- Collection of wound exudate and accompanying odour as indicative of an infection

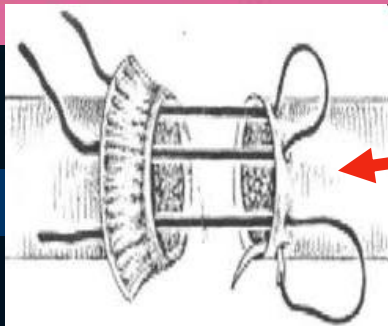
# MAGGOT THERAPY



## EXPECTED MODE OF ACTION

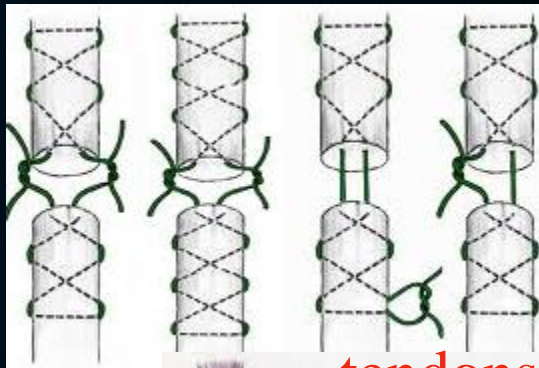
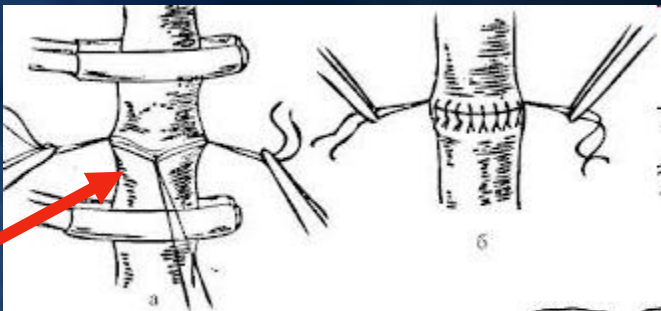
Debridement	Eating necrotic tissue
Kills bacteria	Ingested bacteria are killed in the gut
Environmental	Production of Ammonia → $\uparrow$ pH → inhibits bacterial growth
Antibiotic effect	Secretion of chemical with anti-microbial activities
$\uparrow$ Wound healing	Combined effect of earlier effects. Direct stimulatory effect

# Hemostasis.



nerves

Restoration of injured organs integrity and its structures (stitching of nerves, tendons, vessels, connecting of bones etc).



tendons

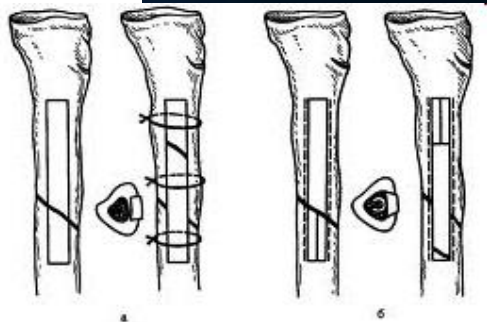
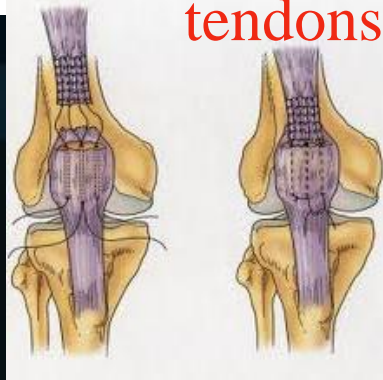


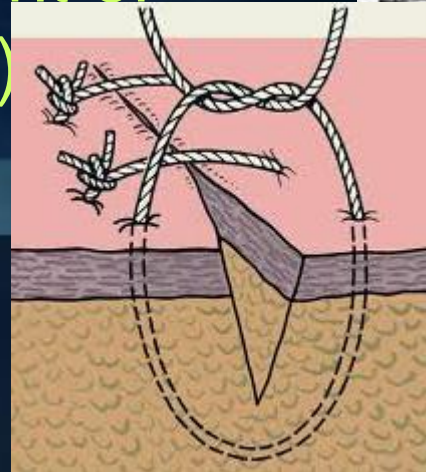
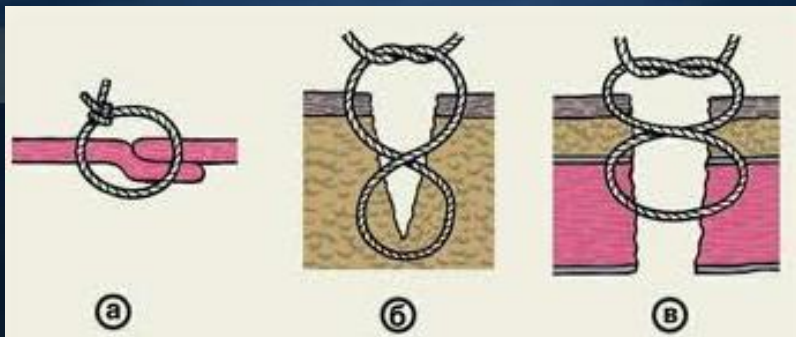
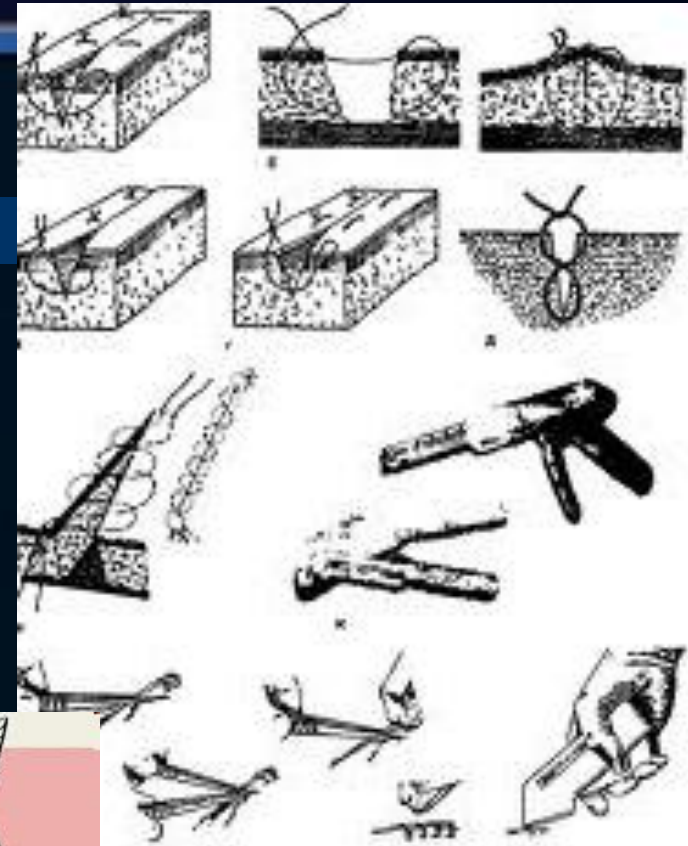
Рис. 30. Скользящая костная аутопластика.  
а—по Ш. Д. Халупову; б—по В. М. Арсеньеву.





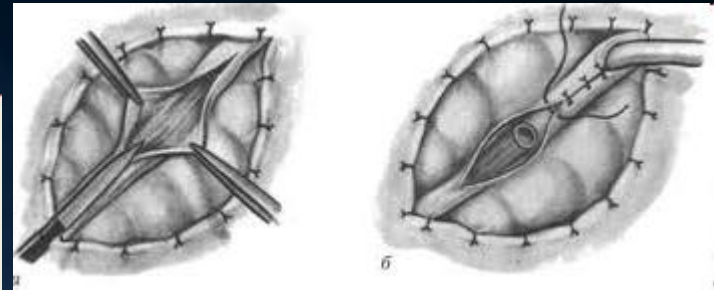
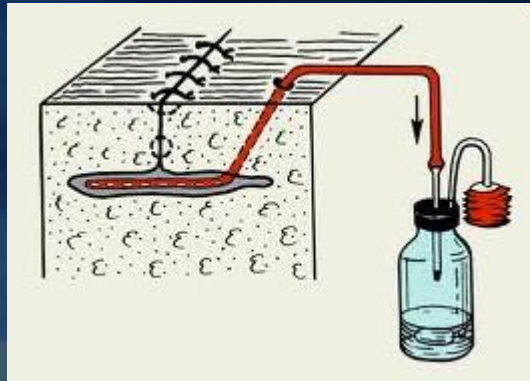
# Applying stitches to the wound with leaving of drainages (according to indications).

- 1.Layer-by-layer stitched wound.(small wounds with little zone of injury (cut, stab-wounds etc.), not much dirt, with localization of wound on the face, neck, trunk and superior extremities and if not much time passed since the moment of injury – **up to 24 hours**)





- **2. Stitch of the wound with leaving drainage (drainages).** (In case of risk of development of infection, if wound is localized on foot or shin, or zone of damage is big, or PSD is provided in 6-12 hours from the moment of injury, or patient has accompanying pathology, etc.)







- **3. The wound is not stitched.** If high risk of infection complications is.



after 48 hours



### 3. The wound is not stitched

If high risk of infection complications is:

- • late PSD (after 48 hours),
- • massive dirtying of wound with soil,
- • massive damaging of tissues
- • accompanying diseases (anemia, immune deficiency, diabetes mellitus),
- • localization injury on foot or shin,
- • all gunshot wounds
- Byte wound.



# Main kinds of primary surgical debridement of the wound

- The sooner ( from the moment of injury) PSD of wound is provided; the lower risk of infection complications is.
- Depending on remoteness of wound three kinds of PST are used: **early, delayed and late.**

***Early PSD*** is performed in term till **24 hours** from the moment of wound formation, includes the main stages and is usually finished by applying primary stitches. Sometimes drainages are left (at massive damage of tissue).

***Delayed PSD*** is provided from 24 till 48 hours after injury. During these period the inflammation, edema and exudates appear. The difference from early PSD is providing the operation on the background of injection of antibiotics and finishing the operation by leaving the wound open (not stitched). Late this wound is covered by primary delayed stitches.

***Late PSD*** is provided after 48 hours, when the inflammation is maximum and development of infection process begins. Even after PSD probability of suppuration is high. Wound is not stitched. Patient is administered of antibiotic therapy. Early secondary stitches are applied on 7th -20th day, when the wound is totally covered with granulations and cleaned.

NB! Critical state of the patient  
(terminal state, shock of III  
stage) is **contraindication** to  
PSD of wound.

## **(2) Kinds of stitches**

- **Prolonged existing of open wound delays the process of healing. It is especially observed in massive injuries, when significant loss of fluid, proteins, and electrolytes takes part and there is big risk of suppuration. Besides this filling of the wound with granulations and closing with epithelium go very slowly. That's why it's important to put the margins together as soon as possible using different kinds of stitches.**



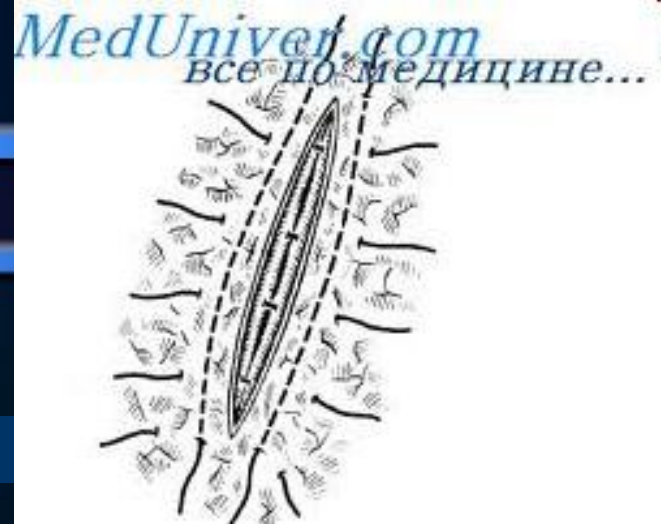
## Advantages of applying stitches:

- • acceleration of healing,
- • decrease of protein and fluid losses through wound surface,
- • decrease of probability of repeated suppuration of wound,
- • increasing of functional and cosmetic effects,
- • facilitation (облегчение) of wound treatment.

There are primary and secondary stitches:

## a) Primary stitches

- ***Primary stitches*** are applied on the wound before development of granulations (aseptic wound). In this case the wound heals by primary intention.
- ***Primarily delayed stitches*** are also applied on the wound before development of granulation tissue in case of risk of infection development (wound heals by primary intention). In this case the wound is not stitched after PSD. Inflammatory process is under control and when it decreases primarily delayed stitches are applied on 1-5 day.



- One kind of primarily-delayed stitches are ***tension stitches*** (провизорные): at the end of operation stitches are applied but threads are not knotted. Threads are knotted on 1st-5th day, when the inflammation process decreases. These stitches differ from the usual ones only because there is no need to do repeated anesthesia and sewing of the margins of the wound.

## b) Secondary stitches

- Secondary stitches are applied on granulative wounds healing by secondary intention. The purpose of secondary stitches is to decrease or to remove of wound cavity. As a result the terms of healing decrease. Indication for applying secondary stitches is granulative wound after liquidation of inflammatory process, without purulent content and necrotic tissues.



- There are **early secondary stitches** (they are applied on **6-21st day**) and



- **late secondary stitches** (are applied after 21st day). Before applying late secondary stitches, "**freshing up the margins**" is performed (it is the principal difference between early and secondary stitches.



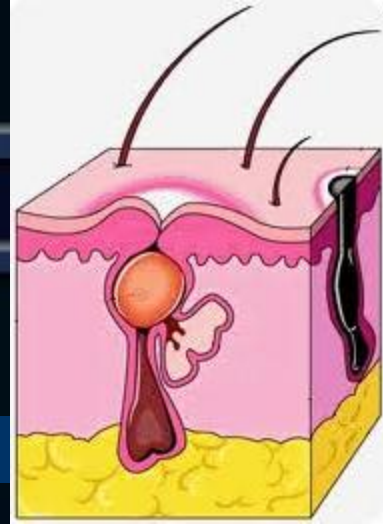


*late secondary stitches*



## Treatment of purulent wounds

- Treatment of purulent wounds is performed in two directions - **local** and **general** treatment. Besides that character of treatment is **determined by phase of wound process.**



# 1. Local treatment of purulent wounds

## Tasks of treatment in phase of inflammation:

- - Struggle against microorganisms in wound.
- - Providing adequate drainage of exudates.
- - Help fast cleaning of wound from necrotic tissues.
- - Decrease development of inflammatory reaction.

In local treatment of purulent wound methods of mechanical, physical, chemical, biological and mixed antiseptics are used. Sometimes it is necessary to do secondary surgical debridement (SSD) of wound.



# 1) Secondary surgical debridement of the wound

- The indication to SSD is presence of purulent source, absence of adequate outflow from the wound, formation of wide zones of necrosis. SSD is performed **after 3 days and late**. The contraindication is only terminally poor state of patient. **Tasks of SSD of wound:**
  - - opening of purulent focus;
  - - cutting of unlivable tissues.
  - - providing adequate drainage of wound.
- In this case besides palpatory examination different kinds of instrumental diagnostics are used: ultrasound method, tomographic, x-ray (osteomyelitis), computer tomography and other.

## 2) Treatment of purulent wound after the operation (PSD, SSD)

### medicamental treatment in First phase of wound healing

- In the first stage of healing, when massive exudation occurs, the ointment preparations can't be used as they form an obstacle for an outflow of detached substances, in which there are many bacteria, products of proteolysis, necrotic tissues. During this period the bandage has to be maximally hygroscopic and contain antiseptics. They can be: 3% solution of boric acid, 10% solution of sodium chloride, 1% solution of dioxydine, 0.02% solution of chlorhexidine etc. Usage of water-soluble ointments: "Levorine", "Miramistin" "Levomekolum", "Levosynum", "Levonorsynum", "Sulfamekolum" and 5% dioxudine ointment is available only on 2nd- 3rd day.

- **"Chemical necrectomia"** is using proteolytic ferments (necrolytic and anti-inflammatory action). There are Tripsine, Chymotrypsine, Chymopsyn.
- **Physical methods of influence are used:** ultrasound cavitation of wounds, vacuum treatment of purulent cavity, treatment by pulsing stream, different methods of using of laser, bioptron, ultraviolet lightening are widely used. All these methods stimulate the cleaning from necrotic tissues and have damaging effect on microbial cells.

### 3) Treatment in phase of regeneration (second phase of wound healing)

- In the phase of regeneration, when the wound is cleared from unlivable tissues and inflammation decreased, the main purpose is suppression of infection and stimulation of reparative processes.
- Granulations are very tender and vulnerable, that is necessary to use medicine drugs reparation on ointment basis, which prevent mechanical traumatization. Antibiotics (syntomycine, tetracycline, hentamycine ointments etc.), stimulating substances (5% and 10% methyluracyl acid, "Solcoseryl", "Actovegyn") are introduced into the content of ointments, emulsions and liniments.



Cont..

- **Multicomponent ointments** are widely used. They contain anti-inflammatory, regeneration stimulative substances and substances which improve the regional blood circulation, antibiotics. These are: "Levometoxyd", "Oxyzon", "Oxycyclozol", "Dioxysol", "Oflokain" and other.
- **Secondary stitches** (early and late) are applied

## 4) Treatment of the wounds in phase of formation and reorganization of scar

### (Third phase of wound healing )

- In third phase of healing main task is to accelerate the epithelization of the wound and to protect it from additional traumatization. Bandages with indifferent and stimulating ointments, physiotherapeutic procedures are used for this purposes.

## 5) Physiotherapeutic treatment

- Physiotherapeutic procedures play an important role in curing of purulent wounds.
- In the first phase UHF (ultra-high frequencies) and ultraviolet radiation in erythematic dose, electro- and phonophoresis are used. In the second and third stages of wound process UV-radiation, laser radiation by defocused ray, magnetic field are used.
- During the whole period of wound process hyperbaric oxygenation is used, which improves the oxygen supply of the tissues.

# Promotion of Wound Healing

Dressings: keep wound covered & clean

- Wound bed moist / Surrounding skin dry
- Debridement when necessary
- Remove exudate:  
Drains, Wound VAC, Irrigation
- Pack wounds loosely
- Nutritional interventions



## **6) Treatment in abacterial environment**

- For massive wound defects and burns treatment in controlled bacterial medium is successfully used. There are isolators of common and local types. The whole patient isolation is necessary in treatment of patients with decreased tolerance to infection: after oncology operations, supported by massive chemical therapy or radiation treatment, in transplantation of the organs, combined with constant taking of immune de-pressants, that decrease the reaction of tearing away (отторжения), and also in different diseases of blood, which cause the disorder and depressing of lymph- and leucopoiesis.
- Treatment in abacterial environment is provided without applying bandage. The following parameters are maintained constant: temperature - 26-32°C, pressure - 5-15 mm Hg, relative humidity (относительная влажность) - 50-65% (depending character of wound process).

## 2. General treatment

General treatment of wound infection has several directions:

- • **Antibacterial therapy.**
- • **Desintoxication** The choice of the method of desintoxication depends on expressiveness of intoxication and on difficulty of patient's state (infusion of salt solutions, method of forced diuresis, using of desintoxicative solutions, extracorporal methods of detoxication)
- • **Immune correcting therapy** (Interferon, levamysol, preparations of thymus (thymalin, thymosyn, T-activin, interleukine-1 ("Betaleukine"), interleukine-2 ("Ronkoleukine")).
- • **Anti-inflammation therapy** (preparation of salicylatis group, steroid and nonsteroid anti-inflammation remedies).
- • **Symptomatic treatment** (with hard disfunction of different organs and systems).

# Wound Dressing Principles

- If exudate is present - Select one that absorbs exudate.
- Keep wound bed moist but surrounding skin dry
- Pack wounds loosely to avoid pressure on new granulation tissue
- Fasten securely using tape, binders etc...  
OR self-adhesive type dressing materials.

# Dressings for DRY wounds

- **Transparent:** gas exchanged between wound & environment but bacteria prevented from entering. Creates moist healing environment Example: Tegaderm
- **Hydrogels:** High water content enhances epithelialization and autolytic debridement. Needs cover dressing and wound edge barrier Example: Carrasyn
- **Wet – to- Moist Gauze dressings:** keeps wound bed moist. Minimizes trauma to granulation tissues



# Dressings for DRY wounds



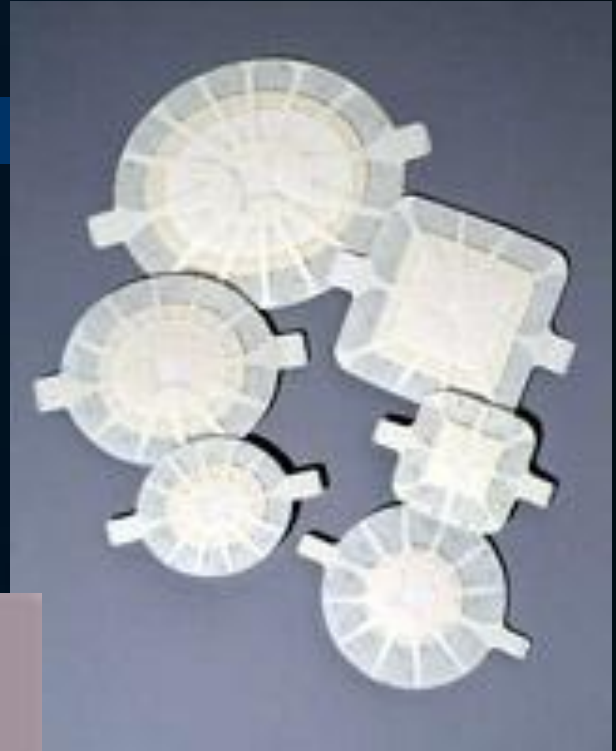
**Wet – to Moist Gauze**



# Dressings for MOIST wounds

- **Hydrocolloid:** hydrophilic particles mix with water to form a gel... wound stays moist. DO NOT use in infected wounds.  
Example: Duoderm
- **Absorption Materials:** beads, powders, rope or sheets that absorb large amount of exudate  
Example: Calcium Alginate
- **Foam:** Made of hydrophilic material. Highly absorbent.  
Example: Allevyn
- **Dry Gauze:** Can absorb wound drainage. Can be impregnated with agents to promote healing

# Dressings for MOIST wounds



# Irrigations

- Cleanses a wound using pressure
- Sterile Normal Saline = usually prescribed
- Avoid caustic agents ie: peroxide, iodine etc.
- Pressure between 4-15 pounds per square inch (psi) i.e. 60ml syringe with catheter tip



# Other Therapies

- **Wound V.A.C.** – negative pressure vacuum assisted closure system. Removes drainage and helps wounds close.
- **Hydrotherapy** – Pulse lavage, Whirlpool  
Aids in debridement and cleansing, warm water vasodilation.
- **Hyperbaric Oxygen**
- **Electrical Stimulation**

# Other Therapies



**Electrical Stimulation:**  
- electrical signals direct  
cell migration in wound  
healing

# Bandages & Binders

- Secures dressings in place
- Determine size needed
- Outer covering must cover entire wound
- Tape to secure (initial, date time)

# Heat & Cold Therapy

- **Heat-** reduces pain & promotes healing through vasodilation
- Increases oxygen and nutrients to aid in inflammatory response
- Reduces edema by promoting removal of excessive interstitial fluid
- Promotes muscle relaxation



# Heat & Cold Therapy

- **Cold-** decreases pain by vasoconstriction
- Decreased blood flow to the area decreases inflammation and edema
- Raises the threshold of pain receptors thereby decreasing pain
- Decreases muscle tension

# Safety Precautions Heat & Cold Therapy

- Need physician's order
- Very young and very old
- Peripheral vascular disease
- Decreased LOC
- Spinal cord injury
- Presence of edema and/or scar tissue
- NO LONGER than 20-30minutes at a time.  
Rebound phenomena

# Options for Wound Closure

## Sutures



- Non-absorbable sutures
  - Tinsel strength 60 days
  - Non-reactive
  - Outermost closure

# Sutures



- Absorbable sutures
  - Synthetic > natural
  - Synthetic increases wound tensile strength
  - Deeper layers
  - Avoid in highly contaminated wounds
  - Avoid in adipose tissue
  - Synthetic & monofilament > natural & braided

# Sutures

- Advantages

- Time honored
- Meticulous closure
- Greatest tensile strength
- Lowest dehiscence rate

- Disadvantages

- Requires removal
- Requires anesthesia
- Greatest tissue reactivity
- Highest cost
- Slowest application



# Staples



- More rapidly placed
- Less foreign body reaction
- Scalp, trunk, extremities
- Do not allow for meticulous closure

# Staples

- Advantages

- Rapid application
- Low tissue reactivity

- Disadvantages

- Less meticulous closure
- May interfere with some older generation imaging techniques (CT, MRI)

# Adhesive Tapes



- Less reactive than staples
- Use of tissue adhesive adjunct (benzoin)
- Poor outcome in areas of tension
- Seldom used for primary closure
- Use after suture removal

# Adhesive Tapes

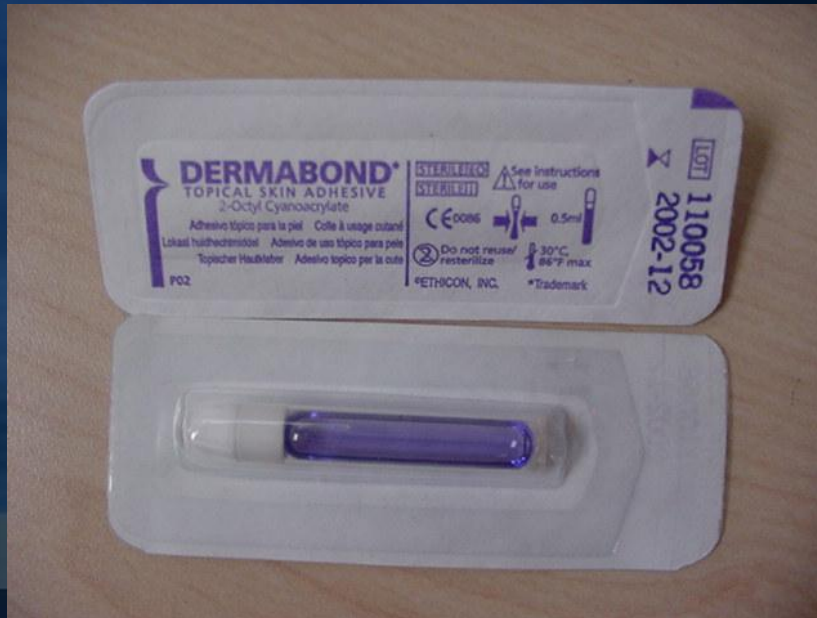
- Advantages

- Least reactive
- Lowest infection rate
- Rapid application
- Patient comfort
- Low cost
- No risk of needle stick

- Disadvantages

- Frequently falls off
- Lower tensile strength than sutures
- Highest rate of dehiscence
- Requires use of toxic adjuncts
- Cannot be used in areas of hair
- Cannot get wet

# Tissue Adhesives



- Dermabond, Ethicon
- Topical use only
- Outcome equal to 5-0 and 6-0 facial repairs
- Less pain and time
- Slough off in 7-10 days
- Act as own dressing
- No antibiotic ointment



# Tissue Adhesives

- Advantages

- Rapid application
- Patient comfort
- Resistant to bacterial growth
- No need for removal
- Low cost
- No risk of needle stick

- Disadvantages

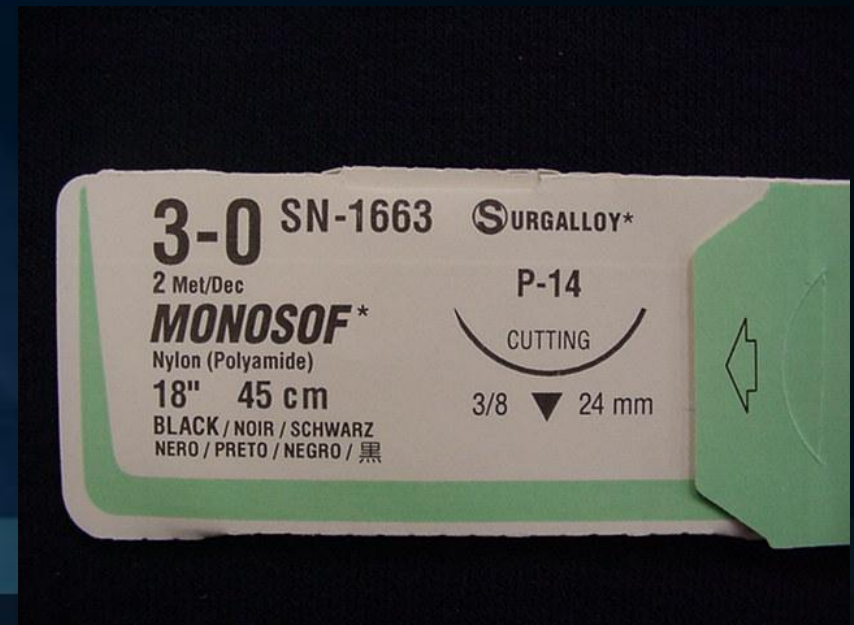
- Lower tensile strength than sutures
- Dehiscence over high tension areas (joints)
- Not useful on hands
- Cannot bathe or swim

# Post-procedural Care

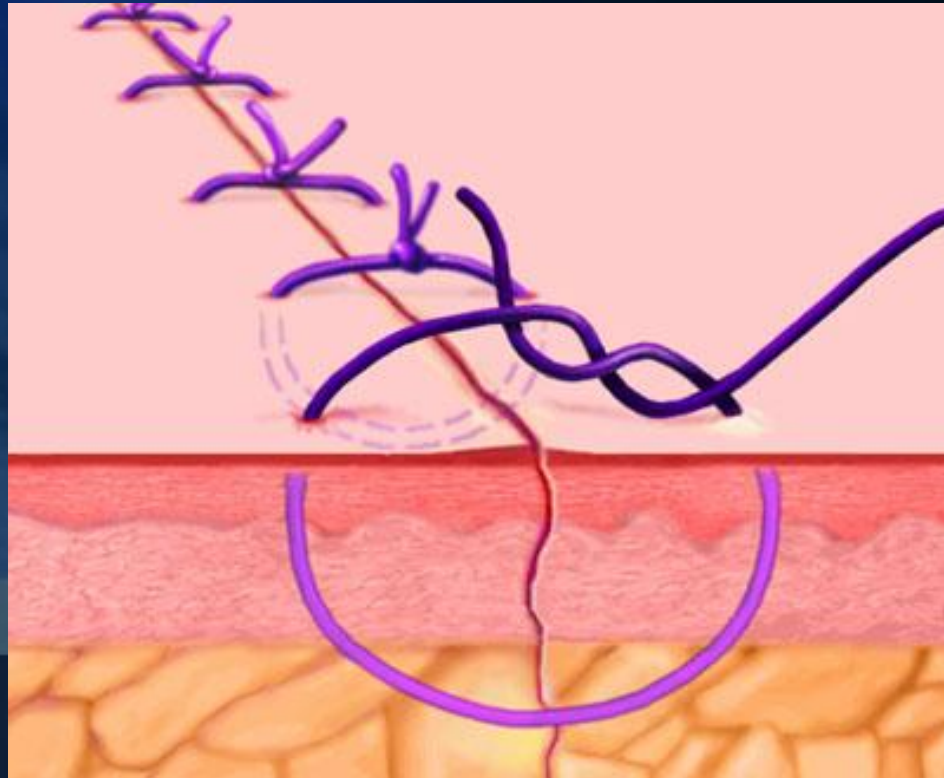
- Dressing for 24-48 hours
- Topical antibiotics
- Start cleansing in 24 hours
- Suture/staple removal
  - Face 3-5 days
  - Non-tension areas 7-10 days
  - Tension areas 10-14 days

# Choosing Your Suture

- 6-0
  - Face
- 5-0
  - Chin
  - Low tension/detail
- 4-0
  - Large laceration
  - Moderate tension
- 3-0
  - Significant tension



# The Interrupted Stitch



# The Interrupted Stitch

- Instrumentation

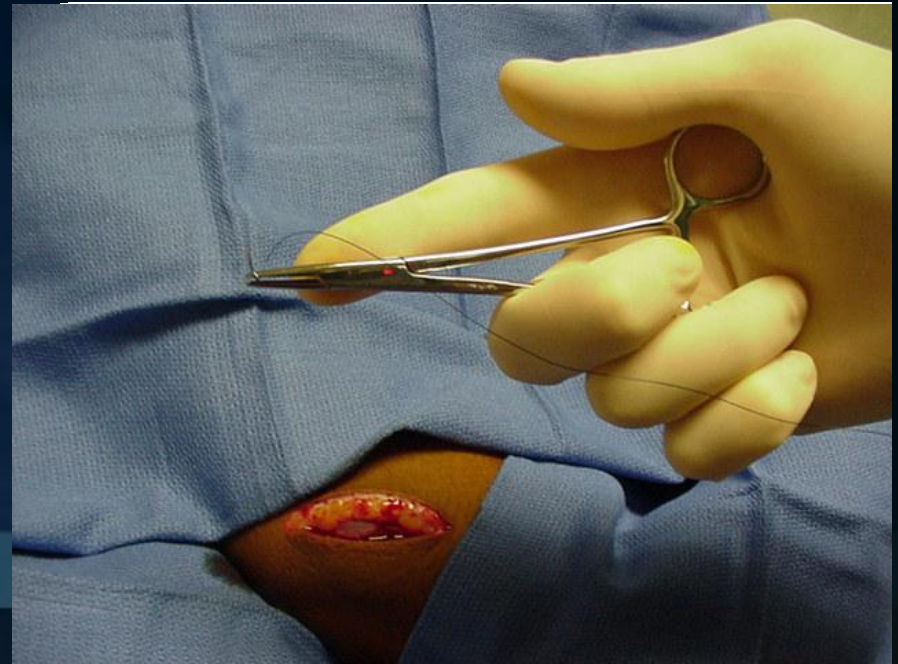
- Hemostat
- Scissors
- Forceps with teeth
- Plain forceps
- Control syringe
- Tub for saline
- Gauze
- Sterile towels
- Syringe and splash shield





# The Interrupted Stitch

- Finger tip grip
- Palm grip
- Grip needle one-third of way from thread



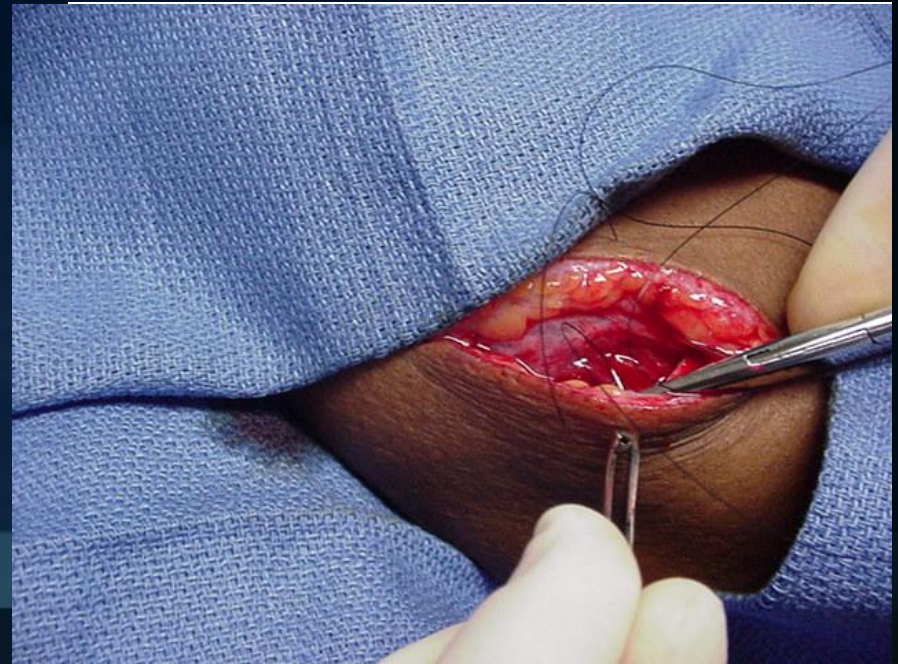
# The Interrupted Stitch

- Curl needle into dermis of 1<sup>st</sup> side



# The Interrupted Stitch

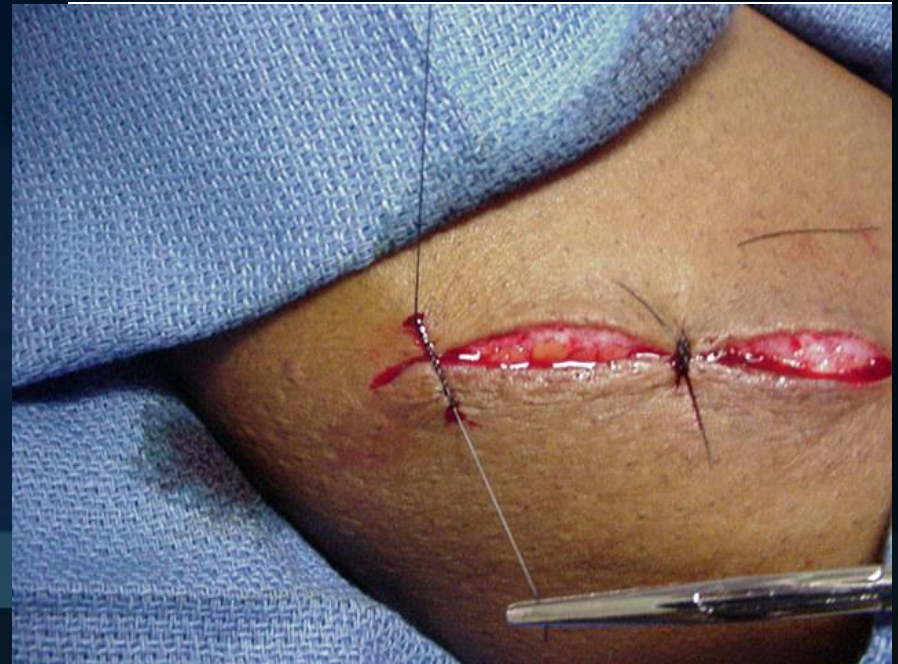
- Curl needle into dermis of 1<sup>st</sup> side
- Curl needle trough parallel opposite subcutaneous side





# The Interrupted Stitch

- Curl needle into dermis of 1<sup>st</sup> side
- Curl needle trough parallel opposite subcutaneous side
- Tie square knot with at least two braids



# The Interrupted Stitch

- Curl needle into dermis of 1<sup>st</sup> side
- Curl needle trough parallel opposite subcutaneous side
- Tie square knot with at least two braids
- Repeat three to four throws



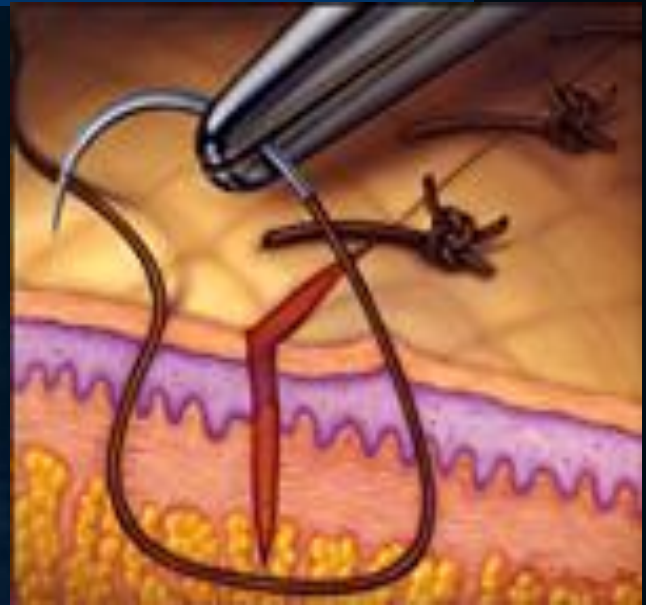


# Procedure Note

- 6cm right upper arm laceration repair
  - 1% lido c/ epi, irrigated c/ NS, betadine prep and sterile drape. Explored: no vascular involvement, barely into muscle body of triceps. Closed with 4.0 monosoft interrupted sutures. Good wound edge approximation. Topical antibiotics and dressing. Tolerated procedure well.

# Points to Remember

- Specific points affecting wound healing
- Evaluation of laceration and neurovascular assessment
- Types of sutures
- Staples
- Adhesive tapes
- Tissue adhesives



# Points to Remember



- Advantages vs disadvantages
- Post procedure care
- Choosing your suture
- Instruments
- Be able to perform interrupted suture for lab final

# Suturing methods:

- Simple interrupted
- Simple running
- Horizontal mattress
- Vertical mattress
- Running subcuticular (intradermal)

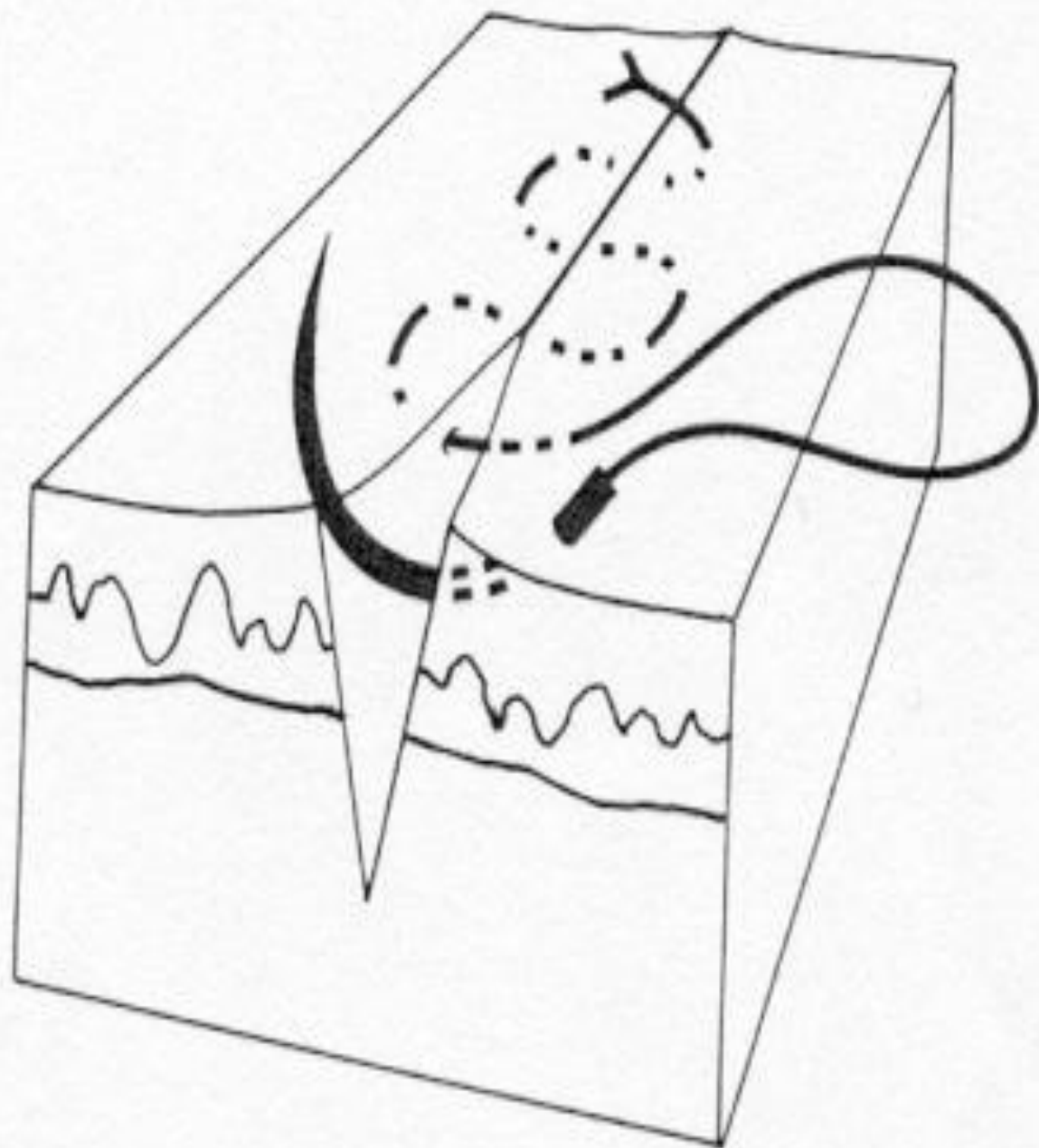
# Simple Interrupted:

- Most common
- Easy to master
- Can adjust tension with each suture
- Stellate, multiple components, or directions wound



# Simple Running:

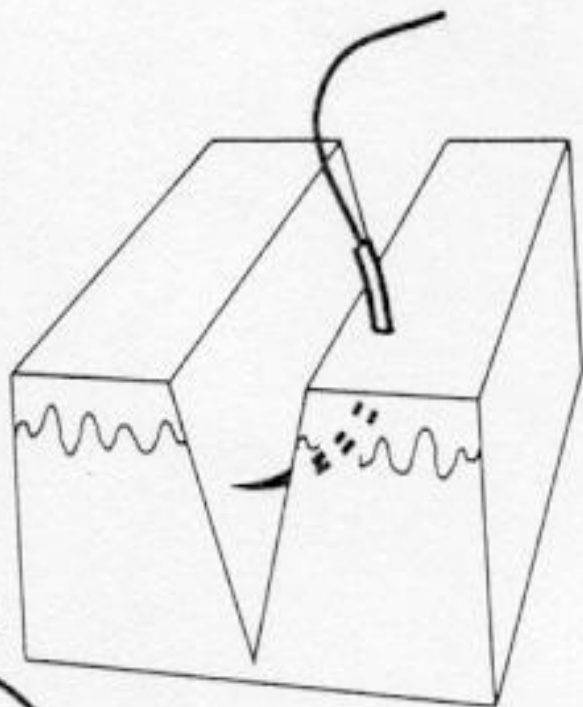
- Minimize time of suture repair
- Even distribution of tension
- Low-tension, simple linear wounds
- Removed within 7 days to avoid suture marks
- Optimal suture material is nonabsorbable



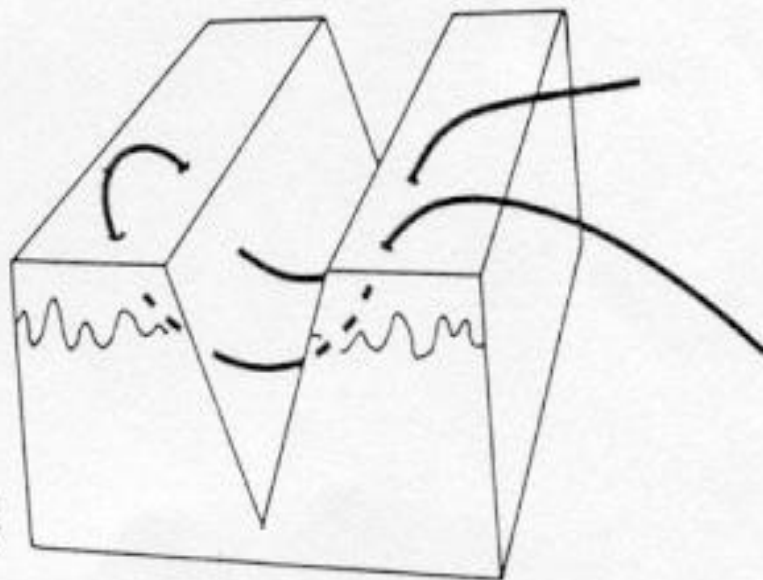
# Horizontal Mattress:

- Cause wound edges eversion
- Single layer closure with significant tension
- Decrease repair time, less knots required
- Need delayed suture removal, so risk of suture marks

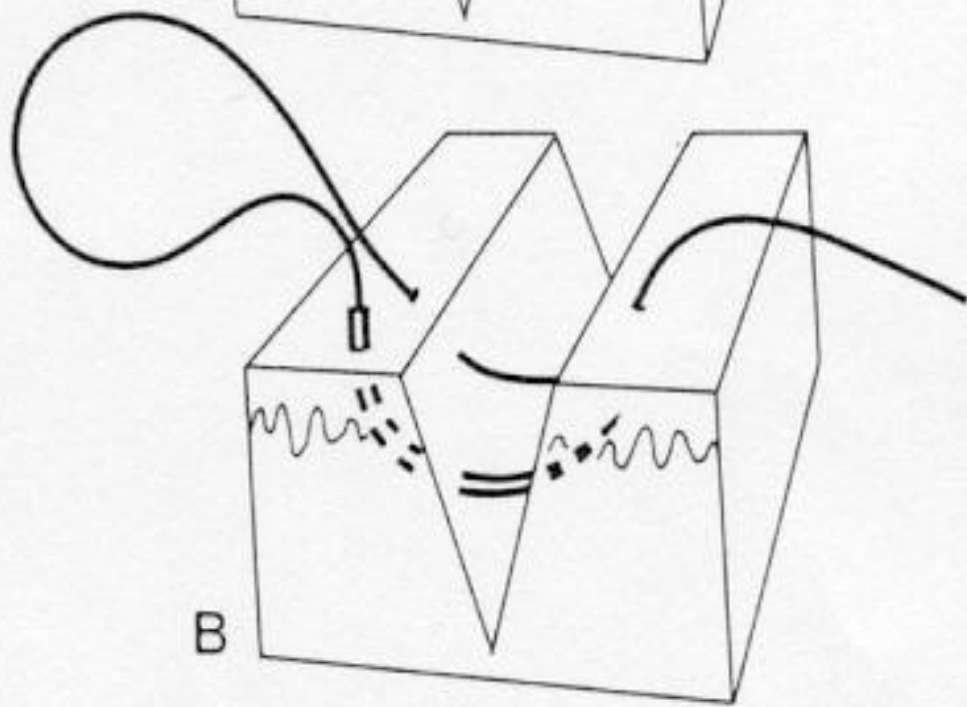
A



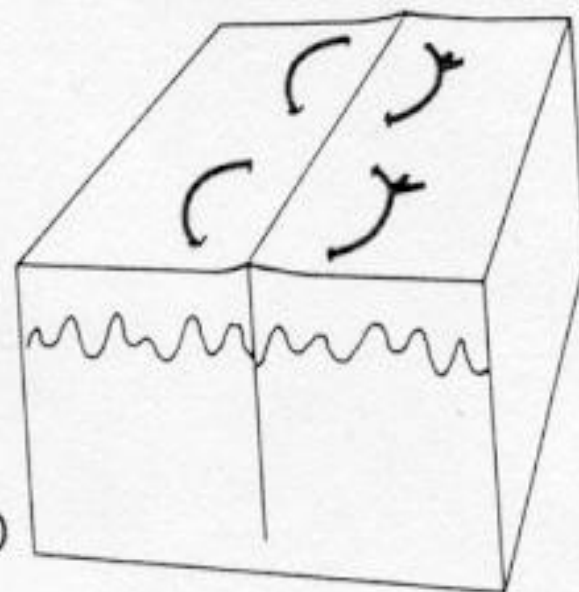
C



B



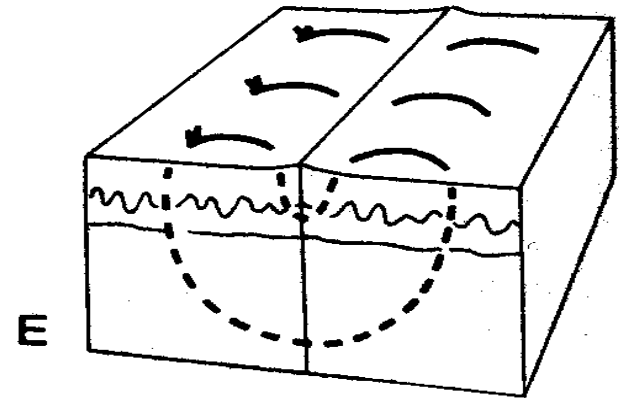
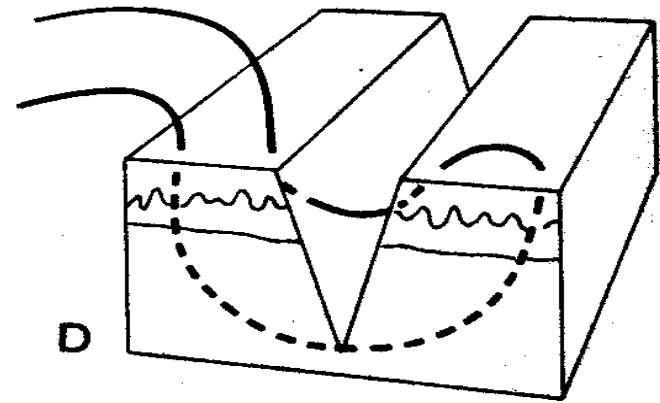
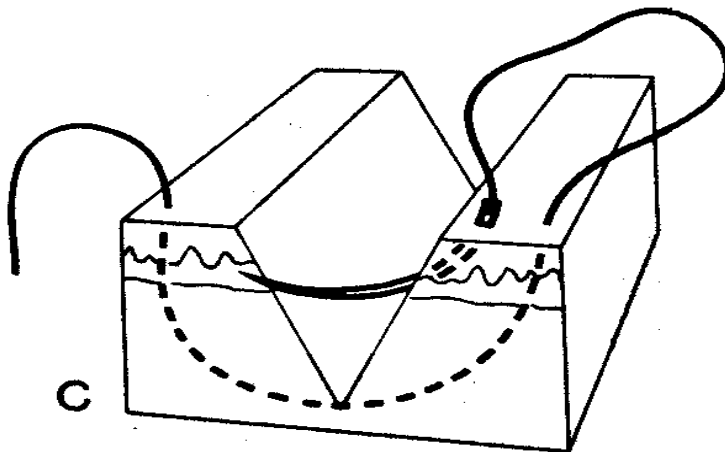
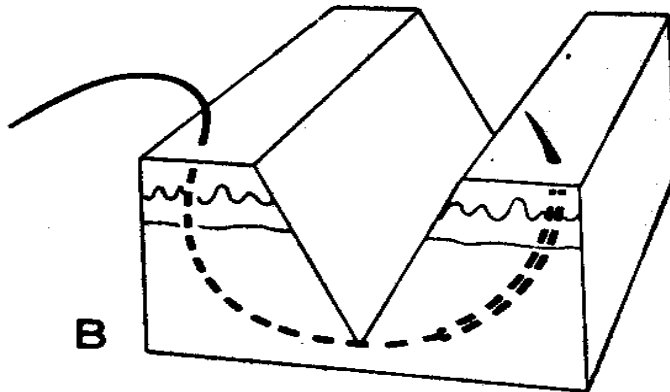
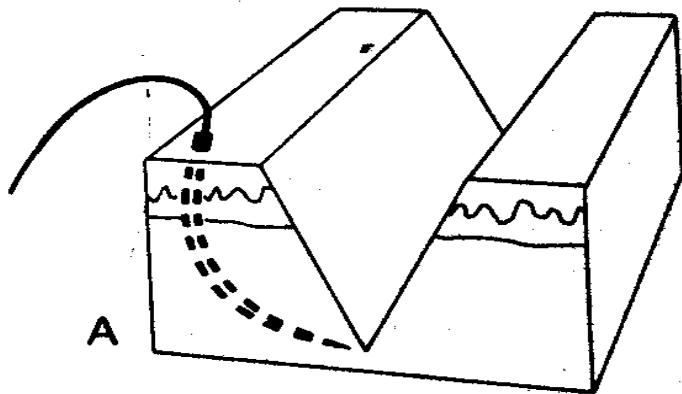
D



# Vertical Mattress:

- High-tension wounds
- Prone to skin suture marks if left in too long

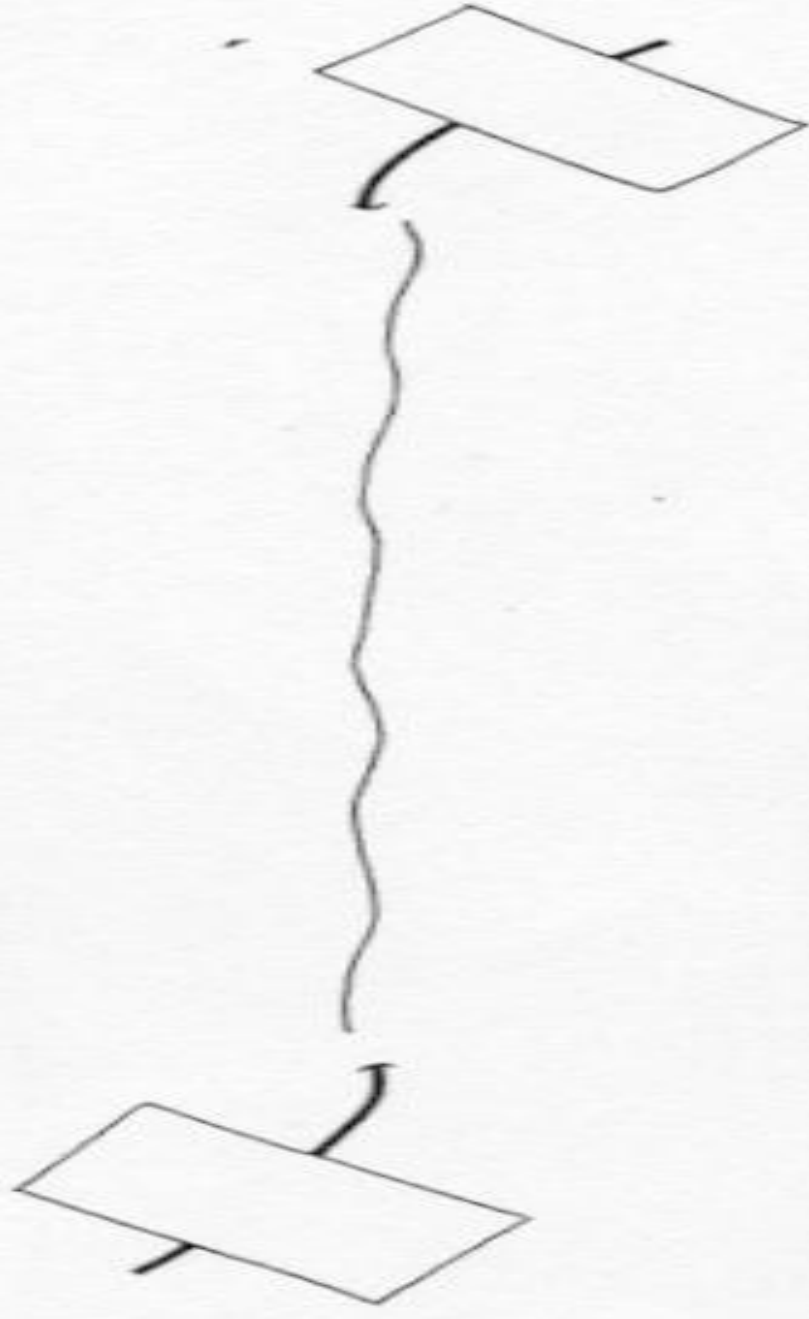
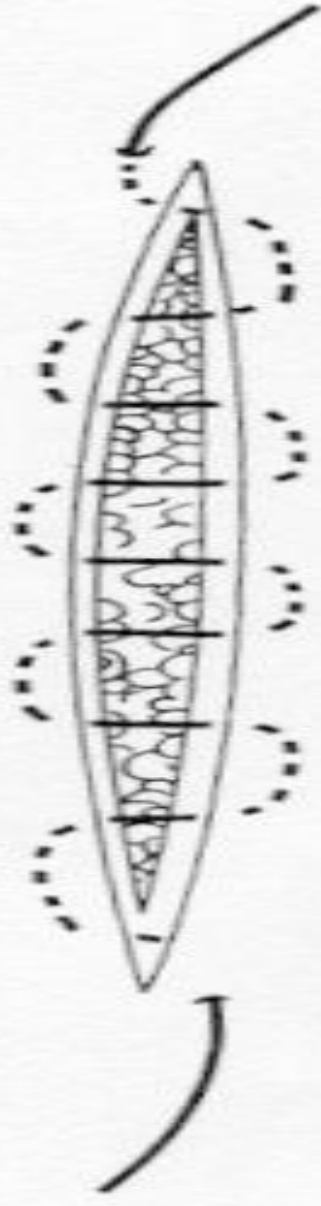




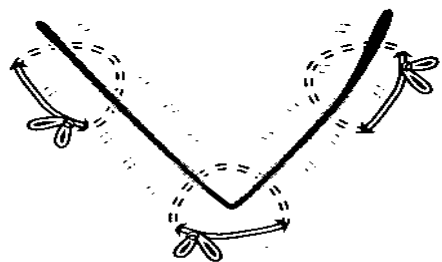
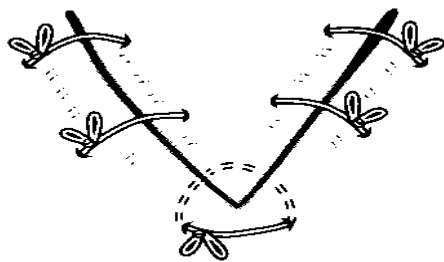
**Figure 5.** With a vertical mattress suture, the technique is begun in the same way as a simple skin suture, but the wound is entered and exited a generous distance from the edge. Then the needle is resecured to the holder, and with a backhand technique the wound is reentered and exited about 1 to 2 mm from the edge. The suture is tied in the usual fashion. (From Simon RR, Brenner BE: Plastic surgery principles and techniques. *In* Procedures and Techniques in Emergency Medicine. Baltimore, Williams & Wilkins, 1982, p 291; with permission.)

# Running Subcuticular (Intradermal):

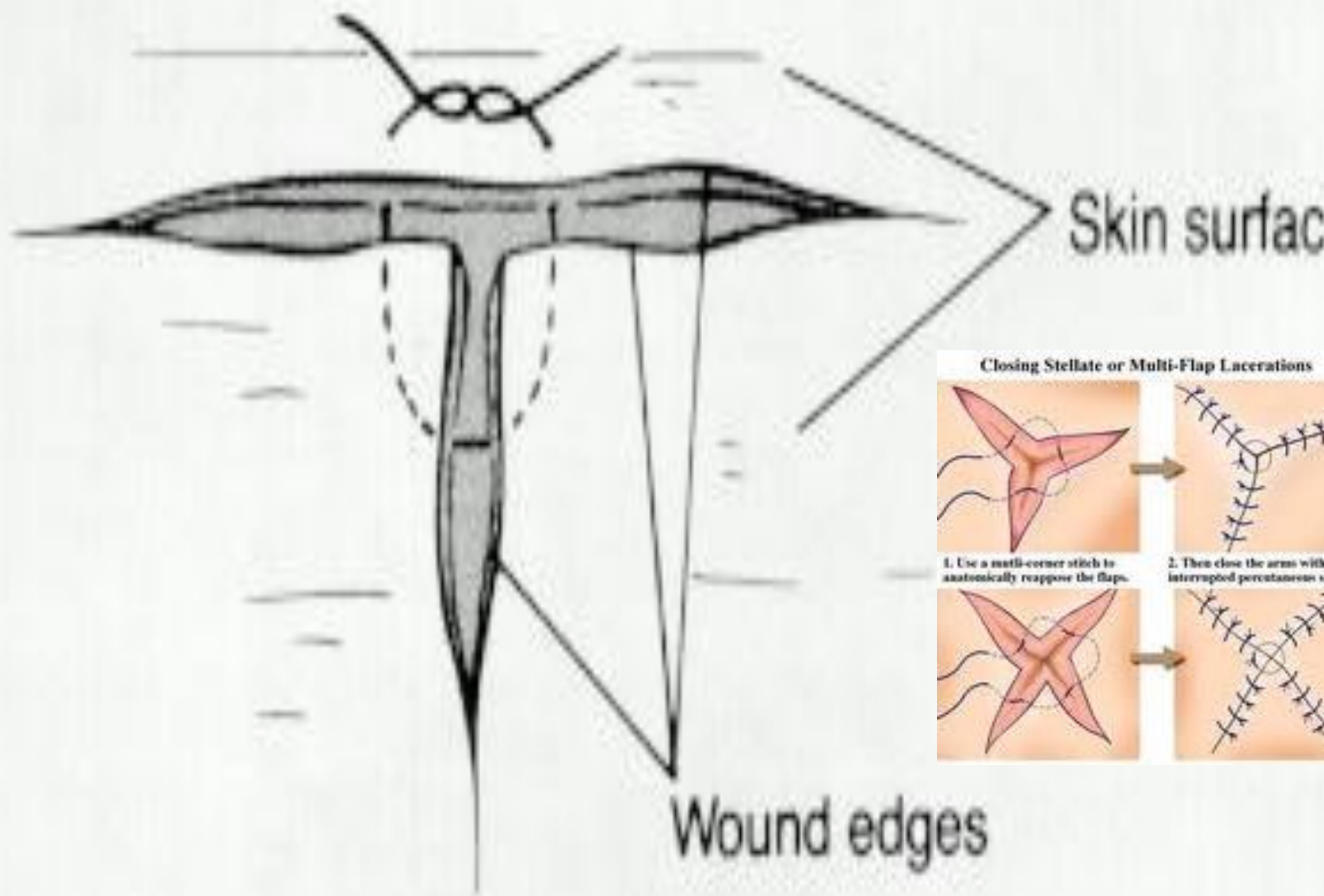
- Best for areas where cosmetic result is of utmost importance
- Time-consuming
- Difficult to master
- Low tension wounds
- Absorbable suture

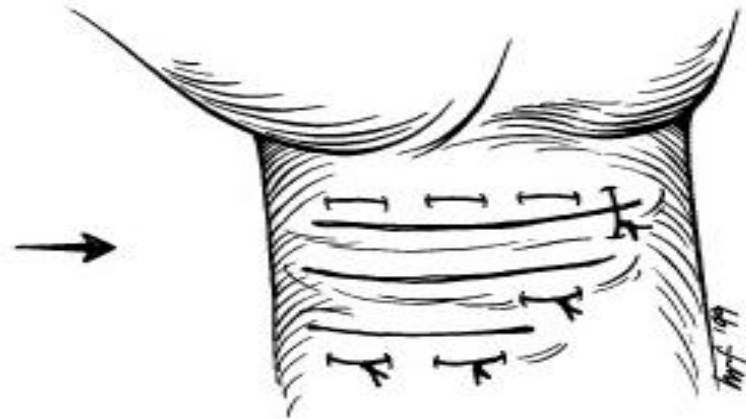
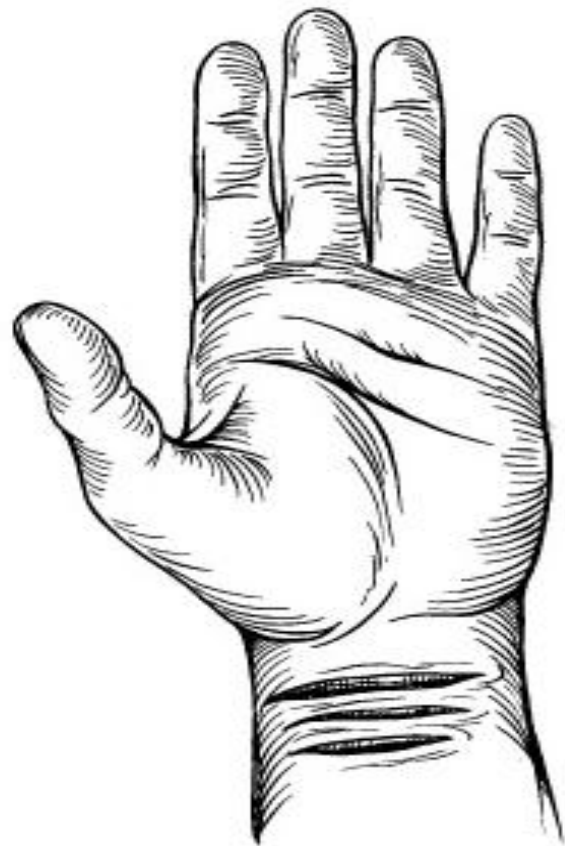
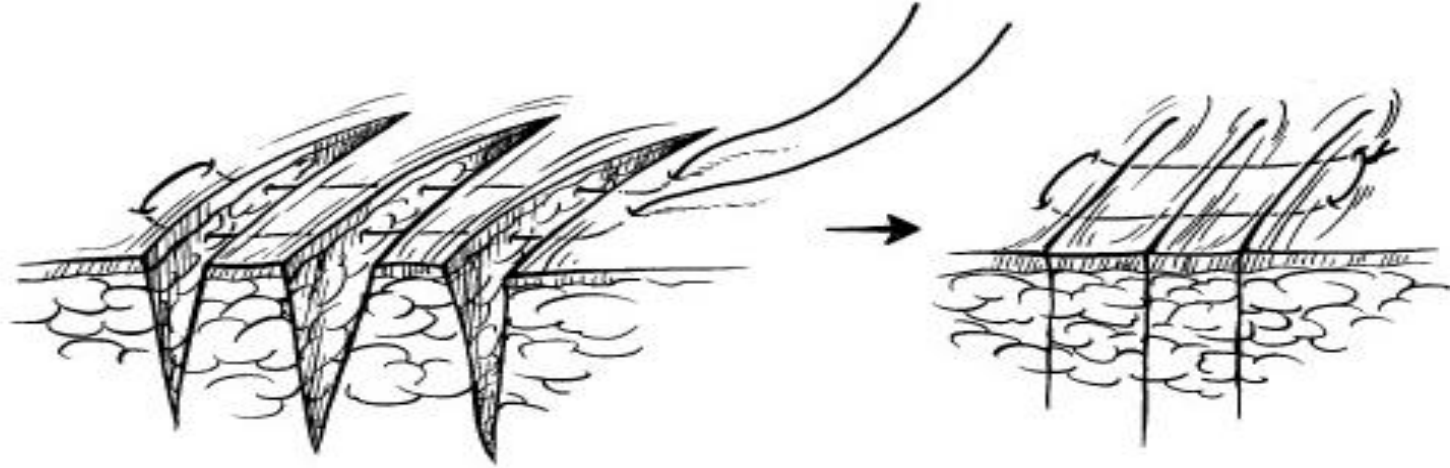


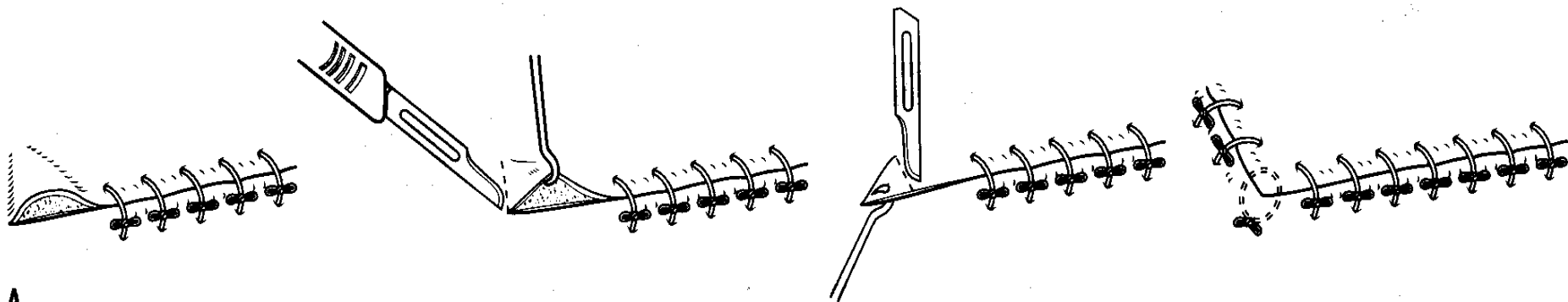




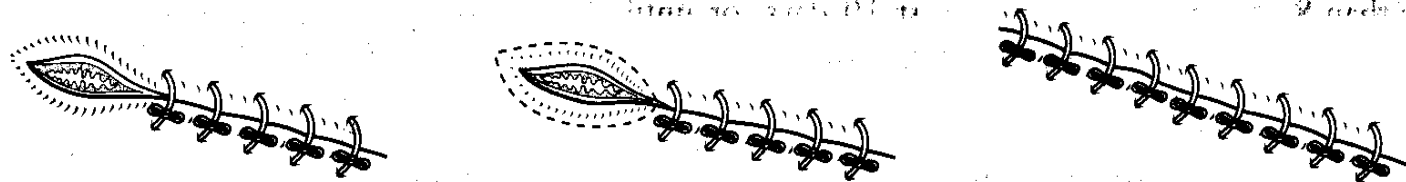




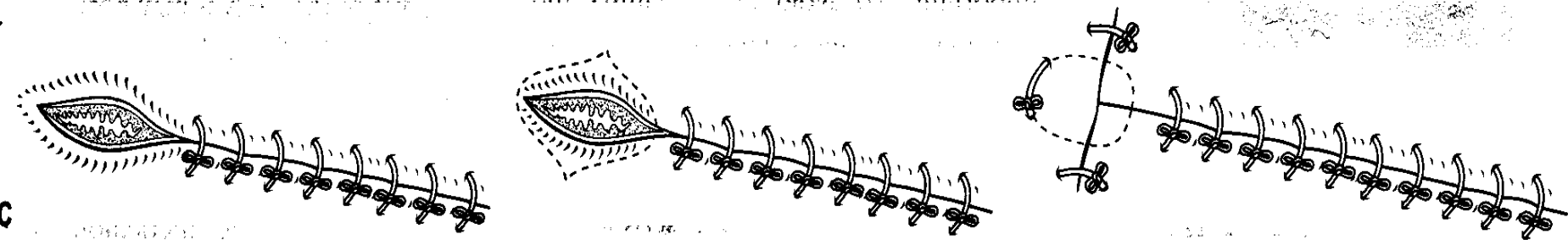




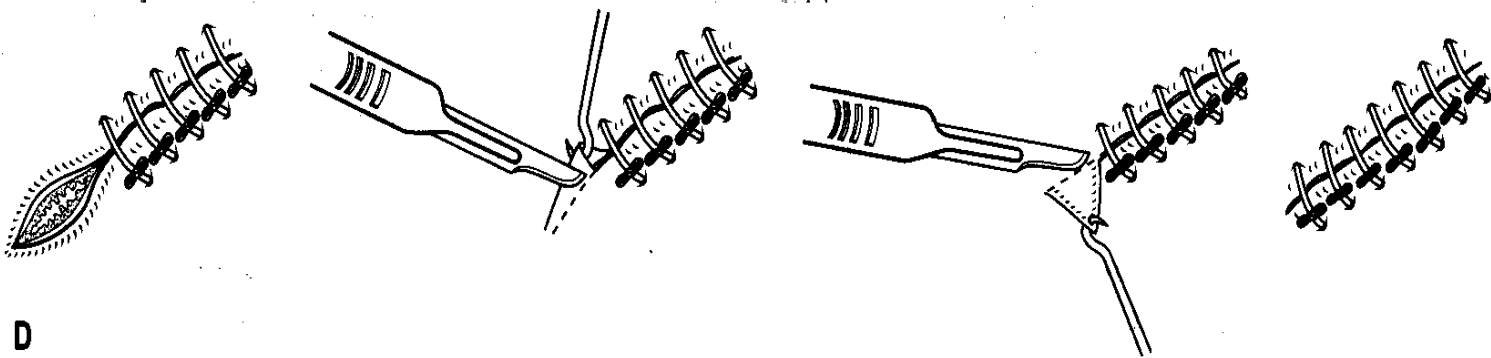
A



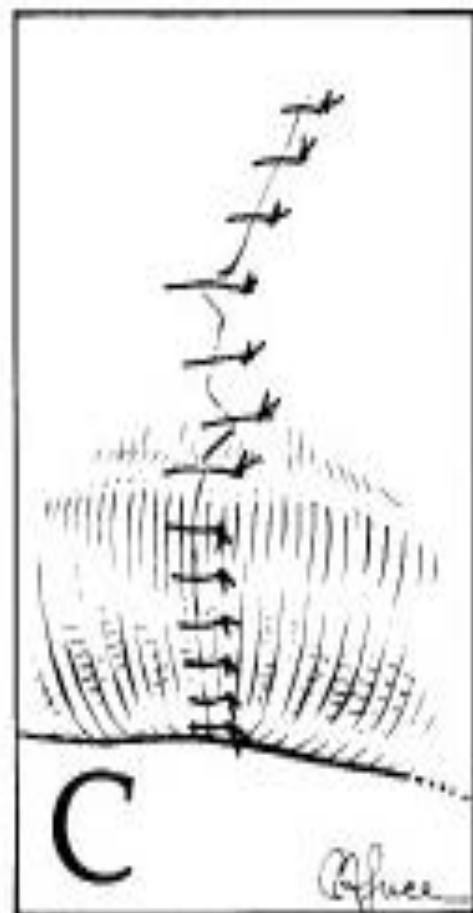
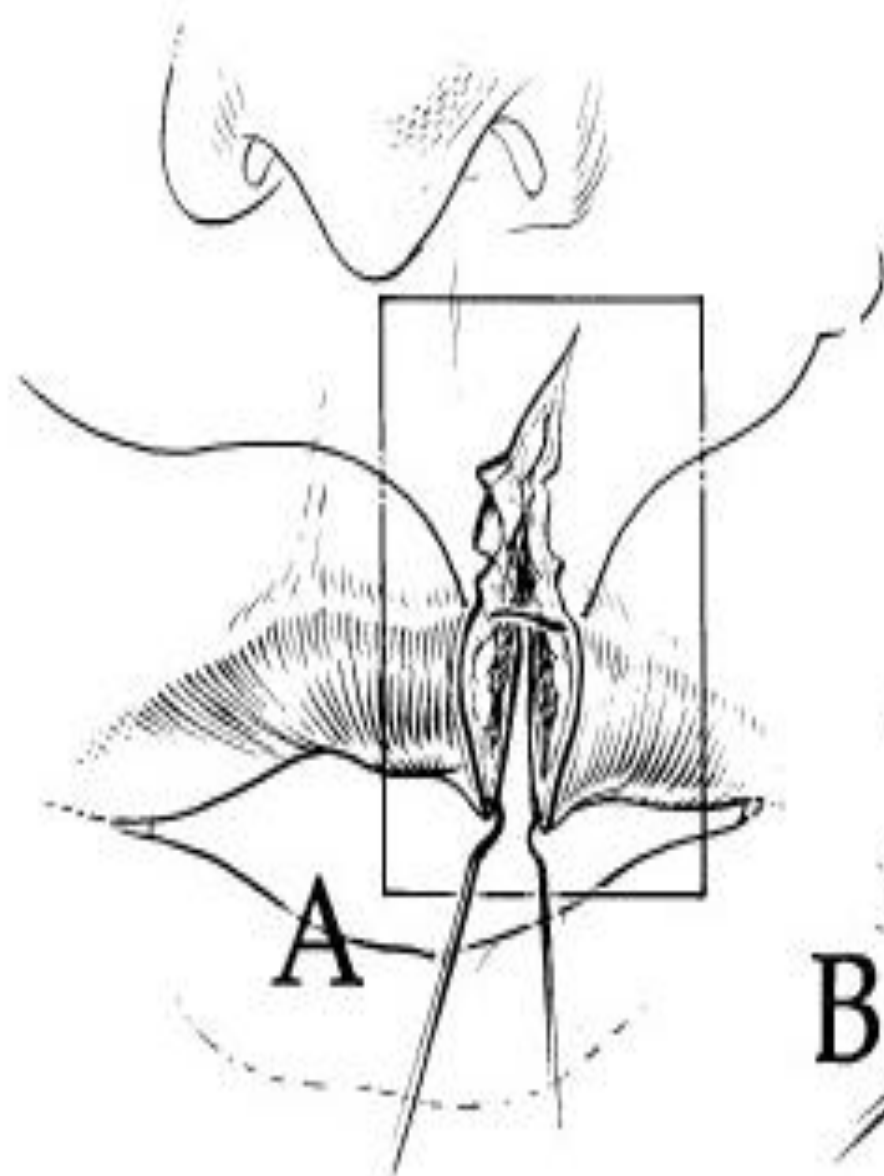
B



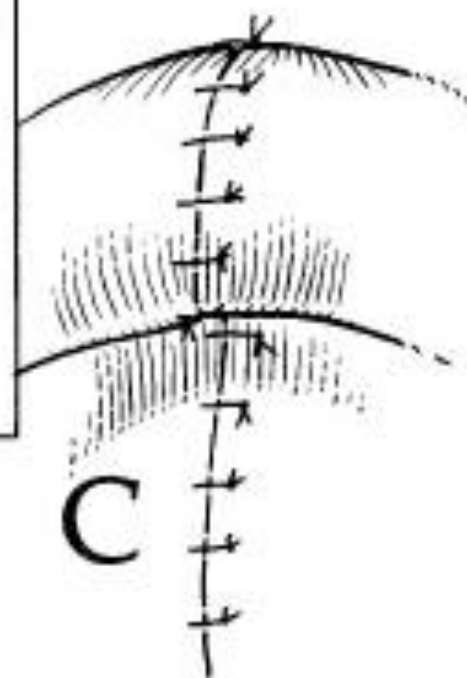
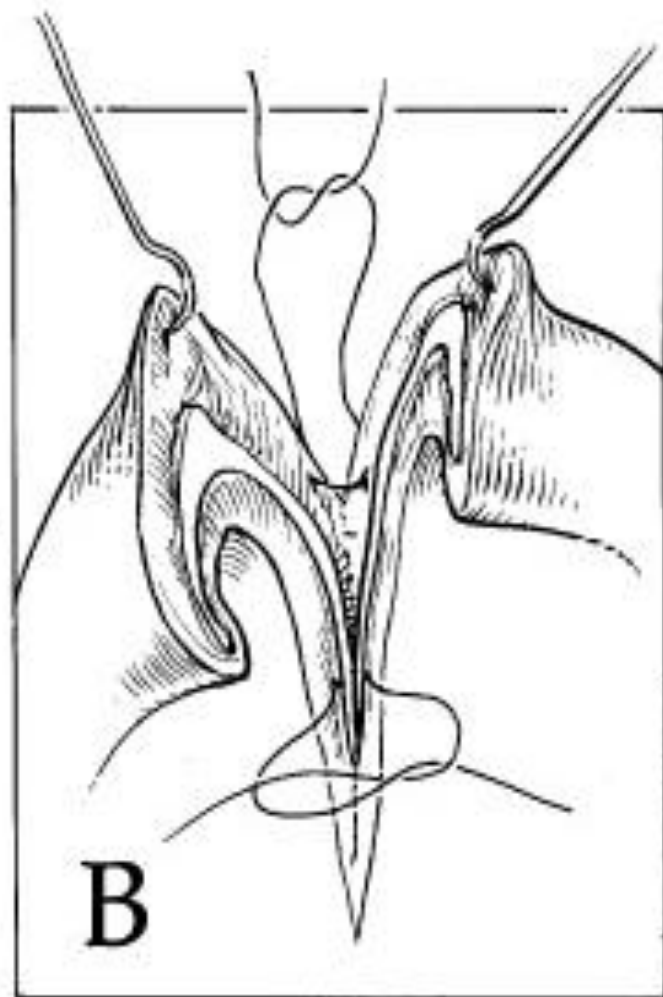
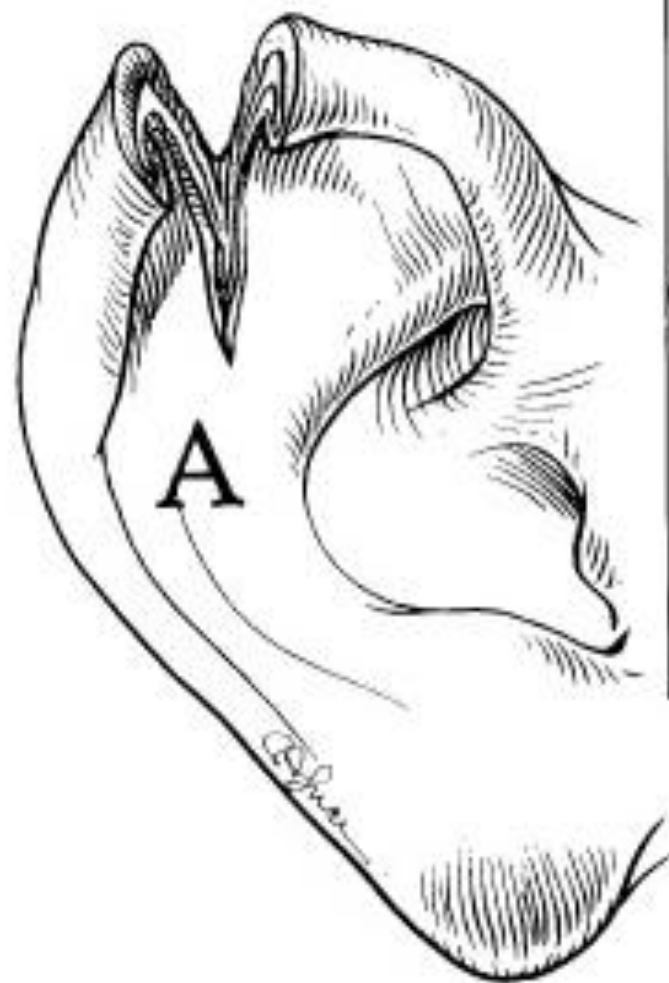
C



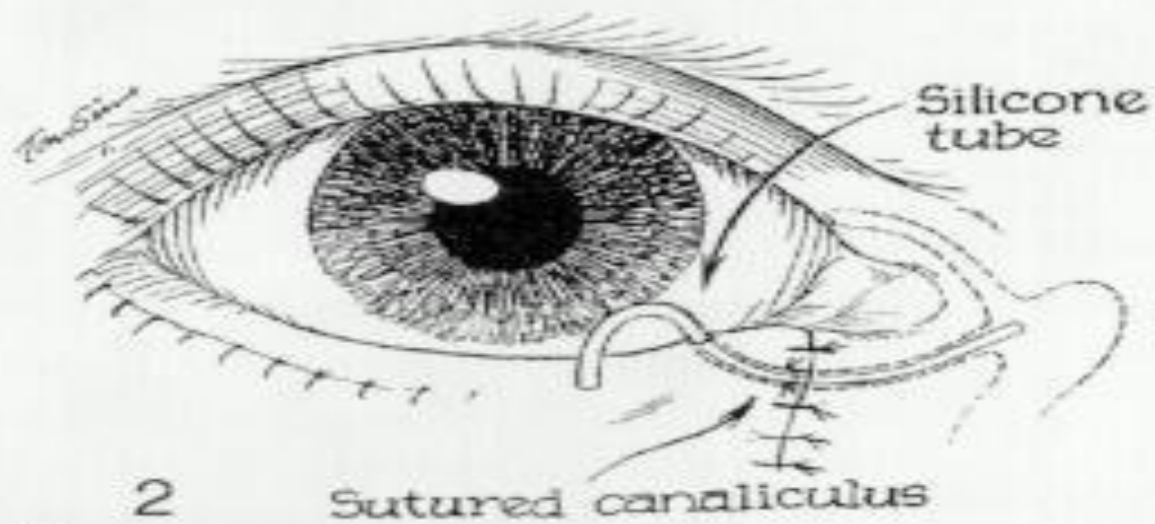
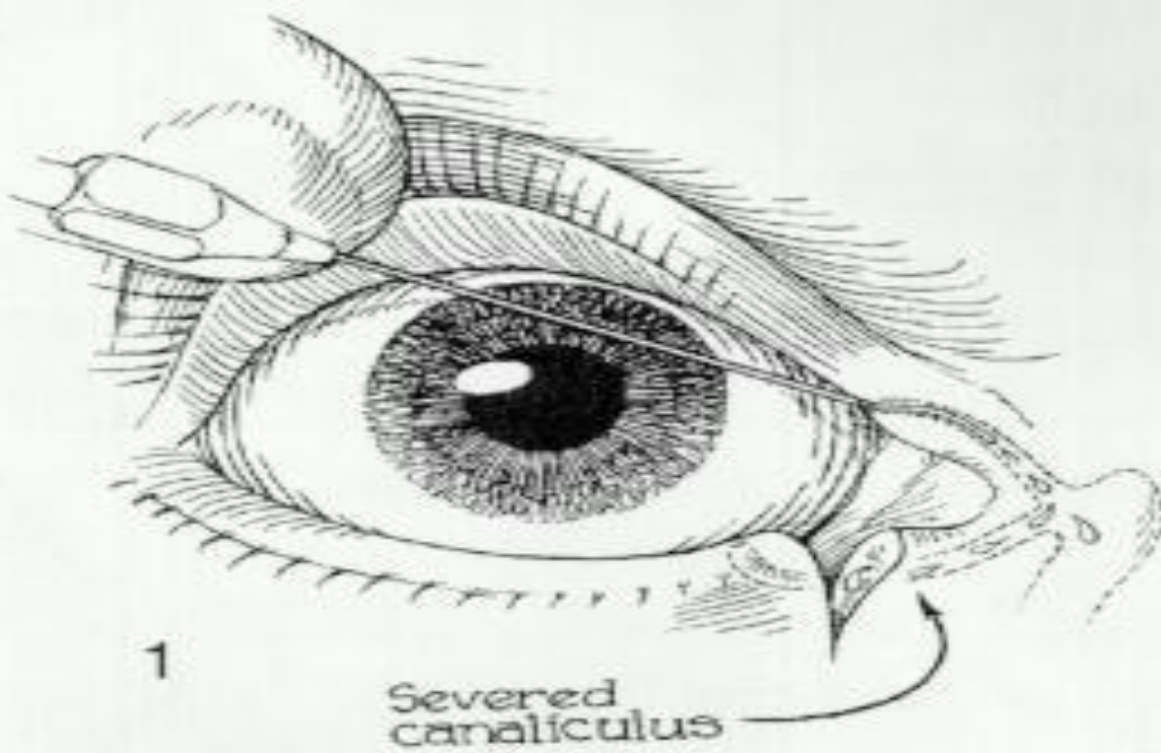
D



Orbicularis Oris Muscle








B

**Questions?**



SUTURE TRAY... UMM...  
NURSE NICELY, DO YOU  
MOONLIGHT AS A  
COCKTAIL WAITRESS?

WOW... HOWEVER  
DID YOU  
GUESS?

HMM... MAYBE  
HE'LL LEAVE  
A TIP...

je

**Thank you!!!**



**Together, we can make a  
difference!**

