



S BASIC
SUTURING
SKILLS



B . S . S

Basic Suturing Skills

Sutures, needles and wound care techniques. Basic suturing skills course gives you the opportunity to understand the basics of wound management and allows you to practice simple suturing in preparation for your future.

To help you collect what you learned on this course, this booklet was made as a complimentary guide for you. Though it doesn't replace standard more in-depth books and other resources.

Students involved in this project are named below:

- Abdullah Suliman Yamani
- Abdulmohsen Mohammed Alsofi
- Abeer Adel Saleh
- Ahmed Yousef Shebly
- Abrar Mohammedsaleh Farran
- Batool Farhoun Qari
- Fatima Abdullrahim Alghabban
- Ghaidaa Abdulaziz Hawsawi
- Orjuana Mansoor Khudari
- Raghad Zuhair Aljurushi

This booklet has been edited by:

- Raghad Zuhair Aljurushi

This booklet has been revised by:

BASEM ALSHAREEF

MBBS,FRCS,ABC

Consultant surgeon

Table of Content

Topic	Page
Wound Healing and Management	
Phases of wound healing	6
Factors that affect wound healing	6
Type of wound closure	7
Wound assessment	7
Prevention of wound infection	9
Wound Closure	
Wound preparation	10
<i>Aseptic technique</i>	10
<i>Local Anesthesia</i>	10
Suture materials	12
Characteristics of suture material	15
Needle	16
<i>The anatomy of a needle</i>	16
<i>Types of needles</i>	18
Suturing instruments	19
Suture techniques	20
<i>Simple Interrupted Suturing</i>	20
<i>Continuous Suturing</i>	21
<i>Mattress Suturing</i>	21
<i>Subcuticular Suturing</i>	22
Knotting techniques	23
<i>Instrument knot</i>	23
<i>ONE handed knot</i>	25
<i>Two handed knot</i>	27
Wound care	30
<i>wound dressing</i>	30
<i>Suture removal</i>	31
Alternative Methods of Wound Closure	32

Wound healing and management

1. Phases of wound healing

Wound healing involves a complicated series of event that can be divided into three phases:

A- Inflammatory (4 days after tissue injury)

The main cells involved in this process are polymorphonuclear leukocytes (PMNs), platelets, and macrophages. Shortly after a wound occurs, PMNs appear and remain the predominant cell for approximately 48 hours. The neutrophil is not crucial for normal wound healing, but the macrophage is.

B- Proliferative (4 days to 3 weeks)

This phase begins only when the wound is covered by epithelium. It is characterized by the production of collagen in the wound. The wound appears less edematous and inflamed than before, but the wound scar may be raised, red, and hard. The primary cell in this phase is the fibroblast, which produces collagen.

C- Maturation (3 weeks to 1 year)

This phase is characterized by the maturation of collagen by intermolecular crosslinking. The wound scar gradually, flattens and becomes less prominent and more pale and supple. This phase is a time of great metabolic activity. Collagen is deposited in the wound, and existing collagen is remodeled and removed; thus, there is no net collagen gain in the wound.

2. Factors that affect wound healing

A- Local Factors:

- Wound cleaning.
- Good approximation of the edges.
- Bleeding must be controlled to prevent hematoma formation, which predispose wound to infection.
- Infection decreases the rate of wound healing and detrimentally affects proper granulation tissue formation, decreases oxygen delivery, and depletes the wound of needed nutrients.

B- Systemic Factors:

- Nutrition is an extremely important factor in wound healing.
- Uncontrolled diabetes mellitus or Hyperglycemia decrees wound healing .
- Medications like, steroids .
- Chronic illness (immunodeficiency disease , cancer, uremia, liver disease, and



jaundice) prevent wound healing

- Smoking
- Immunosuppression medication like steroid and chemotherapy impair healing.
- History of radiation, because it affects local wound healing by causing vacuities, which leads to local hypoxia and ischemia.

3. Type of wound closure

A- Primary Intention:

Acute wounds can be managed in several ways. The most common method is to primarily close the wound, resulting in *healing by primary intention*. The method applies to all surgical incisions and lacerations that are closed with sutures, staples, adhesive band, or any technique by which the surgeon intentionally approximates the epidermal edges of a wound. It also includes tissue transfer techniques and flaps that may be used to close larger defects.

B- Secondary Intention:

The wound is left to close by granulation . it takes longer than the previous method but generally it is good for infected wound where dressing is necessarily. Classically these wounds are treated with “wet-to-dry” dressings wherein a gauze sponge is moistened with saline and used to pack the wound, covered with a dry dressing; the moist sponge dries out, and when it is removed and changed once or twice a day, gentle debridement of the wound is achieved.

C- Delayed Primary Closure:

In delayed primary closure, sometimes called *healing by tertiary intention*, the wound is initially managed as a secondary intention wound, that is, left open with dressing changes. After some times, when the wound is clean and granulation tissue is abundant, the wound edges are actively approximated. This approach is successful because granulation tissue, while not sterile, is extremely vascular and as such is highly resistant to infection.

4. Wound assessment

- **First step:** is to control bleeding and evaluate the need for other emergency procedures.
- **Second step** is to obtain a thorough history about the patient and the events surrounding the injury.

1. About the Patient

- **Tetanus Immunization Status**

Tetanus is a devastating disease, causing muscle spasms that can lead to muscle rigidity and seizures. Without adequate treatment, one in three adults with tetanus will die. Although immunization has made tetanus uncommon, it always lurks in the background.



A- Pulsatile Bleeding at Time of Injury

Even if the patient is not bleeding at the time of your examination, the history of bright red, pulsatile bleeding at the time of injury implies an arterial injury. A thorough vascular exam is required, and formal surgical wound exploration is almost always indicated.

B- Medical Illnesses

Patients with diabetes are more prone to infections and wound-healing problems. Encourage diabetic patients to keep glucose levels well controlled to decrease the risk of complications. Malnourished patients and patients with human immunodeficiency infection (HIV) or a history of cancer also have wound-healing difficulties.

C- Smoking History

Tobacco smoking dramatically decreases circulation to the skin and slows down the wound-healing process. Medical professionals have a duty to tell all patients not to smoke. But the patient with an open wound should be specifically warned that smoking interferes with and perhaps prevents the healing process. Smoking also increases the risk for wound complications and poor cosmetic outcome.

2. Events surrounding the Injury

A- Timing of the Injury

It is best to close an open wound within 6 hours of injury. Do not close a wound after 12 hours because the risk of infection becomes unacceptably high. Wounds on the face are exceptions to this rule. The face has an excellent blood supply, which makes infection less likely. In addition, cosmetic concerns are important. It is therefore acceptable to close a wound on the face that is older than 6 hours (perhaps up to 24 hours or at most 48 hours), as long as you can clean it thoroughly.

B- Nature of the Injury

- A wound caused by a clean knife has a low risk of infection (figure1).
- Dirty wound carries risk for tetanus and other infection . Wood may break off and leave pieces behind, increasing the risk for subsequent infection if the wound is not explored and washed out thoroughly.
- Any wound that may contain a foreign body should be explored and the foreign body removed.
- Animal bites, especially cat bites, often penetrate more deeply than you think. Bites on the hand should raise concern about involvement of an underlying joint. Oral bacteria may cause severe infections. Always consider the risk of rabies
- Human bites also are associated with specific oral bacteria that may cause serious infections .
- If any object penetrated the patient's clothing or shoes before piercing the skin, the chance for infection is increased because pieces of clothing may become embedded in the underlying tissues. If an object penetrated the patient's shoes, be concerned about a possible pseudomonal infection.
- Crush injuries may be associated with greater underlying damage than initially appreciated.
- Gunshot wounds .
- Thermal or electrical injury.





Human bites



Knife wound



Dog bites



Gunshot

5. Prevention of wound infection

- Never close infected wounds.
- For fresh wound, systematically perform wound toilet and surgical debridement. Then close it primarily when the wound completely clean.
- For contaminated wounds manage them with surgical toilet, leave them open and then close them 48 hours later. This is known as delayed primary closure.

To prevent wound infection:

- Restore tissue perfusion and blood circulation as soon as possible after injury.
- Maintain the core temperature of the body within normal range.
- provide high-energy nutrition as soon as possible .
- Perform wound toilet and debridement as soon as possible (within 8 hours if possible).
- Respect universal precautions to avoid transmission of infection.
- Give antibiotic prophylaxis to victims with deep wounds and other indications.
- Antibiotics not replacement for good debridement and wound toilet.
- Use of topical antibiotics and washing wounds with antibiotic solutions are not recommended.

- An infected wound is a wound with pus.
- A contaminated wound is a wound containing foreign or dirty material.



Wound closure

The goals of laceration repair are to achieve hemostasis, avoid infection, restore function to the involved tissues, and achieve optimal cosmetic results with minimal scarring.

1. Wound preparation

A- Aseptic technique

1- Actual preparation of the wound involves cleansing and debridement.

Clean ..Clean..Clean.. very important to prevent any infections.

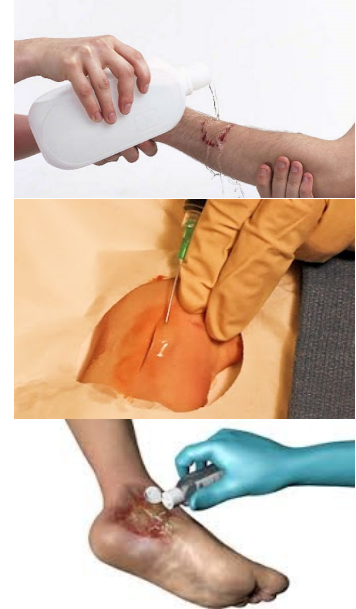
2- The skin surface surrounding the wound, should be washed and disinfected with a solution that is rapidly acting, with a broad spectrum of antimicrobial activity.

Also it should not delay healing or reduce tissue resistance to infection.

3- Prior to cleansing, the area around the wound may have to be anaesthetized to reduce the discomfort to the patient.

Although excellent as skin cleansers, these solutions are potentially toxic to the local wound defenses and may increase the rate of subsequent wound infection if they are spilled into a wound in large quantities. These solutions should be irrigated from the wound with a sterile normal saline solution as the final step in wound cleansing

Wound irrigation is a form of mechanical wound cleansing that is known to effectively remove bacteria and other debris.



Sterile technique requires the physician to be:

1- able to open and put gloves on without contamination to the sterile surface of the gloves

2- able to clean and drape the wound and surrounding area.

3- able to control the instruments and suture, such that they are not contaminated by non-sterile surfaces

B- Local Anesthesia

It is a method where there is localized loss of pain feeling and consciousness remains intact.

- Local anesthetics

Drugs which produce reversible block to the transmission of peripheral nerve impulse.

- Categories of local anesthesia:

- 1. Topical anesthetics

agents applied topically to such diverse sites as skin, eye, gingival mucosa, tympanic membrane, tracheobronchial tree, and rectum.

Forms of topical anesthetic preparation include:

- ointment
- spray
- solution
- suppository



Example of topical preparations of lidocaine :

- 4% aqueous solutions for endotracheal installations
- 2% Jelly for intra urethral use
- 10% aerosol for anesthesia of gingival mucosa

2. Injectable anesthetics

- Produced by intra dermal and subcutaneous injection of local anesthetics in the area of the intended surgery.
- Primarily useful for minor superficial procedures
- Dosage of local anesthetic required for adequate infiltration depends on the weight of the patient, extent of the area to be anesthetized and the expected duration of the surgical procedures.

Upper dose limits for commonly used local anesthetics agents		
	Plain solution (without adrenaline)	with adrenaline
	mg /kg	mg/ kg
Procaine	7	9
Lidocaine	4	7
Bupivacaine	2	3
Mepivacaine	4	7

N: B 1% local anesthesia is 10mg/ml

- Addition of adrenaline reduces the peak concentration in blood because it induced vasoconstriction
- Any local anesthetic can be employed for infiltrative anesthesia.

The steps for direct infiltration of local anesthetic are as follows:

- I. Ensure that the areas distal to wound show no neurovascular compromise.
- II. Explain the procedure to the patient and, in children, the caregiver.
- III. Provide sedation and restraint, if needed.
- IV. Cleanse the site of infiltration with povidone-iodine or other similar antiseptic preparation and allow to air dry or dry with sterile gauze.
- V. For open wounds, put a few drops of the anesthetic material into the wound and then rapidly place the needle into the subcutaneous layer by inserting it through the wound margin rather than intact skin.
- VI. For intact skin, rapidly place the needle through the skin into the subcutaneous layer.
- VII. Slowly inject small volumes of the anesthetic. During anesthetic infiltration, either slowly advance the needle or initially insert it to the hub and infiltrate as the needle is withdrawn.
- VIII. Anesthetize adjacent areas by inserting the needle through the previously injected skin or wound until the entire region requiring anesthesia is infiltrated.
- IX. After a few minutes, lightly test the skin or wound margins for adequate anesthesia using the injection needle or other sharp object (suture needle, Adson forceps).



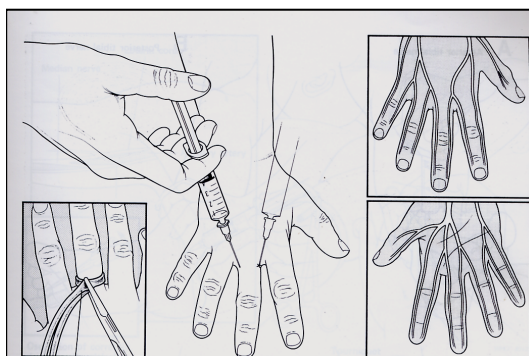
3. Peripheral nerve block

Local anesthetic agent. Injected percutaneously in the area of the nerve to be blocked.

It can be divided arbitrarily into :

A- Minor nerve block

- Involves the blockade of single nerve. Example, is digital nerve block.



B- Major nerve block

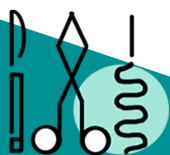
- involve blockade of major trunks or plexus such as brachial plexus blockade.

2. Suture materail

A- Absorbable sutures

An absorbable suture is generally defined as stitch that will lose most of its tensile strength within 60 days after implantation. The ideal absorbable suture has low tissue reactivity, high tensile strength, slow absorption rates, and reliable knot security. Classically, absorbable sutures were only used for deep sutures. However, many have advocated the use of absorbable sutures for percutaneous closure of wounds in adults and children.

Suture	Raw material	Tensile strength retention in vivo	Absorption rate	Tissue reaction	Uses
Plain Catgut	Natural product derived from sheep or cattle intima	Within five to seven days	Phagocytosis and enzymatic degradation within 7-10 days	High Tissue reaction	For all surgical procedures especially when tissues that regenerate faster are involved.
Chromic catgut	natural product derived from sheep or cattle intima treated with chromium salts to resist body enzymes	Within 21 to 28 days	Phagocytosis and enzymatic degradation within 90 days	moderate tissue reactivity.	Chromic gut is more rapidly absorbed in the oral cavity. as plain catgut.



(Vicryl)	synthetic material made of polyglycolic acid and coated with N-laurin and L-lysine.	within three to four weeks	Complete absorption occurs in 60 to 90 days	mild tissue reactivity	Subcutaneous, intracutaneous closures, abdominal and thoracic surgeries
(Monocryl)	Copolymer of glycoline and capiolactone	21 days maximum	90-120 days	mild tissue reactivity	This suture is often used by plastic surgeons for facial lacerations closed with subcuticular running sutures
(Dexon)	synthetic polyglycolic acid	It maintains at least 50 percent of its tensile strength for 25 days.	Complete absorption occurs in 60 to 90 days	Minimal tissue reactivity	Suture where slightly longer wound support is required
Polydioxanone (PDS)	Polyester and polymer	five to six weeks	Complete absorption within 200 days	Mild tissue reactivity	Pediatric cardiovascular surgery, ophthalmic surgery Fascia closure
Maxon	Blok of copolymer of glycolide and trimethylene carbonate	five to six weeks.		Minimal tissue reactivity	in general soft tissue approximation and/or ligation, and in peripheral vascular surgery.



B- Non-absorbable sutures

Suture	Raw material	Tensile strength retention in vivo	Absorption rate	Tissue reaction	Uses
Silk	Natural protein raw silk from silkworm	Lowest tensile strength of any non-absorbable suture. 80-100% lost by 6 months	Absorbed slowly over 1-2 years	Moderate	It is rarely used for suturing of minor wounds because stronger synthetic materials, Typically used to tie off blood vessels or bowel segments
Nylon	Polyamide polymer	high tensile strength loses 15-20% per year	Degrades at approximately 15-20% per year	low	Used for closure of skin, surgical incisions or drainage tubes
Polypropylene (Surgilene, Prolene)	synthesized from polyolefin plastics	high tensile strength more than 1 year	Remain encapsulated in body tissue	low	It is especially noted for its plasticity, allowing the suture to stretch to accommodate wound swelling, plastic surgery
Polybutester (Novafil)	Polymer of propylene	high tensile strength more than 1 year	Remain encapsulated in body tissue	low	Cardiovascular surgery, plastic surgery, general surgery



3. Characteristics of suture material

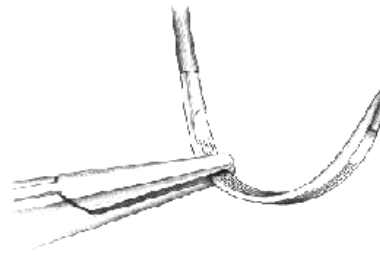
The choice of suture is determined by a balance of the various characteristics of suture materials most appropriate for the specific wound closure situation.

Absorbable vs Non-absorbable	<ul style="list-style-type: none"> Absorbable sutures are generally used as deep sutures; they do not need to be removed post-operatively. Non-absorbable sutures are used for surface sutures; require manual removal post-operatively.
Tensile Strength	<p>Surgeons prefer to use the smallest size that will provide adequate strength. The size increases as the first digit decreases.</p> <ul style="list-style-type: none"> 3-0 is relatively a strong suture 6-0 is a thin comparatively weak suture.
Plasticity and Elasticity	<p>The ability to retain length and strength after stretch, and the ability to regain its original length after stretch. This is important:</p> <ol style="list-style-type: none"> To accommodate post-operative edema without cutting into the tissue To maintain epidermal approximation once the edema has resolved.
Ease of handling and Knot security	<p>Determined by a number of related characteristics.</p> <ol style="list-style-type: none"> A suture with a low coefficient of friction slides through tissue well but the knot will unravel more easily. A suture with a high memory will spring back to its original position. While these sutures tend to be strong, they may be difficult to handle and have decreased knot security. <p>- A suture with high pliability can be easily bent, and will therefore handle well with good knot security.</p>
Multifilament vs Monofilament	<ul style="list-style-type: none"> Multifilament braided sutures handle more easily and tie well, but can potentially harbor organisms between fibers leading to increased infection risk. They also tend to have higher capillarity so can absorb and transfer fluid more easily increasing potential for bacteria to enter from the skin surface. Monofilament sutures have a lower infection risk and a lower coefficient of friction, but with a lower ease of handling and knot security.
Tissue reactivity	<p>Refers to the degree of inflammatory response to the suture.</p> <ol style="list-style-type: none"> Higher for natural products such as silk and gut Lower for synthetic fibers such as nylon.



4. Needles

Suture needles should be handled very carefully.
The needle should only be grasped with needle-holders.



A- The anatomy of a needle:

Choosing the proper needle can be confusing because of varying nomenclature. While the basic anatomy of the needle remains the same, the needle anatomy can be divided into the following parts:

1. **The eye:** is the end of the needle attached to the thread.

There are three types of the needle eye:

Closed eye, French (split or spring) eye, or swaged (eyeless).



Closed eye



French eye









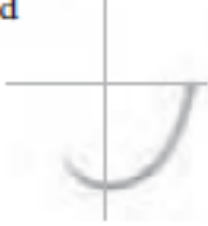
Swaged

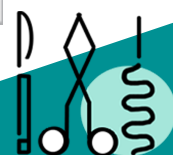
2. **The body:** is the portion that is grasped by the needle holder during the procedure. The body of the needle should be as close as possible to the diameter of the stitch to minimize bleeding and leakage.

The curvature of the needle body may come in a variety of shapes.
Each shape gives the needle different characteristics.

1. STRAIGHT NEEDLE
2. HALF-CURVED NEEDLE
3. CURVED NEEDLE (The curvature may be 1/4, 3/8, 1/2, or 5/8 circle).
4. COMPOUND CURVED NEEDLE








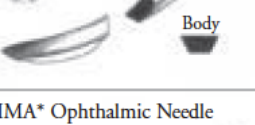

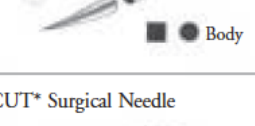


SHAPE	APPLICATION
<p data-bbox="247 280 375 324">Straight</p> 	<p data-bbox="821 280 1220 392">gastrointestinal tract, nasal cavity, nerve, oral cavity, pharynx, skin, tendon, vessels</p>
<p data-bbox="247 537 438 582">Half-curved</p> 	<p data-bbox="821 537 1053 616">skin (rarely used) laparoscopy</p>
<p data-bbox="247 806 399 851">1/4 Circle</p> 	<p data-bbox="821 806 1157 884">eye (primary application) microsurgery</p>
<p data-bbox="247 1075 399 1120">3/8 Circle</p> 	<p data-bbox="821 1075 1356 1276">aponeurosis, biliary tract, cardiovascular system, dura, eye, gastrointestinal tract, muscle, myocardium, nerve, perichondrium, periosteum, pleura, skin, tendon, urogenital tract, vessels</p>
<p data-bbox="247 1344 399 1388">1/2 Circle</p> 	<p data-bbox="821 1344 1340 1556">biliary tract, cardiovascular system, eye, fascia, gastrointestinal tract, muscle, nasal cavity, oral cavity, pelvis, peritoneum, pharynx, pleura, respiratory tract, skin, tendon, subcutaneous fat, urogenital tract</p>
<p data-bbox="247 1590 399 1635">5/8 Circle</p> 	<p data-bbox="821 1590 1332 1702">anal (hemorrhoidectomy), nasal cavity, pelvis, urogenital tract (primary application)</p>
<p data-bbox="247 1814 438 1904">Compound Curved</p> 	<p data-bbox="821 1814 1117 1892">eye (anterior segment) laparoscopy</p>



3. **The needle point:** extends from the extreme tip to the maximum cross section of body. Each needle point is designed and produced to the required degree of sharpness to smoothly penetrate specific types of tissue.

B-Types of needles:

- CUTTING NEEDLES
- CONVENTIONAL CUTTING NEEDLES
- REVERSE CUTTING NEEDLES
- SIDE CUTTING NEEDLES
- TAPER POINT NEEDLES
- TAPERCUT SURGICAL NEEDLES
- BLUNT POINT NEEDLES

SHAPE	APPLICATION
Conventional Cutting 	skin, sternum
Reverse Cutting 	fascia, ligament, nasal cavity, oral mucosa, pharynx, skin, tendon sheath
Precision Point Cutting 	skin (plastic or cosmetic)
PC PRIME* Needle 	skin (plastic or cosmetic)
MICRO-POINT* Reverse Cutting Needle 	eye
Side-Cutting Spatula 	eye (primary application), microsurgery, ophthalmic (reconstructive)
CS ULTIMA* Ophthalmic Needle 	eye (primary application)
Taper 	aponeurosis, biliary tract, dura, fascia, gastrointestinal tract, laparoscopy, muscle, myocardium, nerve, peritoneum, pleura, subcutaneous fat, urogenital tract, vessels, valve
TAPERCUT* Surgical Needle 	bronchus, calcified tissue, fascia, laparoscopy, ligament, nasal cavity, oral cavity, ovary, perichondrium, periosteum, pharynx, sternum, tendon, trachea, uterus, valve, vessels (sclerotic)
Blunt 	Blunt dissection (friable tissue), cervix (ligating incompetent cervix), fascia, intestine, kidney, liver, spleen



5. Suturing instruments

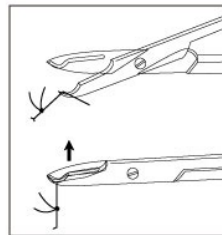
1-Needle holder: used to grab onto the suture needle



2-Forceps: used to hold the tissues gently and to grab the needle



3-Suture scissors: used to cut the stitch from the rest of the suture material



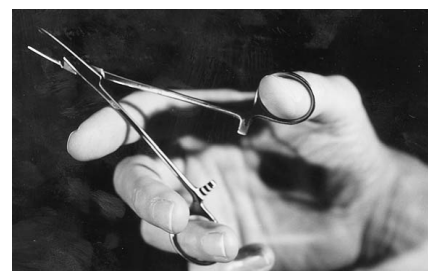
How to Hold the Instruments ?

Whenever you use sharp instruments, you face the risk of accidentally sticking yourself. Needle sticks are especially hazardous because of the risk of serious infection (hepatitis, human immunodeficiency virus). To prevent needle sticks, get to the habit of using the instruments correctly.

Never handle the suture needle with your fingers.

1-Needle Holder:

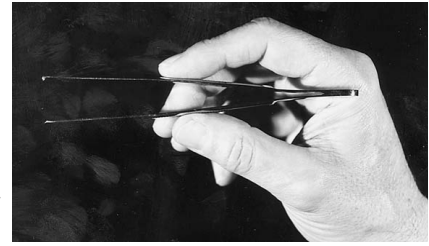
Place your thumb and ring finger in the holes. When using the needle holder, be sure to grab the needle until you hear the clasp engage, ensuring that the needle is securely held. You grab the needle at its half-way point, with the tip pointing upward. Try not to grab the tip; it will become blunt if grabbed by the needle holder. Then it will be difficult to pass the tip through the skin.



2- Forceps:

Hold the forceps like a writing pencil. The forceps is used to support the skin edges when you place the sutures. Be careful not to grab the skin too hard, or you will leave marks that can lead to scarring.

Ideally, you should grab the dermis or subcutaneous tissue -not the skin- with the forceps, but this technique takes practice. For suturing skin, try to use forceps with teeth, which are little pointed edges at the end of the forceps.



3- Scissors:

Place your thumb and ring finger in the holes. It is best to cut with the tips of the scissors so that you do not accidentally injure any surrounding structures or tissue (which may happen if you cut with the center part of the scissors).

6. Suture techniques:

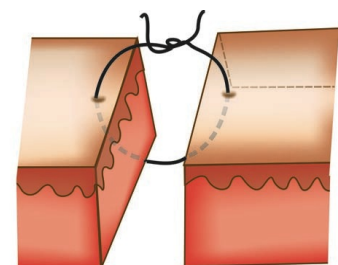
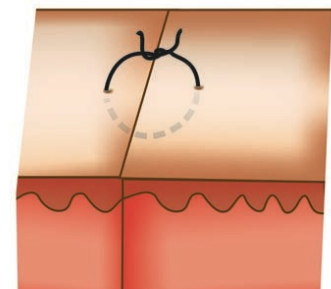
A- Principles:

- The wound edges must not only be aligned but also everted. Eversion ensures that dermal elements of the skin are apposed which is vital for wound healing.
- In most body areas except the face, sutures should be placed 3 to 4 mm apart from the wound margin and 5 to 10 mm apart from each other.
- With simple sutures the knots of the sutures are to be placed away from the opposed edges of the wound.
- Skin handling must be as traumatic as much as possible.

B- Techniques:

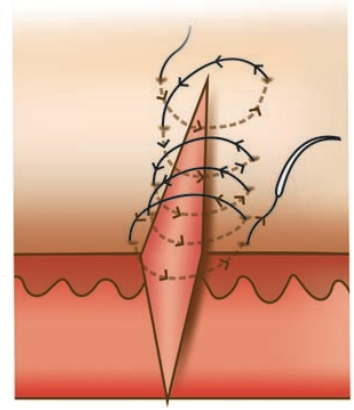
A- Simple Interrupted Suturing

- The simplest way to close skin wounds.
- Insert the needle at 90° to the skin
- It should be 3-5 mm away from the margin and 3-5 mm away from the each other.
- Equal amount of tissue should be opposed on both sides.
- All knots should be placed on the same side with wound edges everted



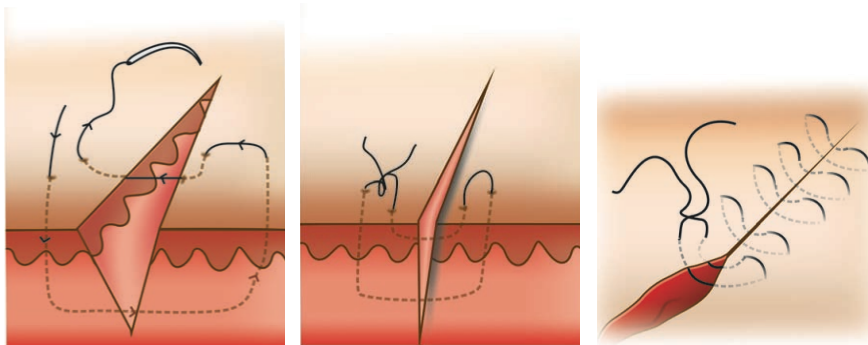
B- Continuous Suturing

- Commonly applied in case of peritoneum and sheath closure.
- Hemostatic.
- It may cause overlapping of edges.
- Wound dehisces if one stitch is dissolved early or if it breaks.
- It is contraindicated if the skin wound is contaminated because of high risk of infection.

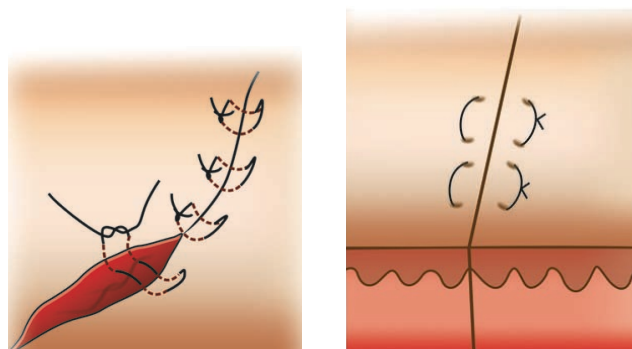


C- Mattress Suturing:

- This is a double stitch, which aims to close the deep part of the wound, to obliterate dead space and slightly invert the edges.
- It also aim to relieve tension from the edges of the wound.
- Starting from one edge of the needle passes through the other edge, and is then returned to the starting side through separate bite
- It is most useful where skin is loose or hemostasis is required.
- If the entry and exit holes lie parallel to the edges, these are called horizontal mattress stitches
- If the entry and exit holes are perpendicular to the edges, these are vertical mattress stitches



Vertical

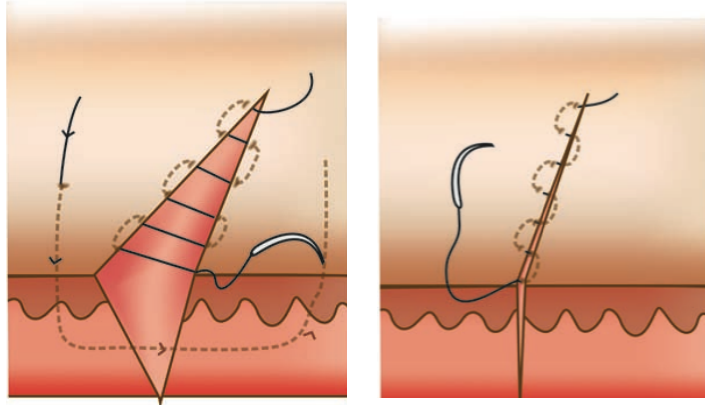


Horizontal



D- Subcuticular Suturing:

- Easy to remove
- Cosmetically better
- The suture material can be absorbable or non-absorbable
- Enter the skin about 1 cm from the end of the incision using preferably a straight needle. Pass the needle through subcuticular layer and dermis along the wound in regular step-wise fashion



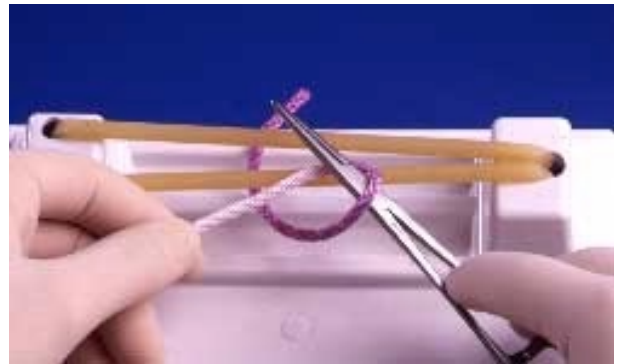
7. Knotting techniques :

A- Instrument knot:

1. Short purple strand lies freely. Long white end of strand held between thumb and index finger of left hand. Loop formed by placing needleholder on side of strand away from the operator.



2. Needleholder in right hand grasps short purple end of strand.



3. White strand is drawn toward operator with left hand and looped around needleholder held in right hand. Loop is formed by placing needleholder on side of strand toward the operator.



4. First half hitch completed by pulling needleholder toward operator with right hand and drawing white strand away from operator. Needleholder is released from purple strand.



5. With end of the strand grasped by the needleholder, purple strand is drawn through loop in the white strand away from the operator.



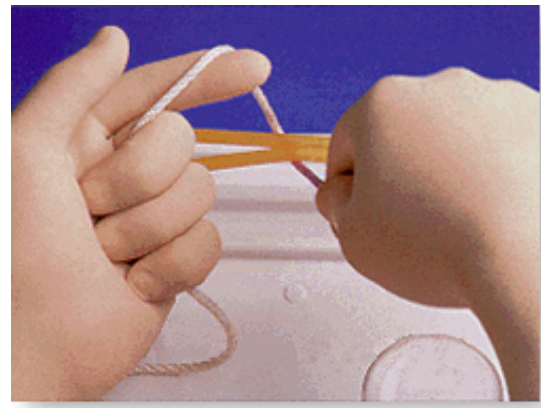
6. Square knot completed by horizontal tension applied with left hand holding white strand toward operator and purple strand in needleholder away from operator. Final tension should be as nearly horizontal as possible.



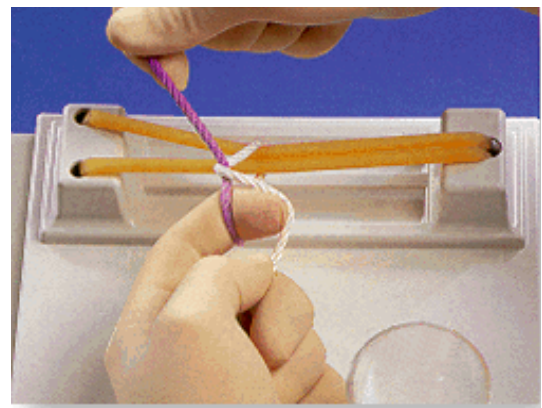
B- Hand knot

ONE handed knot:

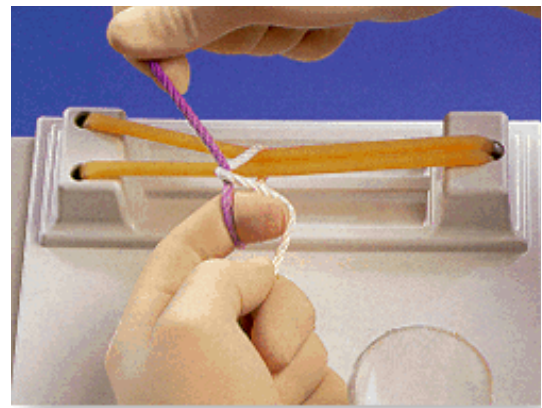
1. White strand held between thumb and index finger of left hand with loop over extended index finger. Purple strand held between thumb and index finger of right hand.



2. Purple strand brought over white strand on left index finger by moving right hand away from operator.



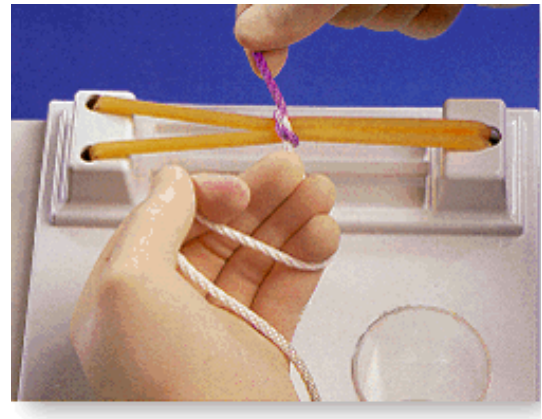
3. With purple strand supported in right hand, the distal phalanx of left index finger passes under the white strand to place it over tip of left index finger. Then the white strand is pulled through loop in preparation for applying tension.



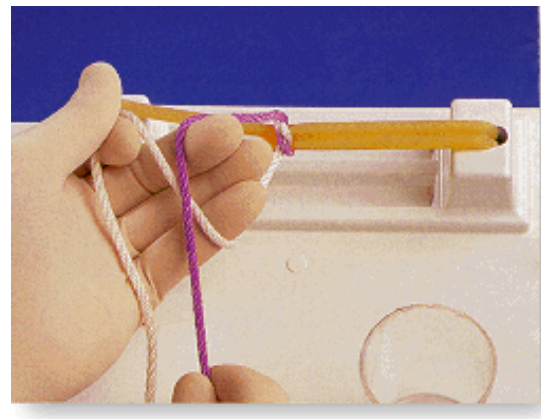
4. The first half hitch is completed by advancing tension in the horizontal plane with the left hand drawn toward and right hand away from the operator.



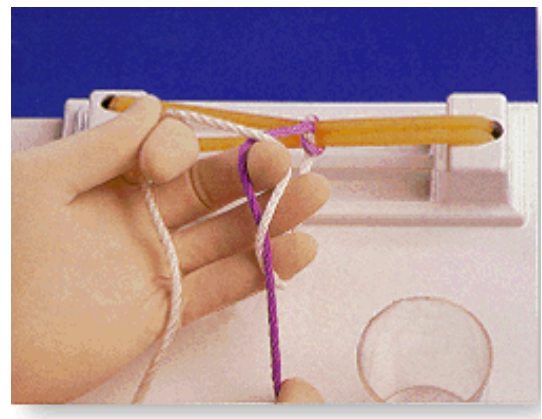
5. White strand looped around three fingers of left hand with distal end held between thumb and index finger.



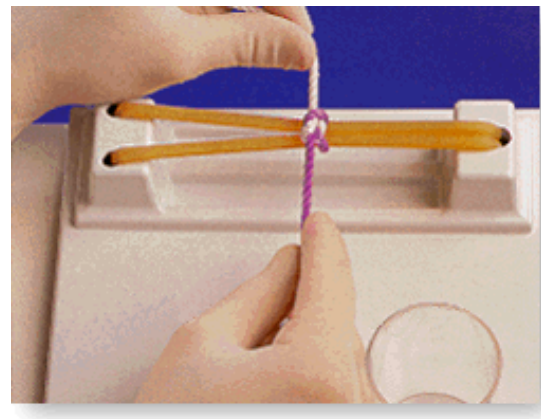
6. Purple strand held in right hand brought toward the operator to cross over the white strand. Continue hand motion by flexing distal phalanx of left middle finger to bring it beneath white strand.



7. As the middle finger is extended and the left hand pronated, the white strand is brought beneath the purple strand.

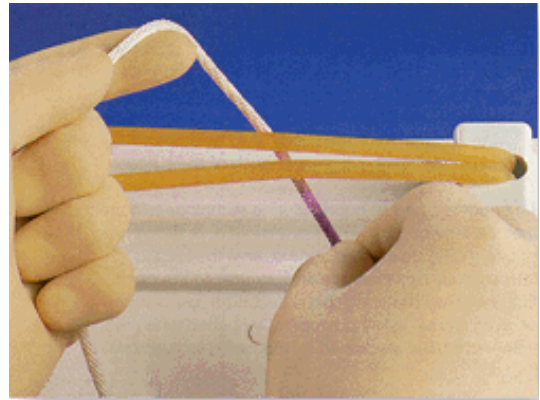


8. Horizontal tension applied with the left hand away and right hand toward the operator. This completes the second half hitch of the square knot. Final tension should be as nearly horizontal as possible.

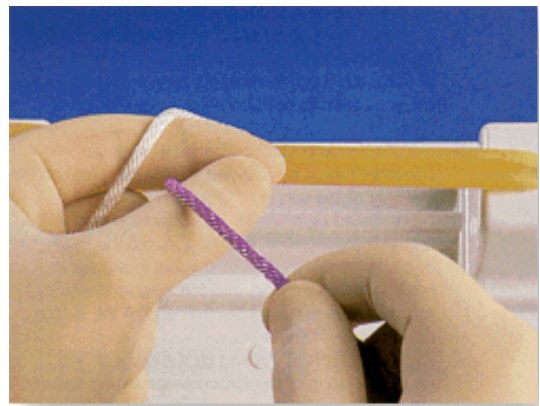


Two handed knot:

1. White strand placed over extended index finger of left hand acting as bridge, and held in palm of left hand. Purple strand held in right hand.



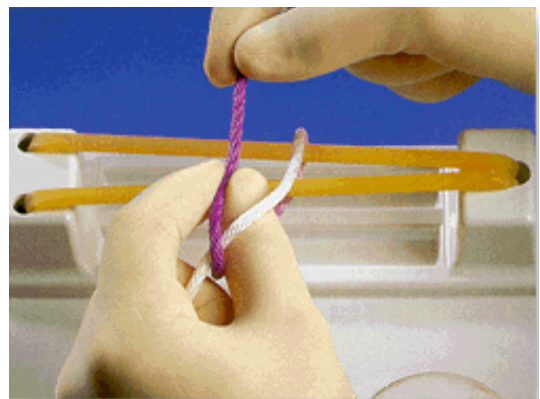
2. Purple strand held in right hand brought between left thumb and index finger.



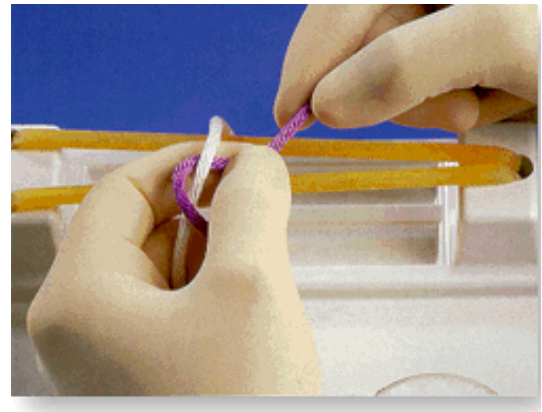
3. Left hand turned inward by pronation, and thumb swung under white strand to form the first loop.



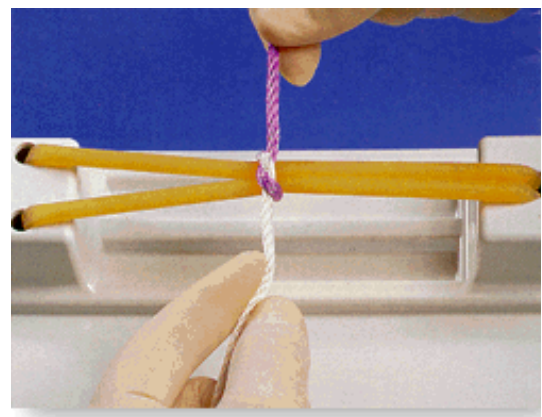
4. Purple strand crossed over white and held between thumb and index finger of left hand.



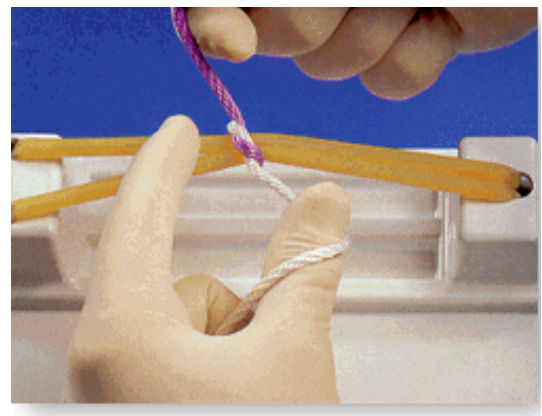
5. Right hand releases purple strand. Then left hand supinated, with thumb and index finger still grasping purple strand, to bring purple strand through the white loop. Regrasp purple strand with right hand.



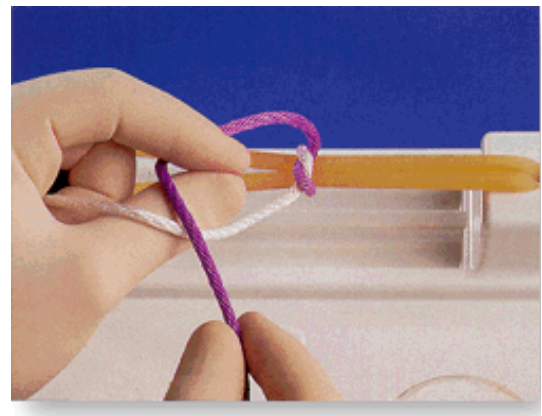
6. Purple strand released by left hand and grasped by right. Horizontal tension is applied with left hand toward and right hand away from operator. This completes first half hitch.



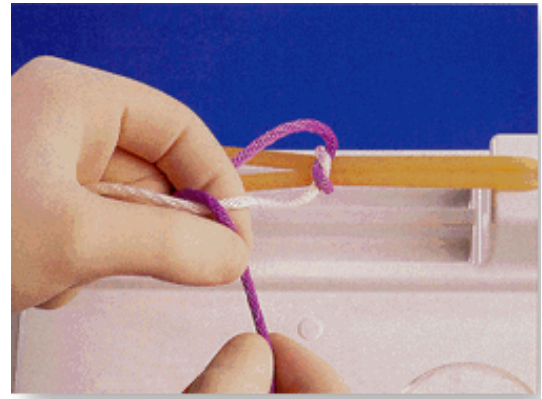
7. Left index finger released from white strand and left hand again supinated to loop white strand over left thumb. Purple strand held in right hand is angled slightly to the left.



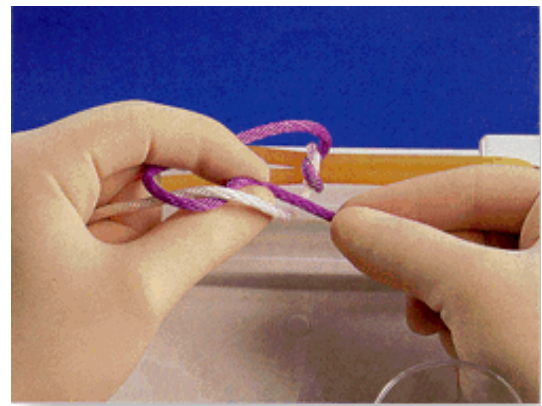
8. Purple strand brought toward the operator with the right hand and placed between left thumb and index finger. Purple strand crosses over white strand.



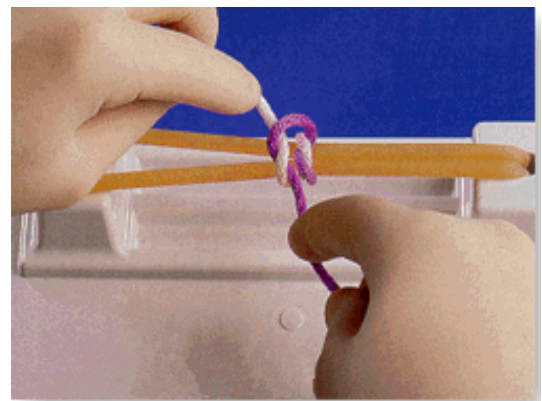
9. By further supinating left hand, white strand slides onto left index finger to form a loop as purple strand is grasped between left index finger and thumb.



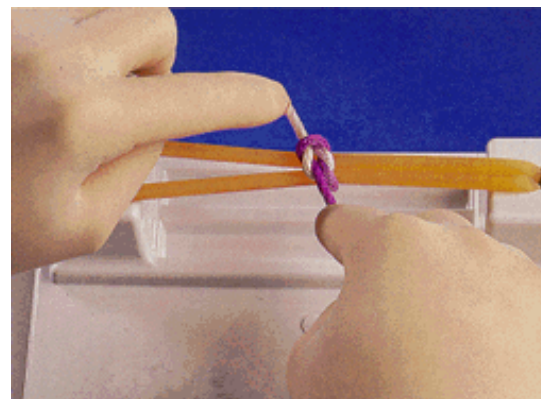
10. The final tension on the final throw should be as nearly horizontal as possible.



11. Left hand rotated inward by pronation with thumb carrying purple strand through loop of white strand. Purple strand is grasped between right thumb and index finger.



12. Horizontal tension applied with left hand away from and right hand toward the operator. This completes the second half hitch.



Wound care:

1- Wound dressing

A- Aim of wound dressing

Covering the wound surface and moisturizing it facilitates healing and re-epithelization of the edges and prevent infection by the low pH created on the wound surface to be occlusive dressings.

B- Layers of dressings

Typically dressings usually have three layers:

1. Contact layer – The layer in contact with the wound surface.
2. Absorbing layer – To absorb the exudate from the wound.
3. Binding layer – The outermost layer which holds the dressing together (bandage).

C- Types of wound dressing

Name	Indications	Advantages	Disadvantages
Nonreabsorbable (gauze)	Most wound types	Easily available, cheap. Good absorbing capacity.	Sticks to the wound. Painful during change. Can damage epithelium. Not truly occlusive. Require frequent change
Films	Superficial wounds and surgical sites	Occlusive dressing. Impermeable to bacteria	Nonabsorbent, hence not useful in exudative wounds
Foams, colloids	Exudative wounds and cavities	Form an 'autolytic' layer to remove debris	Need exudates to function, hence not suitable for dry wounds
Hydrophilic (alginate dressings)	Highly exudative wounds	Form an 'autolytic' layer to remove debris	Cannot be used in sites of anaerobic infection/dry wounds
Hydrogels	Dry and necrotic wounds	Moisture contributing	Can cause maceration of peri-wound skin. Very minimal absorptive capacity.



2- Suture removal

Eyelids _ 3 days

Neck _ 3 to 4 days

Face _ 5 days

scalp _ 7 to 14 days

Trunk and upper extremities _ 7 to 10 days

lower extremities _ 8 to 10 days

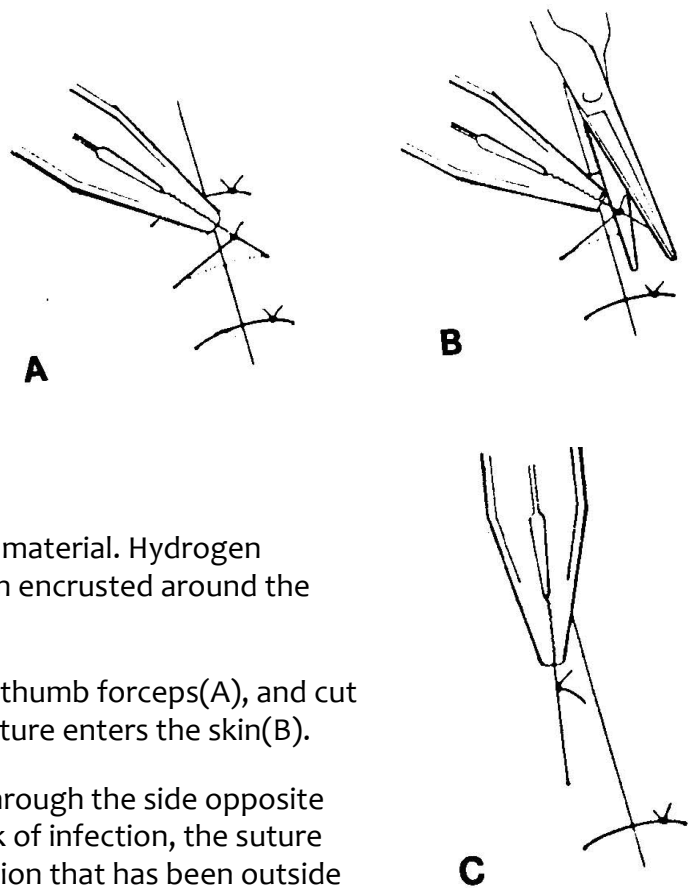
over joints _ 10 – 14 day

Steps of suture removal:

STEP 1—Cleanse the area with an antiseptic material. Hydrogen peroxide can be used to remove dried serum encrusted around the sutures.

STEP 2—Pick up one end of the suture with thumb forceps(A), and cut as close to the skin as possible where the suture enters the skin(B).

STEP 3—Gently pull the suture strand out through the side opposite the knot with the forceps(C). To prevent risk of infection, the suture should be removed without pulling any portion that has been outside the skin back through the skin



Alternative Methods of Wound Closure:

A. Wound closure tapes (Steri-Strips)

1. composed of strips of reinforced microporous surgical adhesive tape.
2. used to provide extra support to a suture line, either when running subcuticular sutures are used or after sutures are removed
3. the tapes may reduce spreading of the scar if they are kept in place for several weeks after suture removal.
4. Often, used in conjunction with a tissue adhesive. Because they have a tendency to fall off ,and mainly in low-tension wounds and rarely for primary wound closure.



B. Staples

Used in surgical wounds in the , including wounds on the scalp or the trunk.

- **Advantages:**

Quick placement, minimal tissue reaction, low risk of infection, and strong wound closure.

- **Disadvantages:**

less precise wound edge alignment and higher cost.



C. Tissue adhesive glues

- Superglues that contain acrylates
- may be applied to superficial wounds to block pinpoint skin hemorrhages and to precisely coapt wound edges.
- Because of their bacteriostatic effects and easy application, they have gained increasing popularity.
- The most commonly used adhesive, 2-octyl cyanoacrylate (Dermabond), has also been used as a skin bolster for suturing thin, atrophic skin
- **Advantages:** rapid wound closure, painless application, reduced risk of needle sticks, absence of suture marks, and elimination of any need for removal.
- **Disadvantages:** increased cost and less tensile strength (in comparison with sutures)



References:

- Sarabahi S, Tiwari VK(eds). Principles and Practice of Wound Care.1st ed .2012
- Choudhury Dhiraj. General Surgical Operations.1st ed. 2008
- Ethicon,Wound_Closure_Manual, Ethicon US, LLC. 2010 - 2016, available from: http://www.uphs.upenn.edu/surgery/Education/facilities/measey/Wound_Closure_Manual.pdf
- Glenn E.Talboy, Annesley W. Copeland, Gregory J. Gallina. Wound and wound healing. Peter F. Lawrence. Essential of general surgery. Philadelphia: lippincott williams and wilkings; 1994 . P130-144
- WILLIAMS, Norman S.; BULSTRODE, C.; CONNELL, O. Bailey. Love's short practice of surgery. 26th International Student Edition, 2008
- Edgerton M: The Art of Surgical Technique. Baltimore, Williams & Wilkins, 1988.
- McCarthy JG: Introduction to plastic surgery. In McCarthy JG (ed): Plastic Surgery. Philadelphia, W.B. Saunders, 1990, pp 48–54
- Md, Nadine B. Semer. *Practical plastic surgery for nonsurgeons*. Place of publication not identified: IUniverse Com, 2007. Web.
- "Violence and Injury Prevention." *World Health Organization*. World Health Organization, n.d. Web. 24 Feb. 2017.
- Tadesse, Kedir, wondimu, Anderson, Yerdaw. "Essential Surgical Skills". Ethiopia Public Health Training Initiative. (2007).
- Hsu DC. Subcutaneous infiltration of local anesthetics [Internet]. uptodate. uptodate; 2017 [cited 2017Feb24]. Available from: <https://www.uptodate.com/contents/subcutaneous-infiltration-of-local-anesthetics>
- Closure of minor skin wounds with sutures [Internet]. Closure of minor skin wounds with sutures. [cited 2017Feb23]. Available from: <https://www.uptodate.com/contents/closure-of-minor-skin-wounds-with-sutures#H18>
- Dunn D. Wound closure manual. Ethicon, inc Johnson & Johnson Company. 2007.
- H. Cyanoacrylate for Intraoral Wound Closure: A Possibility? [Internet]. International Journal of Biomaterials. Hindawi Publishing Corporation; 2015 [cited 2017Feb28]. Available from: <https://www.hindawi.com/journals/ijbm/2015/165428/>
- Best M. Alternative Methods of Wound Closure. Alternative Methods of Wound Closure 1970. <http://benangjahitbedah.blogspot.com/2015/02/alternative-methods-of-wound-closure.html?m=1> (accessed February 28, 2017).





الطلاب أولاً
عمادة شؤون الطلاب
جامعة أم القرى



B . S . S