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Advanced Emergency Trauma Course

Wound Care and Management

Presenter: Rockefeller Oteng, MD

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Lecture Objectives

- To discuss the basic approach to wounds
  - Wound evaluation
  - Wound examination
- Discuss wound preparation
- Wound repair techniques
- Special considerations and concerns

Historical Background

- In ancient Egypt and Greece they went on to define two entities; acute and chronic wounds. The Ebers Papyrus, circa 1500 BC, talks of the use of lint, animal grease and honey as topical treatment for wounds.
- Galen of Pergamum, a Greek surgeon, served the Roman gladiators and is credited for many contributions to this particular field.
- The most significant advances came in the 19th century with the development of microbiology and advances in cellular pathology.
- Through time and science we have come to recognize the importance of using sterile surgical techniques and attempt to decrease complications.

Epidemiology

- It is estimated that 11.5 million patients with wounds are seen in American ED's each year
- This is roughly 12 percent of all ED presentations
- Reports note that a majority of these wounds occur in the face and scalp, then upper extremities and lower extremities

Epidemiology

- There is a reported infection rate of 3.5% to 6.5% of all adult lacerations treated in the ED
- Although all wounds have the potential to become infected, there are several that have a higher propensity for such outcomes
- In pediatric population the laceration infection rates are lower at 1.2%

Wound Examination/Exploration

- Initial steps:
  - Patient comfort and safety
    - Positioning: Patient should be supine to avoid fainting. Any observers should be seated as well
  - Initial Hemostasis
    - Should be established with simple direct pressure
    - When you are ready (well lit area, repair tools available) you can use more invasive measures
  - Remove all rings and other jewelry from the injured area (i.e. finger)

Wound Examination/Exploration

- Initial steps:
  - Pain relief
    - Begins with gentle and empathetic handling of the injury
    - Continues with a specific pain management plan
  - Wound care delay
    - If there are going to be delays in your repair then please dress the wound with some moistened gauze

Wound Examination/Exploration

- Basic and key history should be collected:
  - Mechanism of injury (what caused the injury)
  - Age of the wound (time since injury)
  - Allergies
  - Tetanus immunization status
  - Medical history
    - Diabetes
    - Immunosupression
    - Peripheral vascular disease

Wound Examination/Exploration

- Screening examination
  - Basic vital signs
    - A forehead laceration with hypotension and tachycardia is a more concerning injury
  - Wounds and lacerations are often the visual result of systemic issues
    - The laceration from a fall should lead to a discussion of why the person fell
  - General examination should be performed
    - The only injury is the one you visualize

Wound Examination/Exploration

- Wound assessment
  - A complete evaluation of an injury must include documentation of the following elements
    - Location
    - Length
    - Estimated depth (visible tissues)
    - Shape of wound
    - Proximal and distal nerve function
    - Tendon function

Wound Examination/Exploration

- Wound assessment continued:
  - Examination elements cont:
    - Vascular integrity (blood flow through area)
    - Evidence of foreign body or contamination
    - Evidence of fracture
    - Alterations in range of motion

Wound Preparation

- Once you have decided to repair the wound, the area must be prepared
- This process involves several components
  - Peripheral area cleansing
  - Provision of anesthesia
  - Wound irrigation and cleansing
  - Wound exploration and or debridement

Wound Preparation

- Peripheral cleansing:
  - The area adjacent to the wound should be as free of dirt and contaminates as possible
  - Goal is to remove dirt, dried blood and other debris
  - It should be visibly clean to the eye

Wound Preparation

- Provision of Anesthesia:
  - In most cases the wound should be anesthetized prior to irrigation
  - It is difficult and often ineffective to attempt to irrigate a painful wound
  - Depending on the location and extent of the injury one can choose local wound infiltration, versus a regional nerve block

Wound Irrigation/Exploration

- Once good anesthesia has been achieved
- “The solution to pollution is dilution.”
- Irrigation is the most effective way to:
  1. Remove debris and contaminates from a laceration
  2. Reducing bacterial counts on wound surfaces.
- We know that higher pressure irrigation is superior to low pressure systems

Wound Irrigation/Exploration

- The Current practice is based on a study using a 35 ml syringe attached to a 19 gauge catheter (7-8 psi)
- Most clinicians use normal saline as irrigation fluid
- However there are other solutions
  - 10-20 parts saline with 1 part 10% povodine-iodine solution
- No proven advantage to this solution

Wound Irrigation/Exploration

- Moistened sponges can be used to cleanse the wound periphery
- Irrigation can be achieved with:
  - 20ml or 35ml syringe attached to either
    - A 18-19gauge catheter
    - Or a Zerowet splash guard
  - One can fashion a similar device by piercing the base of plastic medicine cup and placing it over the syringe and needle or catheter

Wound Irrigation/Exploration

- Irrigation should continue until there is no visible skin or wound contaminates
- The amount of irrigation varies depending on the size, location and amount of contamination
- Typically 200-500ml
- The clean wound should appear pink with viable issue, may have some mild bleeding

Wound Irrigation/Exploration

- Should there be any contaminate not removed by the irrigation
- Then a moist 4x4 gauze can be used for manual debridement
- If unsuccessful then sharp debridement can be pursued with tissue scissors or a surgical scalpel.

Wound Irrigation/Exploration

- As part of the irrigation process the wound should be *explored* to the base
- Searching for any foreign material that could be a focal point for infection
- Also directly inspect for function of relevant nerves, tendons, arteries and joints
- Irrigation without exploration is incomplete at best.

Wound Closure

- There are 3 types of wound closures and they can be achieved with several different options.
- These types are:
  - Primary closure (Primary intention)
  - Secondary closure (Secondary intention)
  - Tertiary Closure (Delayed primary closure)

Wound Closure

- Primary Closure:
  - Is mainly carried out on a laceration that is relatively clean, maybe minimally contaminated
  - The wound is without devitalized tissues.
  - Can be achieved by the use of sutures, wound adhesive, wound tapes or staples
  - Is often performed during the “Golden Period.”

Wound Closure

- The golden period refers to the first 6-8hrs following the time of the laceration or wound
- In clinical practice this period can extend up to 24hrs after the actual injury.
- There are no rigid guidelines but typically any injury that can be converted to a fresh appearing wound, after usual wound preparation can be primarily closed.

Wound Closure

- Secondary Closure:
  - Refers to wounds that are not closed by sutures but are allowed to heal by the formation of granulation tissue
  - Is best for ulcerations, skin infections, abscess cavities, puncture wounds, partial thickness dermal burns and abrasions

Wound Closure

- Tertiary Closure:
  - Applies to wounds that on initial presentation were not good candidates for primary closure
  - Wounds that were contaminated by feces, saliva, vaginal secretions, or significant soil.
  - Usually undertaken 4-5days after the initial cleansing , debridement and observation.
  - Theoretically you delay closure to avoid the high risk of closing a contaminated wound

Methods for Closure

- Sutures:
  - There are several different types of sutures, which are then further divided based on the size of the needle
  - Can be broken down into two groups
    1. Absorbable:
       - Gut, chromic gut, Polyglyolic-acid(PGA), Polyglactin 910(vicryl), Polydioxanone(PDS)
    2. Non-absorbable:
       - Silk, Nylon(ethilon, Dermalon), Proypropylene (Prolene), Dacron(Mersilene)

Prolene Suture

PD-SELF

http://commons.wikimedia.org/wiki/File:Atraumatisches_Nahtmaterial_11.JPG

- One example of non absorbable suture. Prolene has a blue color making it easier to see in areas where hair is involved.

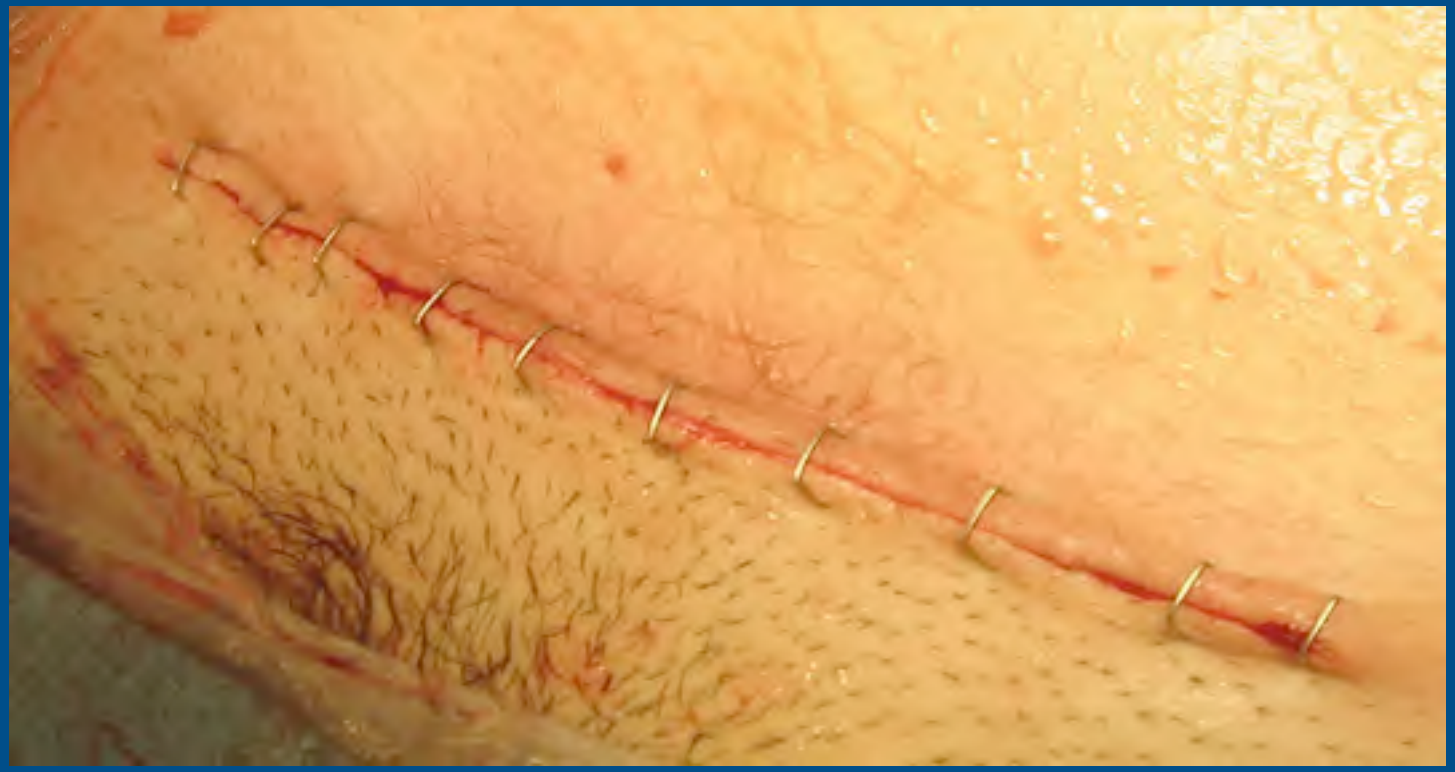
Methods for Closure

- Wound Taping
  - Can be considered and used with
    - Straight laceration with little tension
      - Forehead, chin, thorax, non joint areas of the extremities
    - Laceration that have a high potential for infection
    - A Laceration in a patient with thin fragile skin
      - Elderly, those on chronic steroids
    - Support of a sutured wound
  - Cannot be used on the scalp, over the joint surfaces, or in a bleeding wound

Methods for Closure

- Wound Stapling
  - Can be used in the following situations:
    - Linear lacerations of the scalp, trunk and extremities
    - As temporary rapid way to close an extensive laceration in acutely ill patients
  - Should be avoided in areas that you are going to CT.
  - They may also move during the process of obtaining an MRI

Skin Staples used to close Cesarean section surgical laceration

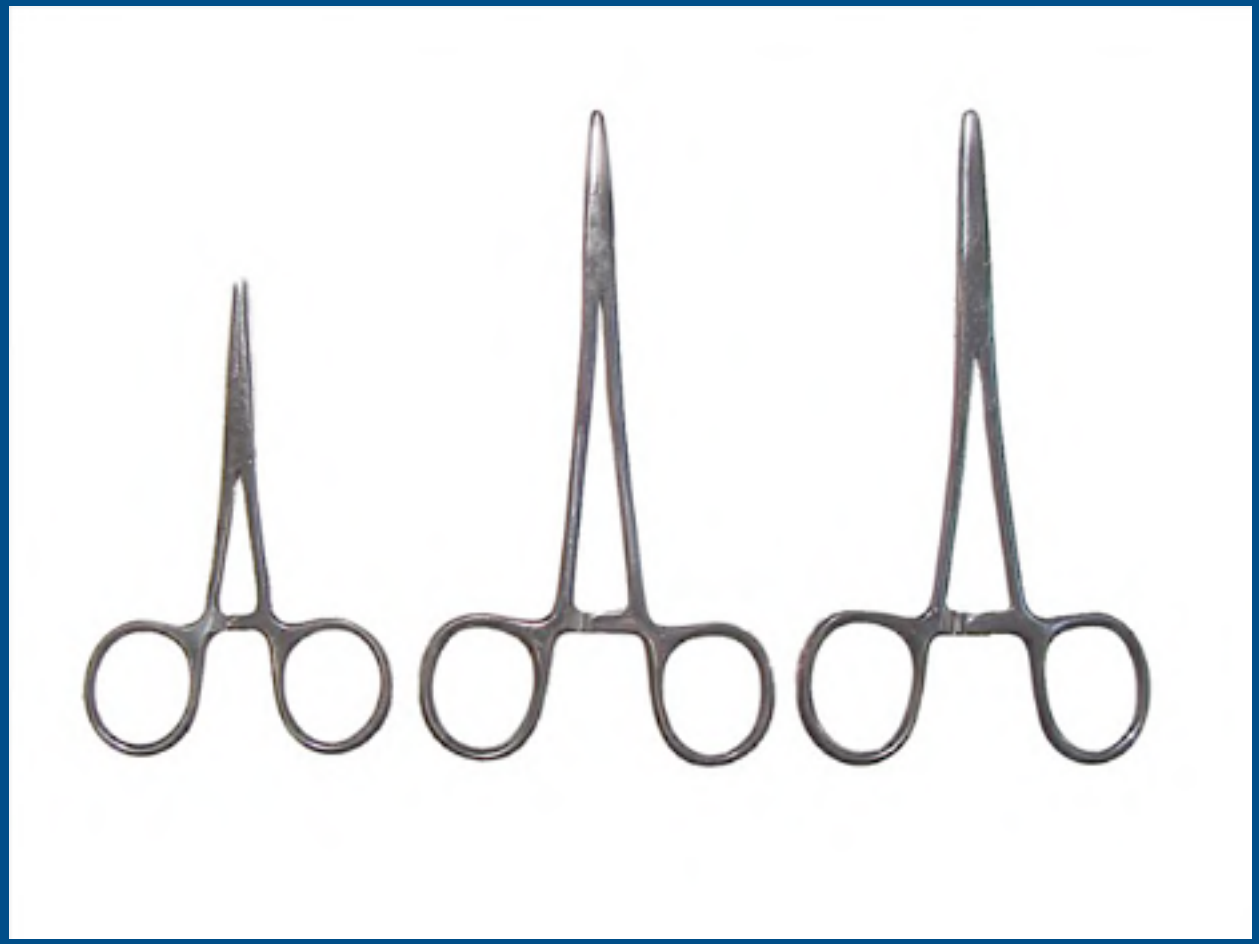


PD-INEL http://commons.wikimedia.org/wiki/File:C-sec_suture.jpg

Suture Tools and Technique

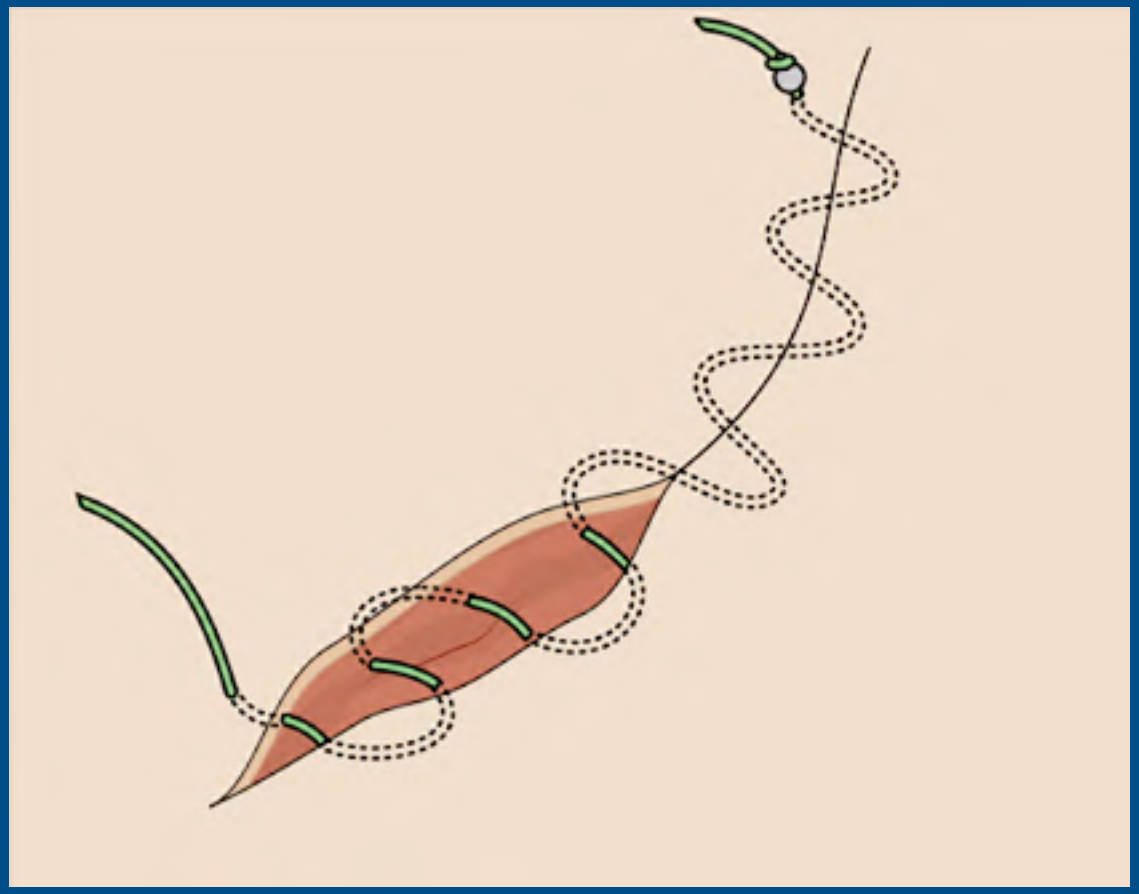
- To repair the wound you will need:
  - Suture Materials
  - Needle driver or hemostat
  - Scissors
  - Forceps

Hemostats



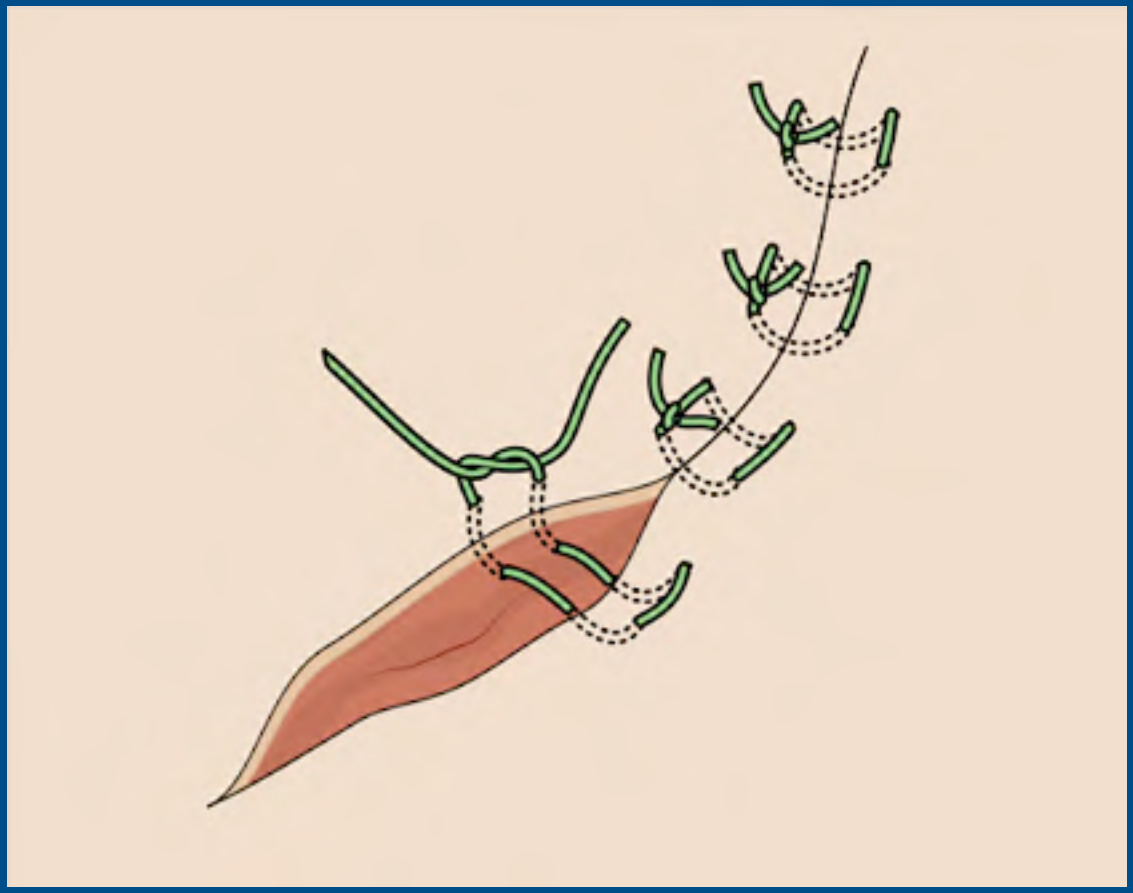
PD-INEL Source undetermined

Subcuticular stitch



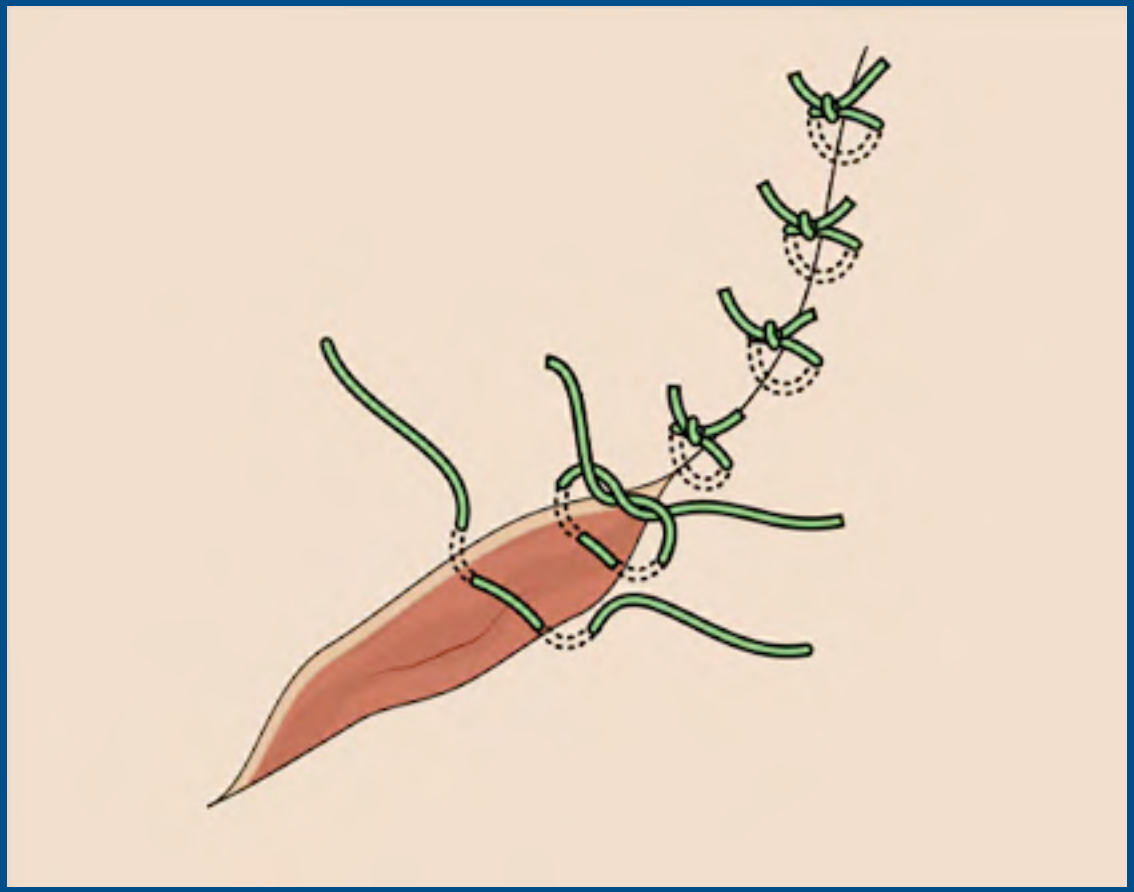
Olek Remesz (Wikipedia)

Horizontal Mattress Suture



 Olek Remesz (Wikipedia)

Simple Interrupted Sutures



Olek Remesz (Wikipedia)

Suture Removal Times

Area Sutured	Time to removal (in days)
Face	3-5
Scalp	7-9
Neck	5-8
Upper Extremities	8-14
Lower Extremities	14-21
Trunk	10-14

- These are generalizations. Your patient's time will depend on several factors, general co-morbidities, wound tension, level of wound contamination.

Questions?

Dkscully (flickr)

References

- Richard M Stillman, M. (2008, August 19). *Wound Care*. Retrieved september 15, 2009, from emedicine: http://emedicine.medscape.com/article/194018-overview
- Tintinalli, J. (2004). Emergent Wound Management. In J. Tintinalli, *Emergency Medicine a Comprehensive Study Guide* (pp. 287-310). New York: McGraw-Hill.
- Trott, A. T. (1997). *Wounds and Lacerations.* St Louis: Mosby.
- Moy RL, Lee A, Zalka A. Commonly used suturing techniques in skin surgery. Am Fam Physician 1991; 44:1625-34.