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Advanced Emergency Trauma Course

Wound Care and Management

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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
    - Immunosuppression
    - 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 contaminants 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 contaminants 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 contamine 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 4-5 days 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), Proypolylyene (Prolene), Dacron(Mersilene)
Prolene Suture

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

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

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

Source undetermined

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Subcuticular stitch

Olek Remesz (Wikipedia)
Horizontal Mattress Suture

Olek Remesz (Wikipedia)
Simple Interrupted Sutures

Olek Remesz (Wikipedia)

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## Suture Removal Times

<table>
<thead>
<tr>
<th>Area Sutured</th>
<th>Time to removal (in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>3-5</td>
</tr>
<tr>
<td>Scalp</td>
<td>7-9</td>
</tr>
<tr>
<td>Neck</td>
<td>5-8</td>
</tr>
<tr>
<td>Upper Extremities</td>
<td>8-14</td>
</tr>
<tr>
<td>Lower Extremities</td>
<td>14-21</td>
</tr>
<tr>
<td>Trunk</td>
<td>10-14</td>
</tr>
</tbody>
</table>

- 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