

BASIC PRINCIPLE OF SURGERY

LEC 2

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اختصاص الجراحة التقيمية

Wound and wound management

Classification of wound:

1- According to integrity of skin:

A-Open wound: Type of wounds in which the skin has been compromised and underlying tissues are exposed. Open wounds can be classified into a number of different types:

- **Incised wound:** wound results from objects with narrow, sharp edges (sharp knife or glass). The wounds have regular clear cut borders. The wound is relatively clean and minimal debridement is required.
- **Lacerated wound:** results from objects with narrow dull edges (like saws or fan blades); The wound edges are irregular (jagged) and show crushing which extends a limited distance proximal and/or distal to the site of the open wound. Moderate debridement may be required. Incised wounds and lacerations can be repaired directly.
- **Penetrated wound:** Cause by sharp pointed objects like nails. Have relatively small opening and May be very deep. Infection/ foreign particles might have been carried deep into wound.
- **Perforating wound:** E.g. gunshot wounds. Have two opening one of entrance and other of exit.
- **Abrasions:** is a shearing injury of the skin in which the surface is rubbed off. Most are superficial and will heal by epithelialization.
- **Crush wounds:** results from objects with broad edges (like a punch press or a wooden log). Wound edges are irregular, and damage may extend further beyond what is visibly injured. Extensive debridement is required. They are often accompanied by degloving injuries and compartment syndrome.
- **Avulsion:** is the most severe mechanism of injury caused by traction . Separation of tissues occurs at different levels according to their tensile strength. The tissue is to torn rather than cut.. A degloving injury is a special type of avulsion. Debridement is complex, and often grafts are required for repair

B-Closed wound: Wounds in which the skin has not been compromised, but trauma to underlying structures has occurred. Examples of closed wounds are:

- **Hematoma** - (also called a blood tumor) - caused by damage to a blood vessel that in turn causes blood to collect under the skin. Initially this is fluid, but it will clot within minutes or hours; later after few days the hematoma will again liquefy → increased risk of secondary infection → pus formation

- **Contusions** - (more commonly known as a bruise) - Caused by blunt trauma that damage the tissue under the skin without breaking the skin. Characterized by skin discoloration due to bleeding into the tissues.

2-According to Rank-Wakefield classification:

A-Tidy: These wounds are inflicted by sharp instruments and contain no devitalized tissue. They are usually single with clear cut borders. Such wounds can be closed primarily. Examples: surgical incisions, wounds caused by glass and knife.

B-Untidy: These wounds are resulting from crushing, avulsion, and contain devitalized tissue. They are usually multiple with irregular borders. Such wounds can not be closed primarily and therefore should be allowed to heal by second intention. Examples: wound caused by road traffic accidents.

Tidy	Untidy
Incised	Crushed or avulsed
Clean	Contaminated
Healthy tissues	Devitalised tissues
Seldom tissue loss	Often tissue loss

2-According to duration of wound:

a-Acute: *is a wound for which the injury has occurred within the past 3 to 4 weeks. Examples: wounds caused by operative procedure.*

b-Chronic: *If the wound persists beyond 4 to 6 weeks, it is considered a chronic wound, a term that also includes wounds that have been present for months or years. "Non-healing, recalcitrant," and "delayed healing are terms used interchangeably to describe chronic wounds.*

3- According to wound depth:

- **Superficial wounds:** Only the epidermis is affected. A truly superficial wound does not bleed and heals within a few days. Examples include most abrasions and 1st degree burn.
- **Partial-thickness wounds:** The epidermis and part of the dermis is affected. A partial-thickness wound does bleed. It can take from several days to several weeks to heal by epithelialization. Examples include a 2nd degree burn.
- **Full-thickness wounds:** involves the epidermis and the dermis. The underlying fatty tissue, bones, muscles, or tendons may also be damaged. It takes longer time to heal than does a partial-thickness wound. Examples include a 3rd degree burn.

Management of Traumatic wounds

1-Evaluation:

- a) Manage the life threatening injury
- b) History of the wound should include
 - Time: wound that remain open for over 6 to 8 hrs are more likely than fresh wound to become infected if closed.
 - Mechanism: predicts the degree of tissue damage
 - Environment: predict the degree of contamination
- c) past history
 - comorbidities: DM, vascular disease, malignancy, malnutrition can impair wound healing
 - Tetanus status: determine the need for prophylaxis:

Tetanus Prophylaxis Guidelines (CDC Guidelines, 1998)

Tetanus toxoid history	Clean, minor wounds	Contaminated or major wounds
<3 doses, or unknown	Tetanus toxoid	Tetanus toxoid Tetanus immunoglobulin
≥3 doses	Nothing (except tetanus toxoid if >10 y since last booster)	Nothing (except tetanus toxoid if >10 y since last booster; consider immunoglobulin if toxoid is not administered)

- Past surgical history: previous scar, non healed wound,
 - Medication: steroid and chemotherapy
 - Allergies: allergy to sulfa containing drug are contraindication for the use of topical silver sulfadiazine
- d) Physical examination:
- Examine the wound for active hemorrhage, foreign bodies, and surrounding tissue damage
 - **Evaluate for tetanus prone wounds:**
 - I. **More than 6 hrs old**
 - II. **Stellate**
 - III. **Deep punctures**
 - IV. **Crush injury with devitalized tissue**
 - V. **Foreign body contamination**
 - Evaluate for damage to underlying nerves, tendon, blood vessels, bone, muscle.
 - Document complete neurovascular examination.
 - Measure the length, depth of wound and describe configuration(linear, stellate, etc)

- e) Laboratory test: complete blood count, Hb A1C. Albumine, blood urea and serum creatinine
- f) Radiology: evaluate bone fracture, presence of foreign body, hematoma and gas.

2-Irrigation and debridement: *Debridement involves the excision of all devitalized, contaminated tissue and foreign bodies. Irrigation with copious amount of normal saline or lactated Ringer's is beneficial in reduction of bacterial count. High-pressure **pulsatile jet lavages** can be more effective than low-pressure systems.*

3- Closure:

- **Primary Closure should be attempted within 6 hours(wound of face and hand can closed within 24 hrs)** if wound is clean and free of foreign body.
 - ✓ *Incised wound by sharp knife or glass = primary suture*
 - ✓ *Lacerated wound=wound excision and primary suture*
- Secondary intention closure: allow the wound to heal on its own.
- *Delayed primary suture:*
 - ✓ *Contaminated wound like human and cat bite wound= Delayed primary suture*
 - ✓ *Crush wounds=wound excision and delayed primary suture.*
- **Abrasions** need to be carefully scrubbed and cleaned of fine debris to prevent traumatic tattoos
- **Contusions** should be evacuated of any hematoma. Posttraumatic cooling reduces inflammation. After 24–48 h, heating assists in mobilization of hematoma.

******Method of wound closure : suturing, skin staples, Skin Tapes, Skin Adhesives**

4- Dressing

- ✓ Protect the wound from the external environment and mechanical forces
- ✓ Absorb secretions/maintain a clean environment
- ✓ **Promote granulation** tissue formation and reepithelialization.
- ✓ Optimize patient comfort.

5- Antibiotic use: indicated in

- ✓ Wound with surrounding cellulitis
- ✓ Wound in immunosuppressed or diabetic patients
- ✓ Patient with valvular disease
- ✓ Crepitus or foul smell
- ✓ in patients with mechanical implants
- ✓ wounds contaminated by oral flora or animal bites

SCAR

A. Normal scar: *visible scar is the normal endpoint for all full-thickness skin skin injuries.*

Criteria :

- ✓ Remains within the confines of the original wound.
- ✓ Not elevated above skin level (flat)
- ✓ Soft
- ✓ Less prominent with time.
- ✓ No itching and pain
- ✓ Not cause contracture

B. Pathological scar:

HYPERTROPHIC SCAR: *scar tissue that does not extend beyond the boundaries of the incision or wound, develop within weeks of wounding (during the inflammatory phase), and there is usually some degree of improvement with time. It raised, erythematous, and often pruritic.*

Etiology: *the scar formation depend on many factors:*

- a. Amount and depth of wound (most commonly with burns)
- b. presence of inflammation, infection
- c. Prolonged open wound (>21 days, most commonly with burns)
- d. Areas of tension (over sternum, flexor surfaces).

Natural history

1. Becomes apparent at ~6 to 8 weeks after injury
2. Worsens over 6 months
3. May cause contractures at joints
4. May take 1 to 2 years to mature (scar will become less red, less tender, and less pruritic)
5. May regress somewhat without any intervention at all.

KELOIDS: *scar tissue that extends beyond the boundaries of the incision or wound, may develop months to a year after injury, and do not resolve spontaneously. Common in ear lobes, presternal area, shoulders and areas of tension.*

Etiology: intrinsic factors appear to play a greater role in keloid development than extrinsic factors. definitive etiology is unknown.

1. Major factors:

- ❖ Increased skin pigmentation is a risk factor.
- ❖ Genetic predisposition (autosomal dominant).

2. Contributing factors

- ❖ Age (peak just after puberty).
- ❖ Hormones (keloids worsen during puberty and pregnancy;).

*****Because of high recurrence rates, multimodality therapy recommended*

Treatment of hypertrophic and keloid scars:

- Pressure – local moulds or elasticated garments.
 - Commonly used for hypertrophic burn scars
 - Induces local tissue hypoxia, reduces fibroblast proliferation and collagen synthesis
 - Compression of 24 to 30 mmHg to be effective
- Silicone gel sheeting or topical silicone gel
 - increase hydration of remodeling scar
 - Require application of at least 12 hours/day for at least 3 months to be effective
- Intralesional steroid injection (triamcinolone)
- Excision and steroid injection
- Excision and postoperative radiation (external beam or brachytherapy)
- Intralesional excision (keloids only)
- Laser – to reduce redness (which may resolve in any event)
- Vitamin E or palm oil massage (unproven)

Note: In keloid, excision only is rarely successful (Recurrence Rates 50-100%), so it should be followed by steroid injection locally or radiation (in severe cases)

Comparison between keloid and hypertrophic scar:

features	Hypertrophic scar	keloid
<i>Genetic</i>	<i>Not familial</i>	<i>familial</i>
<i>Race</i>	<i>Not race related</i>	<i>More in African ancestry</i>
<i>Sex</i>	<i>Female=Male</i>	<i>Female>Male</i>
<i>Age</i>	<i>Children</i>	<i>10-30 years</i>
<i>Borders</i>	<i>Remain within wound</i>	<i>Outgrows wound area</i>
<i>Natural history</i>	<i>Subsides with time</i>	<i>Rarely subsides</i>
<i>Site</i>	<i>Flexor surfaces</i>	<i>Ear lobes, sternum</i>
<i>Etiology</i>	<i>Related to tension</i>	<i>unknown</i>