FORENSIC & TOXICOLOGY

SUMMARY

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Wounds

Factors influencing causation of wounds:

1. Nature of object /weapon.
2. Amount of energy discharged during impact (determined by the object mass & velocity).
3. Conditions under which the energy is discharged.
4. Nature of tissue affected (skin, subcutaneous tissue, muscle, bone,…).
5. Area of the affected part.

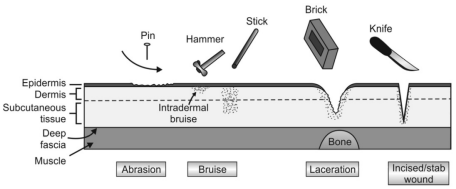


Fig. 11.1: Mechanical injuries caused by blunt and sharp objects

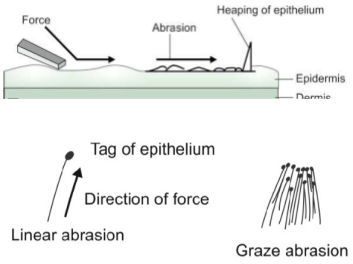
Types of wounds:

1. Abrasions

- **Rough blunt** force injury result in loss of superficial layer of skin.
- It is involve the epidermis >> so usually no (or low) bleeding, no scar formation.
- Mechanism of production:
  1. Compression force: imprint abrasion and pressure abrasion (non-imprint).
  2. Tangential force (sliding or friction): linear abrasion and graze abrasion.
- **Types:**

1. Linear abrasion "scratch abrasion"	○ Skin damage in a line-like pattern. ○ It's the result of a sharp, pointed object.
2. Graze abrasion "sliding or brush abrasion"	○ Caused by making contact with or dragging across a rough surface. ○ They show a parallel lines (furrows or grooves). ○ When the friction force is great, grazed area appears like burn injury and it is called in such cases the brush burn.
3. Imprint abrasion "pattered abrasion"	○ Result from a force applied perpendicularly to the skin leading to direct impact of the force to the skin causing stamping of skin with the force. ○ The wound matches the size and shape of the object.
4. Pressure abrasion "crushed abrasion"	○ Result form prolonged pressure from blunt force (like ligature in strangulation). ○ When the pressures abrasion resemble the shape of the object it is called now imprint abrasion :)

- Heaping of the epithelium: skin tags appear in the case of abrasions and this help in determining the direction of the force
  (يعني إنه صار في زوائد جلدية عند جهة معينة فبداية الجرح بتكون من الاتجاه المعاكس).
- Medicolegal importance: site, type of the offending object & time of the crime can be determined.
- Bite mark is an patterned abrasion.
- Abrasion wound can be fabricated (but less common than insicied wound).



Differentiation between antemortem and postmortem abrasion:

	Antemortem abrasion	Postmortem abrasion
Site	Anywhere	Bony prominence
Color	Bright red	Pale & dry
Covering	Scab composed of coagulation of blood & lymph	No such scab
Signs of inflammation	Present	Absent
Microscopy	Coagulation & vital reaction present	No

Age of abrasions:

Red, no scab	Fresh
Dark red scab	12 – 24 hours
Reddish brown scab	1 – 2 days
Dark brown	3 – 5 days
Blackish scab shrinks & falling begin from the margin	5 – 7 days
Scab fall of leaving hypo-pigmented area	7 – 10 days

2. Contusion

- Extravasation or collection of blood due to rupture of blood vessels caused by **blunt** nature without loss of continuity of tissue.
- If the contusion is visible throughout the skin or subconscious tissue you can call it bruises.
- Subcutaneous bruises is the most common type.
- Ecchymosis and petechiae are caused by pathological disorder such as bleeding tendency.
- Factor affecting contusion: condition of tissue, body part, situation of bruise, condition of blood vessels, presence of disease, sex, age, color of skin, optical character of skin.

Age of contusion:

Color	Age	Caused by
Red	Fresh	Extravasation of **blood**
Bluish	1 – 3 days	**Deoxyhemoglobin**
Bluish dark to **brown**	4 days	**Hemosiderin**
Greenish	5 – 6 days	**Hematoidin**
Yellow	7 – 12 days	**Bilirubin**
Complete disappearance	2 weeks	-

- **Complication:**
  - If inflicted on vital parts (e.g. neck, heart), the contusions may cause death.
  - Multiple contusions may cause death by shock and hemorrhage.
  - The contusions are painful lesions.
  - Multiple contusions of intestine may cause ischemia or gangrene.
  - The collected blood in contusion may lead to proliferation and multiplication of bacteria.
  - Pulmonary fat embolism; due to fat expressed from fat cells and then liquid fat entering the injured and torn blood vessel may lead to pulmonary fat embolism.

Differentiation between contusion & postmortem lividity:

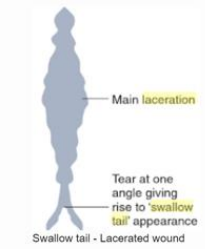
	Contusion	Postmortem lividity
Cause	Extravasation of blood due to blunt trauma	Stasis of blood in the vessels
Site	Anywhere (including internal organs)	Dependent sites
Surface	Elevated due to swelling	Not elevated
Color	Variable; depend on the age	Purplish blue
Edges	Ill-defined	Well-defined
Signs of inflammation	Present	Absent
Incision	Extravasation of blood in the surrounding & can't be washed out	Shows blood in the vessel & can be washed out

Differentiation between contusion & congestion:

	Contusion	Congestion
Caused by	Blunt force	Pathological condition
Color	Variable, depend on the age	No changes in the color
Edges	Ill-defined	Well-defined
On dissection	Extravasation of blood	Engorged vessels with blood

3. Lacerated wound

- Slitting or tearing of tissues caused by **blunt force** (involves the whole skin thickness).
- The most common type of wound seen in the ER.
- Commonly seen at bony prominences.
- **Irregular margins & ragged & uneven.**
- There may be bruising and crushing of the edges.
- Hair follicles are crushed.
- Swallow tails which are small tears at the angle of the main lacerated wound.

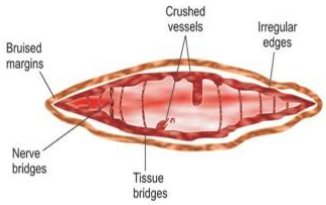


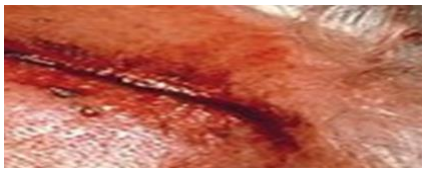
- Bleeding from lacerated wound is less compared to incised wound; the vessels are torn and crushed >> capable of retracting and undergo thrombosis >> less hemorrhage.
- **Some tissue, nerves, and blood vessels remain intact at the base of the wound represented as "tissue /structure bridging" and it is a characteristic sign (vs. incised wound).**
- Usually heal with scar formation.
- Medicolegal importance: the cause, nature, age, direction, manner of injury can be determined.
- Undermined edge, slopped side and adjacent contusion shown by physical examination is often the side which force was directed.

Differentiation between antemortem and postmortem lacerated wounds:

	Antemortem lacerated wound	Postmortem lacerated wound
Extravasation of blood	Present	Absent
Coagulation of the blood	Present	Absent
Signs of healing	Present	Absent
Increased enzyme activity	Present	Absent
Pus / infection	Present	Absent





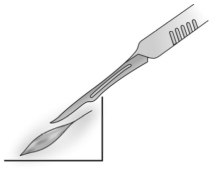


4. Incised wound

- Caused by drawing or striking the edge of **sharp object** on the skin and underlying tissues.
- Broader than the edge of the weapon causing it because of retraction of the divided tissues.
- Spindle-shaped and gaping.
- **The length is greater than the breadth (vs. depth in stab wounds).**
- **Clean, well defined margins mostly everted but maybe inverted & no bruises.**
- Hemorrhage is more in comparison with lacerated wound.
- Direction of application of force can be known by the "tailing", it is the end point.
- Medicolegal importance: the cause, nature, age, manner, direction of injury can be determined.

Self-inflected wounds (fabricated wound)	Defense wounds
Injuries on accessible part of the body, superficial, minor, regular, multiple & similar in shape, parallel or grouped together, handedness, old scar may be seen, psychiatric disorder.	When the victim tries to defend himself, mainly on the palm and ulnar aspect of the hand.

Notice the tailing in the left so the direction of the offending force from the right to the left.



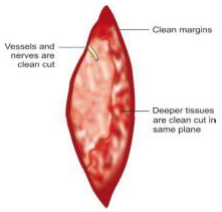
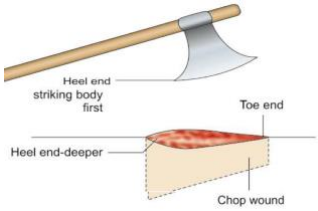



Fig. 11.8: Incised wound

5. Chop wound



- Type of incised wound made by hacking or chopping motion with fairly **sharp and relatively heavy weapon** such as axe.
- Wounds are wider and deeper than incised wounds but not so sharp.
- **Two parts in the chop wounds may be identified:**
  - The part of wound nearer to the assailant, known as heel end of the chop, is deeper than distal part from the assailant, known as toe end of the chop.
- Medicolegal importance: relative position of the assailant, type of weapon, age of injury can be determined, the manner usually homicidal, accidental injury may happen.

6. Stab wounds

- Wound produced by mechanical force along the long axis of a **narrow or pointed object.**
- **Types of stab wounds:**
  - Penetrating wounds: entry wound without exit wound.
  - Perforating wounds: entry and exit wounds.
- Entry point is larger and inverted, the exit point is smaller and everted.
- **The depth of stab wound is more than length and width.**