INJURY

(WOUND)

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INJURY

- Injury come under **Sec. 44 of I.P.C.**

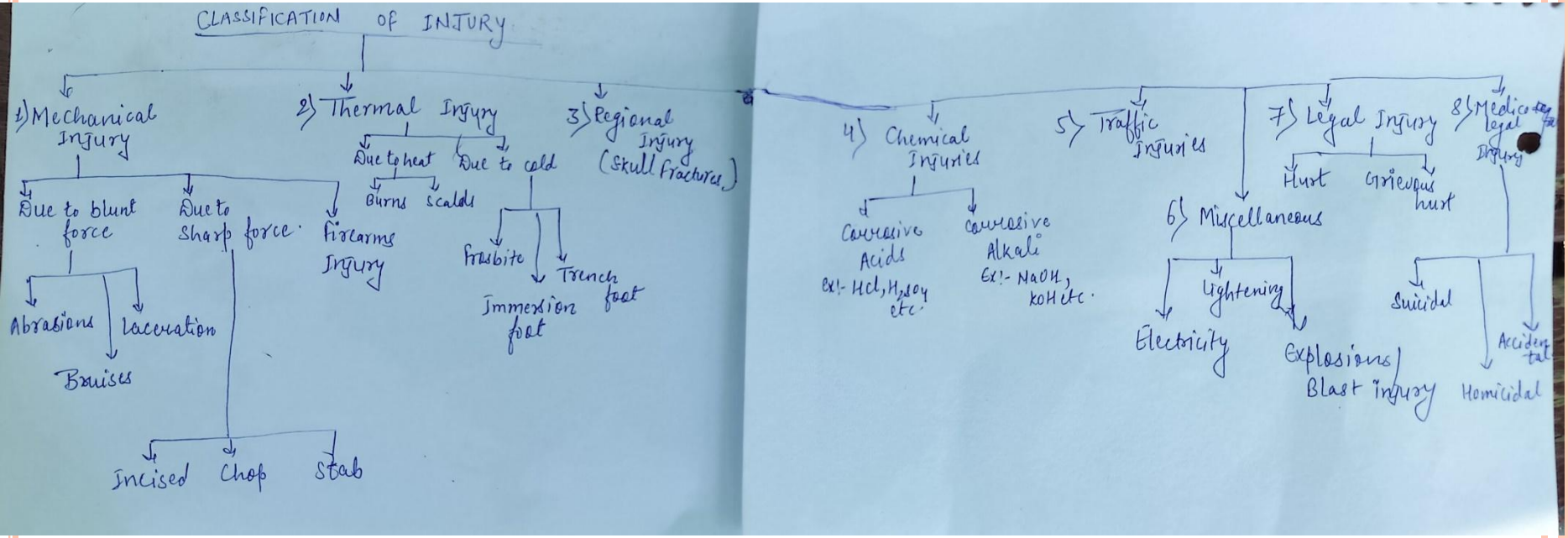
- **Legally, An injury** is any harm, whatever illegally caused to any person in body, mind, reputation or property.

- **Medically, a wound or injury** is a break of the natural continuity of any of the tissues of the living body.

Table (10–2). Difference between antemortem and postmortem wounds.

	Trait	Antemortem wounds	Postmortem wounds
(1)	Edges:	The edges are swollen, everted, retracted, and wound gapes.	Edges do not gape, but are closely approximated.
(2)	Haemorrhage:	Abundant and usually arterial.	Slight or more and venous.
(3)	Spurting:	Signs of spurting of arterial blood on the body, clothing or in its vicinity present.	No spurting of blood.
(4)	Extravasation:	Staining of the edges of the wound and extravasation in neighbouring subcutaneous and interstitial tissues which cannot be removed by washing.	Edges and cellular tissues are not deeply stained. The stain can be removed by washing.
(5)	Coagulation:	Firmly coagulated blood in wounds and tissues present.	No clotting or soft, friable clot.
(6)	Vital reaction:	Signs of vital reaction present, i.e., inflammation and repair.	No signs of vital reaction.
(7)	Enzyme histochemistry:	Increased activity of esterases, adenosine triphosphate, aminopeptidase, acid and alkaline phosphatase.	Diminished or no enzyme activity.

Classification of Injury/ Types



Classification of Injury/ Types

1. Mechanical or physical Injuries: Mechanical injury refers to damage to the body's tissues caused by physical force or trauma.

It is caused by -

(A) Due to blunt force:

- **Abrasions.**
- **Bruises / Contusions.**
- **Lacerations**.

(B) Due to sharp force:

- **Incised wounds.**
- **Chop wounds.**
- **Stab wounds.**

(C) Firearms:

- **Firearm wounds.**
- **Blast injuries**.

(2) Thermal Injuries: -Thermal injury refers to damage to the body's tissues caused by exposure to extreme temperatures, either heat or cold.

(A) Due to cold:

- **Frostbite.**
- **Trench foot.**
- **Immersion foot.**

(B) Due to heat:

- **Burns.**
- **Scalds.**

(3) Regional Injuries: Regional injury typically refers to damage or harm that occurs in a specific area or region of the body. This can include injuries to specific anatomical regions such as the head, neck, chest, abdomen, back, arms.

- Fractures

(4) Chemical Injuries: Injuries occurs when harmful or corrosive substances such as acids and alkalis comes into contact with the body. It is produced by -

- Corrosive acids.
- Corrosive alkalis.

(5)Traffic Injuries –It refers to any harm or damage sustained by individuals involved in a traffic accident, whether they are pedestrians, cyclists, motocyclists or occupants of vehicles.

(6)Miscellaneous:

- **Electricity, lightning**
- **Explosions/ Blast injuries**

(7) **Legal:**

- **Simple hurt.**
- **Grievous hurt.**

(8**) Medico-legal :**

- **Suicide injury.**
- **Homicide injury.**
- **Accident injury.**
- **Self-inflicated injury**
- **Ante-mortem and post-mortem Injury**

1. Mechanical Injuries

- The mechanical injury is defined as “damage to any part of the body due to application of mechanical force”.
- This damage may cause loss of tissue.

Due to blunt force:

Abrasion

- An abrasion (gravel rash) is a destruction of the skin, which usually involves the superficial layers of the epidermis only.
- These are caused by application of blunt force like lathi, fall from height, road traffic accident, hit with a hard object like stone, hammer etc.
- In another words, it is caused by friction against a rough surface or by compression, such as a lateral rubbing action by a blow, a fall on a rough surface, by being dragged in a vehicular accident, fingernails, thorns or teethbite.
- Thickness of skin is 1.6 mm..

Types of abrasions:

1. **Scratches:** They are produced by a sharp weapon like needle or pin.
2. **Grazes:** They are produced as a result of friction like fall on a rough surface.
3. **Pressure Abrasions:** These are due to sustained pressure on the area just like the ligature mark in hanging, strangulation, etc.
4. **Imprint Abrasions:** Sometimes, the pattern of the object is seen on the skin just like tyre marks or marks of radiator in road traffic accidents.
5. **Fabricated Abrasions:** Sometimes abrasions are fabricated either by the person himself or with the help of another person to implicate someone.
6. **Contused Abrasions:** If more mechanical violence is used, the abrasion may be contused too, in such cases it may be referred to as contused abrasion or abraded contusion

ABRASIONS

Age of the Abrasions :

- ✓ Abrasions heal from the periphery by new growth of epithelial cells.
- ✓ The exact age cannot be determined.

- Fresh : Bright red.
- 12 to 24 hours: Lymph and blood dries up leaving a bright red scab.
- 2 to 3 days : Reddish-brown scab.
- 4 to 7 days : Dark brown to browinsh-black scab. Epithelium grows and covers defect under the scab.
- After 7 days : Scab dries, shrinks and falls off, leaving depigmented area underneath, which gets gradually pigmented.

Medi-colegal Importance:

- They give an idea about the site of impact and direction of the force.
- The age of the injury may be determined.
- Determine ante-mortem & post-mortem abrasions.
- Patterned abrasions are helpful in connecting the wound with the object which produced them.
- In open wounds, dirt, dust, grease or sand are usually present, which may connect the injuries to the scene of crime.
- Manner of injury may be known from its distribution.

For ex- 1. In throttling, crescentic abrasions due to fingernails are found on the neck.

2. In smothering, abrasions may be seen around the mouth and nose.

3. In sexual assaults. abrasions may be found on the breasts, genitals, inner side of the thighs and around the anus.

Table (8–1). Difference between antemortem and postmortem abrasions.

	Trait	Antemortem abrasions	Postmortem abrasions
(1)	Site :	Anywhere on the body.	Usually over bony prominences.
(2)	Colour :	Bright reddish-brown.	Yellowish, translucent, and parchment-like.
(3)	Exudation :	More; scab slightly raised.	Less; scab often lies slightly below the level of skin.
(4)	Microscopic :	Intravital reaction and congestion seen.	No intravital reaction and no congestion.

Bruises / Contusions

- A bruises / contusion is an effusion of blood into the tissues, due to the rupture of blood vessels (veins, venules and arterioles), caused by blunt force such as fist, stone, stick, bar, whip, hammer, axe, lathi, fall from height, road traffic accident, etc.
- Bruises may be present not only in skin, but also in internal organs, such as the lung, heart, brain and muscles and any tissue.
- It vary in size from pinhead to large collections of blood in the tissues.

Types of bruises:

- **Intradermal-** When bleeding extends deep into the dermis, it is referred to as intradermal bruising.
- **Subcutaneous-**A subcutaneous contusion is a bruise just beneath the skin.
- **Deep-** If the blunt force produces extensive bruising of deeper tissues.

BRUISES

Age of the Bruise:

- A bruise heals by destruction and removal of the extravasated blood.
- The changes start at the periphery of the bruise and later move to the centre.

  - **At first: Red.**
  - **Few hours to 3 days : Blue.**
  - **4th day : Bluish-black to brown(haemosiderin).**
  - **5 to 6 days : Greenish (haematoidin).**
  - **7 to 12 days : Yellow (bilirubin).**
  - **2 weeks: Normal**.

Medico-legal Importance :

- Patterned bruises may connect the victim and the object or weapon, e.g., whip, chain, cane, ligature, vehicle, etc.
- The age of the injury can be determined by colour changes.
- Determine ante-mortem and post-mortem bruises.
- Determine true and artificial bruises.
- The degree of violence may be determined from their size.
- Manner of injury may be known from its distribution. For ex- When the arms are grasped, there may be 3 or 4 bruises on one side and one larger bruise on the opposite side, from the fingers and thumb respectively, indicating the position of the assailant in front of, or behind the victim.

Table (8–3). Difference between true bruise and artificial bruise.

	Trait	Artificial bruise	True bruise
(1)	Cause:	Juice of marking nut, calotropis or plumbago rosea.	Trauma.
(2)	Site :	Exposed accessible parts.	Anywhere.
(3)	Colour:	Dark-brown.	Typical colour changes.
(4)	Shape:	Irregular.	Usually round.
(5)	Margins:	Well-defined and regular, covered with small vesicles.	Not well-defined, diffuse and irregular; no vesicles.
(6)	Redness and inflammation:	Seen in the surrounding skin.	Seen in the site.
(7)	Contents:	Acrid serum.	Extravasated blood.
(8)	Itching:	Present.	Absent.
(9)	Vesicles:	May be found on fingertips and on other parts of the body due to scratching.	Absent.
(10)	Chemical tests:	Positive for the chemical.	Negative.

	Ante-mortem bruises	*Post-mortem bruises*
1.	Colour changes present	Absent
2.	Superficial and deep	Usually superficial only
3.	Ecchymosis is more	Very less
4.	Signs of inflammation and other vital reactions seen	Absent
5.	On microscopic examination, such changes and other changes can be demonstrated	No infiltration of leucocytes

Laceration

- Lacerations are tears or splits of skin, mucous membranes, muscle or internal organs produced by application of blunt force to broad area of the body, which crushed or stretched tissues beyond the limits of their elasticity.
- They are caused by blows from blunt objects, by falls on hard surfaces, by machinery, traffic accidents, etc.
- They are also called tears or ruptures.
- Margins are irregular, ragged and uneven, and their ends are pointed or blunt, and they too show minute tears in the margins.
- If the force produces bleeding into adjacent tissues, the injury is a **'contused-laceration' or 'bruised-tear'**.
- If the margins are abraded, it is called "**abraded laceration**" or "**scraped tear**".
- If the blunt force produces extensive bruising and laceration of deeper tissues, it is called "**crushing" injury.**

Types of laceration :

Split Lacerations : Splitting occurs by crushing of the skin between two hard objects. For ex- Scalp lacerations occur due to the tissues being crushed between skull and some hard object, such as the ground.

Stretch Lacerations : They are due to over-stretching of skin by blunt force.

Avulsion (shearing laceration) : An avulsion is a laceration produced by sufficient force (shearing force) delivered at an acute angle to detach (tear off) a portion of a traumatised surface. For ex- lorry wheel passing over a limb may produce separation of the skin from the underlying tissues.

Tears: Tearing of the skin and tissues can occur from impact by or against irregular or semi sharp objects, such as door handle of a car, by blows by broken glass, or fall over a rough projected object.

Cut Lacerations : Cut lacerations may be produced by a heavy relatively sharp-edged instrument such as axe, hatchet, chopper. etc.

Fig. 9: Lecerated wounds on knees

Fig. 10: Multiple lacerations of the liver

Medico-legal Importance :

- The type of laceration may indicate the cause of the injury and the shape of the blunt weapon.
- Foreign bodies found in the wound may indicate the circumstances in which the crime has been committed.
- The age of the injury can be determined.

Due to sharp force:

A. Incised Wound:

- The incised wound is produced by a sharp weapon such as knife, razor, etc.
- An incised wound (cut, slice) is a clean cut through the tissues, (usually the skin and subcutaneous tissues, including blood vessels), caused by sharp-edged instrument.
- **The wound is longer than it is deep.**
- It is always broader than the edge of the weapon causing it due to restriction of cut tissues.

Characteristics :

Margins : The edges are clean cut, well-defined and usually everted.

Width : The width is greater than the thickness of the edge of the weapon causing it, due to retraction of the divided tissues.

Shape: It is usually spindle-shaped due to greater retraction of the edges in the centre.

Direction: Incised wounds are deeper at the beginning, because more pressure is exerted on the knife at this point.

Bevelling cut : If the blade of weapon enters obliquely, the wound will have a bevelled margin on one side with undermining (undercut) on the other side so that subcutaneous tissue is visible, indicating the direction from which the blade entered..

Age of Incised Wound :

Fresh: Haematoma formation.

12 hours: The edges are red, swollen and adherent with blood and lymph; leucocytic infiltration.

24 hours : A continuous layer of endothelial cells covers the surface; overlying this a crust or scab of dried clot is seen.

Medicolegal Importance:

(l) They indicate the nature of weapon (sharp-edged).

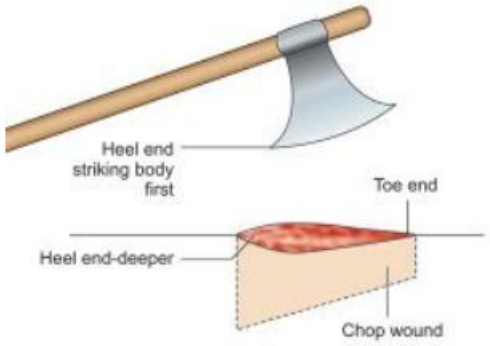
(2) The age of the injury can be determined.

(3) They give an idea about the direction of the force.

(4) Position and character of wounds may indicate mode of production, i.e., suicide, accident, homicide.

B. CHOP WOUNDS (Slash wounds) :

- They are deep gaping wounds caused by a blow with the sharp-cutting edge of a fairly heavy weapon, like a hatchet, an axe, sword, broad heavy knife, chopper, saber, or meat cleaver.
- The dimensions of the wound correspond to cross-section of penetrating portion of the blade.
- The margins are sharp and may show slight abrasion and bruising with marked destruction of underlying organs.



Medico-legal aspects -

- Most of these injuries are homicidal and usually inflicted on the exposed portions of the body like the head, face, neck, shoulders and extremities.
- Accidental injuries are caused by power fans, band saws or ship or airplane propellers, which may lacerate the soft tissues extensively or amputate parts of the body.
- Suicidal chop injuries are very rare.

C. STAB OR PUNCTURED WOUNDS

- A stab wound is produced when force is delivered along the long axis of a narrow or pointed object, such as knife, dagger, sword, chisel, scissors, nail, needle. spear, screw driver, etc. into the depths of the body.
- **The wound is deeper than its length and width on the surface of skin.**

Characteristics :

Margins: The edges of the wound are clean-cut and inverted.

Length : The length of the wound is slightly less than the width of the weapon up to which it has been driven in, because of stretching of the skin.

Width: By examining multiple stab wounds in the body, the length and width of the knife blade can be determined approximately.

Medico-legal Importance :

(l) The shape of the wound may indicate the class and type of the weapon which may have caused the injury.

(2) The depth of the wound will indicate the force of penetration.

(3) Direction and dimensions of the wound indicate the relative positions of the assailant and the victim.

(4) The age of the injury can be determined.

(5) Position, number and direction of wounds may indicate manner of production, i.e., suicide, accident, or homicide.

(6) If a broken fragment of weapon is found. it will identify the weapon or will connect an accused person with the crime.

Table (8–5). Difference between suicidal homicidal and accidental stab wounds.

	Trait	Suicidal wounds	Homicidal wounds	Accidental wounds
(1)	Number:	Often single.	Frequently multiple.	Usually single.
(2)	Site:	Accessible precordial area or upper abdomen.	May be anywhere.	May be anywhere.
(3)	Tentative wounds:	May be present around site of fatal wound.	May be present rarely but away from fatal wound.	Absent.
(4)	Clothing:	Removed from injured area.	Normally not disturbed.	Not disturbed.
(5)	Defence wounds:	Absent.	Often present.	Absent.

Table (8-6). Difference between incised, lacerated and stab wounds.

	Trait	Incised wound	Lacerated wound	Stab wound
(1)	Manner of production :	By sharp objects or weapons.	By blunt objects or weapons.	By pointed sharp or blunt weapons.
(2)	Site :	Anywhere.	Usually over bony prominences.	Anywhere; usually chest and abdomen.
(3)	Margins :	Smooth, even, clean-cut and everted.	Irregular and often undermined.	Clean-cut, parallel edges. Lacerated if weapon is blunt-pointed.
(4)	Abrasion on edges :	Absent.	Usually present.	Absent.
(5)	Bruising :	No adjacent bruising of soft tissues.	Bruising of surrounding and underlying tissues.	Rare.
(6)	Shape :	Linear or spindle-shaped.	Varies; usually irregular.	Linear or irregular.
(7)	Dimensions :	Usually longer than deep; often gaping.	Usually longer than deep.	Depth greater than length and breadth.
(8)	Depth of wound :	Structures cleanly cut to the depth of wound.	Small strands of tissue at the bottom bridge across margins.	Structures cleanly cut.
(9)	Haemorrhage :	Usually profuse and external. Spurting of blood may be seen.	Slight except scalp and external.	Varies; usually internal.
(10)	Hair bulbs :	Cleanly cut.	Crushed or torn.	Usually clean cut.
(11)	Bones :	May be cut.	May be fractured.	May be punctured.
(12)	Foreign bodies :	Absent.	Usually present.	Usually absent.
(13)	Clothes :	May be cut.	May be torn.	May be cut.

FIREARMS INJURY

- Wounds produced by firearms such as shot gun, revolver, rifled gun, pistol etc.
- Firearm wounds cause crushing of the tissues and produce an actual hole.
- The smoke extends up to 30 em., flame up to 15 cm and unburnt and partially burnt powder grains up to 60 to 90cm.
- The character of a wound depends on the distance from which the weapon is discharged.
- If the contact is tight (hard contact), **muzzle impression** (copy or recoil abrasion) is seen.

- In contact shot, the muzzle blast and the negative pressure in the barrel following discharge may suck blood, hair, fragments of tissues and cloth fibres several cm back inside the barrel called "**back spatter“.**
- Cruciate, stellate or ragged lacerations are seen especially if there is a thick bone immediately under the skin.
- Within a distance of about 30 cm., tissues surrounding the wound are singed by flame, and blackened by smoke, and tattooed by unburnt or partially burnt powder granules.
- Unburnt particles of the powder are embedded in the skin producing tattooing (stippling or peppering).

Blackening/Smudging:

- Carbonaceous deposition on skin which can be easily wiped off.
- Caused by deposition of smoke on skin

Tattooing (peppering/stippling):

- Small, descrete, black specks which can't be wiped off
- Caused due to grains of gunpowder driven into skin

Lead ring/Metal ring:

- Deposition of very small quantity of lead deposition at site of entry of projectile

Table (8–12). Difference between wounds of entrance and exit of a bullet wound *(see Plate 8, Figs 40 to 42).*

	Trait	Entrance wound	Exit wound
(1)	Size :	Smaller than the diameter of the bullet. In close discharge, skin is torn.	Bigger than the bullet.
(2)	Edges :	Inverted.	Everted, puckered or torn.
(3)	Bruising, abrasion and grease collar:	Present.	Absent.
(4)	Burning, blackening, tattooing:	May be seen around the wound.	Absent.
(5)	Bleeding:	Less.	More.
(6)	Fat:	No protrusion except in contact shot.	May protrude.
(7)	Tissues within and around the wound:	May be cherry-red due to CO of explosive gases.	No colour change.
(8)	Approximation of edges:	Retains a small central defect.	Re-establishes skin's integrity.
(9)	Fibres of clothing:	Turned in and may be carried into the wound.	Turned out.
(10)	Lead ring or metal ring:	May be seen around the wound by radiological examination.	Absent.
(11)	Spectrography:	More metal is found around entrance wound, if bullet has only passed through soft tissues.	The exit wound may contain more metal if a bone is struck nearer to it.

Table 13.2 Fire-arm discharge effects in relation to the distance travelled in case of rifled fire-arm

	Distance from body	*Effects*
1.	Contact	Blast effect, facial distortion, cherry red discolouration
2.	15 cm	Heat combustion effects
3.	30 cm	Soot particles
4.	60 cm	Fine particles produce blackening
5.	90 cm	Tattooing
6.	Effects of bullets	Abrasion collar, grease collar, wounds of entry and exit

Table 13.3 Difference between entry and exit wound of a fire-arm

	Features	*Entry wound*	*Exit wound*
1.	Size	Usually small except in contact wounds	Bigger than entry wound
2.	Edges	Inverted	Everted
3.	Abrasion collar	Present	Absent
4.	Contusion collar	Present	Absent
5.	Burning, singeing and blackening	Present	Absent
6.	Grease or dirt collar	May be present	Absent
7.	Clothes fibres	May be seen	Absent
8.	Carbon monoxide	Can be detected in high quantity. Keeps on decreasing as track passes	May be present but very less as compared to entry wound

Table 13.4 Fire-arm discharge effects in relation to distance travelled in cases of shot gun

	Distance	*Effects*
1.	Contact and close shot	Gaseous effect. Blow back effect. Cherry red discolouration around the wound of entry.
2.	15 cm	Gun flame effect. Heat combustion effect on clothes, singeing of hair seen.
3.	30 cm	Blackening due to soot particles
4.	60 cm	Coarse particles causing tattooing.
5.	1.25–2 metres	Cards/wads causing minor injuries.
6.	Effects of lead shots	Wound of entry and exit seen in above cases.

Table (8–13). Difference between suicidal, accidental and homicidal firearm wounds

	Trait	Suicide	Accident	Homicide
(1)	Site of entrance wound:	Head or heart.	Any area.	Any area.
(2)	Shot distance:	Contact or very close range.	Close or very close range.	Any range.
(3)	Direction:	Upward or backward.	Any direction.	Usually upward.
(4)	Number of wounds:	Usually one.	One.	One to many.
(5)	Hand pressing trigger:	Powder residue present.	Powder residue present.	Powder residue absent.
(6)	Position of the weapon:	Found at the scene.	Found at the scene.	Not found at the scene.
(7)	Scene:	Usually in his own house.	In his house or while hunting, etc.	Any place.
(8)	Sex:	Usually males.	Usually males.	Any sex.
(9)	Motive:	Insanity, incurable illness, financial loss, etc.	Nil .	Gang feuds, robbery, revenge, etc.

2. MEDICO-LEGAL INJURY/WOUND

1. **Accidental injury** refers to harm or damage to the body that occurs unexpectedly and unintentionally.

2. **Homicidal injury** refers to harm or damage inflicted upon a person with the intent to cause death by another individual. (Homicide is killing of a human being by another human being.)

3. **Suicidal injury** refers to harm or damage to oneself with the intension of causing death.

4. **Self-inflicted wounds** are those inflicted by a person on his own body.

5. **Fabricated wounds** (fictitious, forged or invented wounds) are those which may be produced by a person on his own body (self inflicted), or by another with his consent.

Table (8–7). Differences between suicidal, homicidal and accidental wounds.

	Trait	Suicide	Homicide	Accident
(1)	Nature of wounds :	Usually incised and stab.	Usually chop wounds, lacerations and stab.	Usually lacerations, abrasions and contusions.
(2)	Number of wounds :	Multiple.	Multiple.	Usually single, may bemultiple.
(3)	Target area :	Accessible parts only, i.e., front and sides of the body, such as neck, wrists, left side of chest, groin, etc.	No fixed site; vital parts, such as head, chest, abdomen.	Anywhere; usually on exposed parts and bony prominences. Number of wounds on the same side.
(4)	Wound grouping :	Arranged.	Irregular.	Vulnerable parts.
(5)	Direction :	In right-handed persons from left to right and from above downwards.	Any direction.	Any direction.
(6)	Severity :	Mostly superficial; one or two deep wounds.	Mostly severe and extensive.	Variable severity.
(7)	Hesitation marks:	Usually present.	Absent.	Absent.
(8)	Defence wounds :	Absent.	May be present.	Absent.
(9)	Secondary injuries :	Absent.	May be connected with fight.	May be associated with accident.
(10)	Weapon :	By the side of the body or may be grasped firmly due to cadaveric spasm.	Absent.	Present.
(11)	Clothes :	Not damaged as they are usually removed.	May be damaged.	May be damaged and stained with oil, grease, mud, dirt, etc.
(12)	Scene of crime :	Usually inside closed room; no disturbances of surroundings.	Disturbed and disorderly with signs of struggle and blood stains.	Varies with the nature of the accident.
(13)	Motive :	Present, such as domestic worries, disappointment in love, chronic disease, failure in examination, etc.	Revenge, robbery, sexual offences.	Absent.

Table (8–4). Difference between suicidal and homicidal cut-throat wounds

	Trait	Suicidal wounds	Homicidal wounds
(1)	Situation:	Left side of the neck and passing across the front of the throat; rarely on both sides.	Usually on both sides.
(2)	Level :	High; above the thyroid cartilage.	Low; on or below the thyroid cartilage.
(3)	Direction:	Above downwards and from left to right in right–handed person. Sometimes horizontal cuts across the front of the neck are seen which do not show variation in depth at either end.	Transverse or from below upwards. If attacked from the right side of victim, the wound runs from left to right; if from behind, it may resemble suicidal wound.
4)	Number of wounds:	Multiple, may be 20 to 30, superficial, parallel and merged with the main wound; rarely single.	Multiple, cross each other at a deep level; not repeated in depths of the main wound.
(5)	Edges :	Usually ragged due to overlapping of multiple superficial incisions.	Sharp and clean-cut; bevelling may be seen.
(6)	Hesitation cuts :	Present.	Absent.
(7)	Tailing :	Present.	Absent.
(8)	Severity:	Usually less severe. One wound may be extremely deep, extending up to cervical vertebrae, but sometimes 2 or 3.	More severe; all the tissues including the vertebrae may be cut.
(9)	Wounds in other parts of the body :	Often present across wrists, groin, thighs, ankles, or knees; and rarely on the back of neck.	No wounds on wrists, etc. but severe injuries usually on the head and neck.
(10)	Defence wounds:	Absent; unintentional cuts may be found on the fingers if a blade has been used.	Present.
(11)	Hands:	Weapon may be firmly grasped due to cadaveric spasm.	Fragments of clothing, hair, etc., may be grasped.
(12)	Weapon:	Usually present.	Usually absent.
(13)	Vessels:	As head is thrown back, carotid artery is drawn beneath sternomastoid and against the spine and usually escapes injury.	Jugular vein and carotid artery are likely to be cut.
(14)	Blood stains:	If standing, stains on the mirror and on front of body and clothes running from above downwards and splashes on feet.	If asleep, blood runs down on both sides of the neck and collects behind the neck and shoulder; stains found on both palms, for the victim attempts to cover the wound.
(15)	Clothes:	Not cut or damaged.	May be cut corresponding in position to those in the body; disarrangement, tears and loss of buttons.
(16)	Circumstantial evidence:	Quiet place, such as bedroom or locked bath-room; usually stands in front of a mirror in order to direct the hand better; suicidal note or farewell letter may be found.	Disturbance at the scene, such as disarrangement of furniture in a room; trampling and crushing of vegetable matter and shrubs, or confused foot prints outside.

3. THERMAL INJURY

Thermal injury refers to damage to the body's tissues caused by exposure to extreme temperatures, either heat or cold.

(A) Due to cold:

- **Frostbite.** When the body is exposed to freezing temperature (–8°C to –10°C), erythematous patches appear on skin which are caused by impaired local circulation, injury and shock.
- **Trench foot.** –caused by cold condition**.**
- **Immersion foot. -** caused by cold condition.

(B) Due to heat:

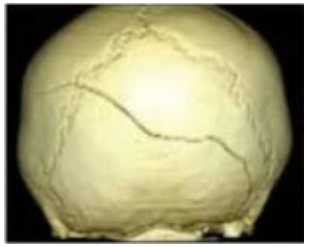
- **Burns-** Burns are defined as injury caused to the body by the application of dry heat like flame, heated material or radiant heat.
- **Scalds-** A scald is an injury which results from the application of liquid above 60°C or from steam. Scalds are wet heat injuries produced by application of heated liquid or its gaseous form like steam. Scalds are usually not so severe as the liquid or gas runs off from the surface

4. Regional Injuries

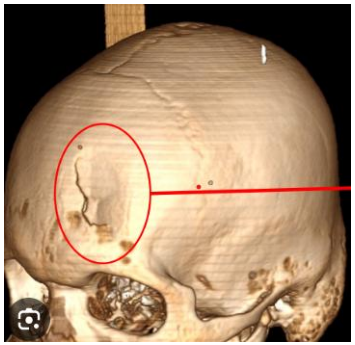
- Regional injury typically refers to damage or harm that occurs in a specific area or region of the body.
- This can include injuries to specific anatomical regions such as the head, neck, chest, abdomen, back, arms.

Types of Fracture Skull:

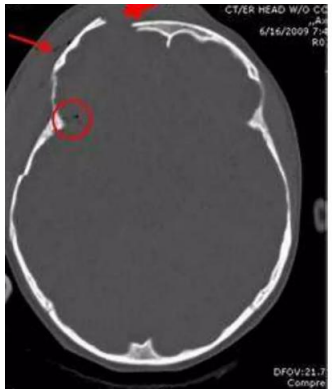
(1) Fissured Fractures: They are produced by general deformation of the skull. These are linear fractures involving the whole thickness of the bone or inner or outer table only.



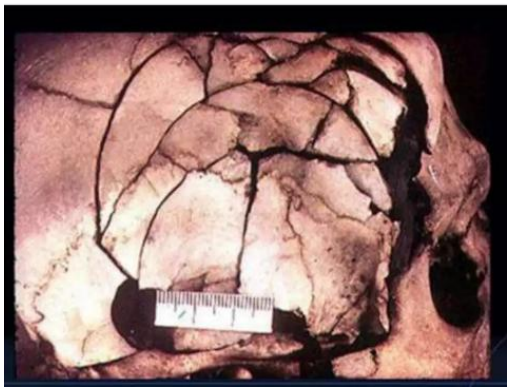
(2)Depressed Fractures: They are also called "fractures a Ia signature" (signature fractures), as their pattern often resembles the weapon or agent which caused it.



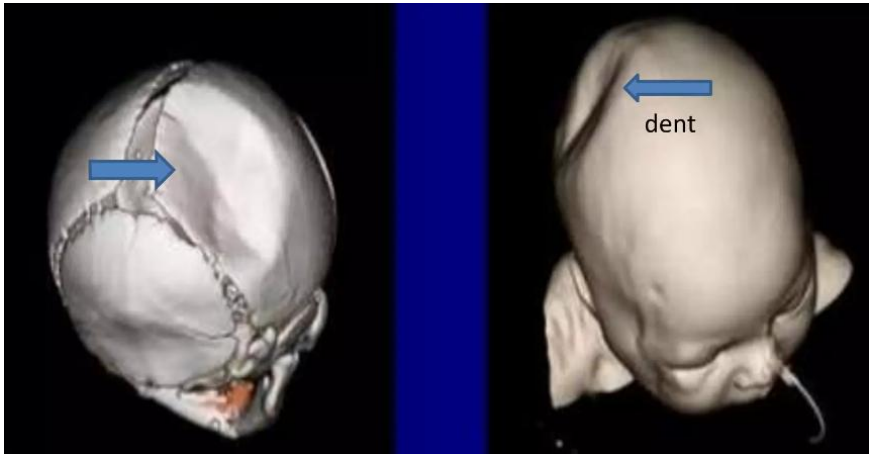
(3) Elevated fracture: One end of fractured fragment is elevated over the surface of skull and the other end is depressed into cranial cavity. It is caused by a blow from heavy sharp weapon.



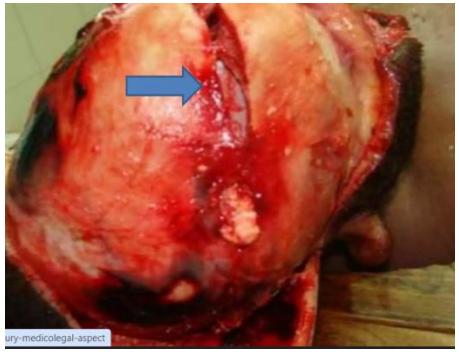
(4) Comminuted Fractures: When there is no displacement of the fragment, it resembles a spider's web or mosaic.



(5) Pond or Indented Fractures: This is a simple dent of the skull, which results from an obstetric forceps blade, a blow from a blunt object or forcible impact against some protruding object. They occur only in skulls of infants.



(6) Gutter Fractures: They are formed when part of the thickness of the bone is removed so as to form a gutter, e.g., in oblique bullet wounds.



(7) Ring or Foramen Fractures: It is fissured fracture which encircles the skull in such a manner that the anterior third is separated at its junction with the middle and posterior third.

5. TRAFFIC INJURIES

- It refers to any harm or damage sustained by individuals involved in a traffic accident, whether they are pedestrians, cyclists, motocyclists or occupants of vehicles.

The following types of injuries are seen in pedestrians:

Primary Impact Injuries: These injuries are sustained when any part of vehicle first strikes the victim. Usually, they are seen on legs when bonnet strikes the legs. When the impact is severe, imprint abrasion in the form of tyre mark or bonnet mark may be seen which may help in identification of the vehicle.

Secondary Impact Injuries: These injuries are sustained as a result of impact between body parts of the victim and the vehicle for the second time as the victim, after being hit by the vehicle is thrown up on the vehicle.

Secondary Injuries: These injuries are sustained when the victim after being thrown by the vehicle hits the ground. Sometimes, the victim may be hit by another vehicle also.

Crush Injuries: When a victim is run over by the vehicle, crush injuries are produced. The severity of injuries depends on weight of the vehicle and area of crush injuries.

6. LEGAL:

Simple hurt.

- Comes under sec 319 of IPC
- Whoever causes bodily pain, disease or infirmity to any person is said to cause hurt.

Grievous hurt.

- Comes under sec 320 of IPC
- The following kinds of hurt only are designated as "grievous":—

  First.—Emasculation.

  Secondly.—Permanent privation of the sight of either eye.

  Thirdly.—Permanent privation of the hearing of either ear.

  Fourthly.—Privation of any member or joint.

  Fifthly.—Destruction or permanent impairing of the powers of any member or joint.

  Sixthly.—Permanent disfiguration of the head or face.

  Seventhly.—Fracture or dislocation of a bone or tooth.

  Eighthly.—Any hurt which endangers life or which causes the sufferer to be during the space of twenty days in severe bodily pain, or unable to follow his ordinary pursuits.

ELECTRICITY INJURY

- **Injury caused due to electricity.**
- They are quite common in rainy season.

The deleterious effects of electricity depend on following **factors:**

- **The Nature of Current**: High voltage currents are very dangerous to life.
- **Resistance of Body:** The deleterious effects of electricity also depend upon the amount of resistance offered by the body.
- **Duration:** Greater the duration of current, more the damage.

Symptoms-

- Immediate loss of consciousness or collapse.
- Cardiac arrest or irregular heartbeat
- Burns or electrical marks on the skin where the current entered or exited the body
- Muscle contractions or spasms
- Difficulty breathing or respiratory distress
- Numbness or tingling sensations
- Neurological symptoms such as confusion, seizures, or loss of coordination.
- Headache and loss of memory may be seen in later stages.

Cause of death

- Low voltage currents up to 220 volts cause death by ventricular fibrillation while midvoltage currents up to 1000 volts cause ventricular fibrillation and respiratory centres failure. High voltage current above 1000 volts causes direct respiratory centres failure.

Post-mortem findings

- **Joule Burn or Endogenous Burns:** These are characteristic electric marks found on the skin.
- **Flash or Spark Burns** : The intense heat which may result from flash-over produces burns, which resemble thermal burns (exogenous burns).
- crocodile flash burns‘
- Electric burns or splits

Medico-legal importance

- Most of the deaths are accidental as the person comes under contact with the electric source.
- Suicidal death and homicidal deaths by electrocution are also reported.
- Visit of the crime scene is very essential to know the mode of death.
- Examination of electric source by engineers may suggest whether the leaking is tampered with or not.

LIGHTENING INJURY

- A flash or bolt of lightning is due to an electrical discharge from a cloud to the earth. The electric current is direct with a potential of abut twenty thousand amperes and about one hundred to thousand million volts or more. Along the track of the current much energy is liberated, most of which is converted into light.

Cause of Death :

Involvement of the central nervous system with paralysis of the heart or of the respiratory centre or electrothermal injuries cause death.

Postmortem appearances:

- The clothes are usually burnt or torn at the point of entrance and exit.
- Arborescent or Filigree Burns: Tree branch like structure. (Lichtenberg's flowers)
- Surface Burns

Medicolegal Importance :

- Most deaths occur in the open, e.g. persons sheltering under trees, open fields, especially if they are carrying or wearing something which may attract lightning.
- Death is always due to accident

FILIGREE BURNS
(LICHTENBERG'S FLOWERS)

BLAST INJURY

- A blast injury is a complex type of physical trauma resulting from direct or indirect exposure to an explosion.
- Blast injuries range from internal organ injuries, including lung and traumatic brain injury (TBI), to extremity injuries, burns, hearing, and vision injuries.
- The **4 categories** are based on the impact on the human body due to the **blast wave, blast wind**, environmental/material factors present in the area of the blast.

1. Primary blast injury

- is caused by the **blast wave** moving through the body. Since only high order explosives create a blast wave, primary blast injuries are unique to high order explosions.
- The blast wave causes damage to more extensively to air-filled organs.
- The resulting barotrauma can **affect the lungs, auditory organs, the eye, brain, and gastrointestinal tract.**

2. Secondary blast injuries

- are caused by debris that is displaced by **the blast wind** of the explosion.
- The secondary blast injuries are caused by debris that penetrates or interacts with the body surface.
- Injuries can include **fractures, amputations, lacerations, dislocations, and any type of soft tissue injury.**

3. Tertiary blast injuries

- are caused when the person in displaced through the **air and impacts on another object by the blast wind,** or when a structure collapses and causes injury to the person.
- Injuries are determined by what the victim strikes.
- High explosive blasts can cause skull fractures, fractured bones, head injuries, or any **traumatic injury (open or closed injuries, chest, abdominal, pelvic injuries, amputations, spinal injuries, and any others).**

4. Quaternary blast injuries

- are comprised of all injuries that are not included in primary, secondary, or tertiary blast injury categories.
- Quaternary blast injuries can be caused by exposure to resulting, **fire, fumes, radiation, biological agents, smoke, dust, toxins**, environmental exposure, and the psychological impact of the event.