

A faint, stylized medical illustration in the background. It features a stethoscope with a blue chest piece and a red tube. Behind the stethoscope is a red heart. To the right of the heart is a blue ECG line. The word 'NOTES' is written in a blue, stylized font, partially obscured by the stethoscope and heart.

Mechanical Injuries

Objectives

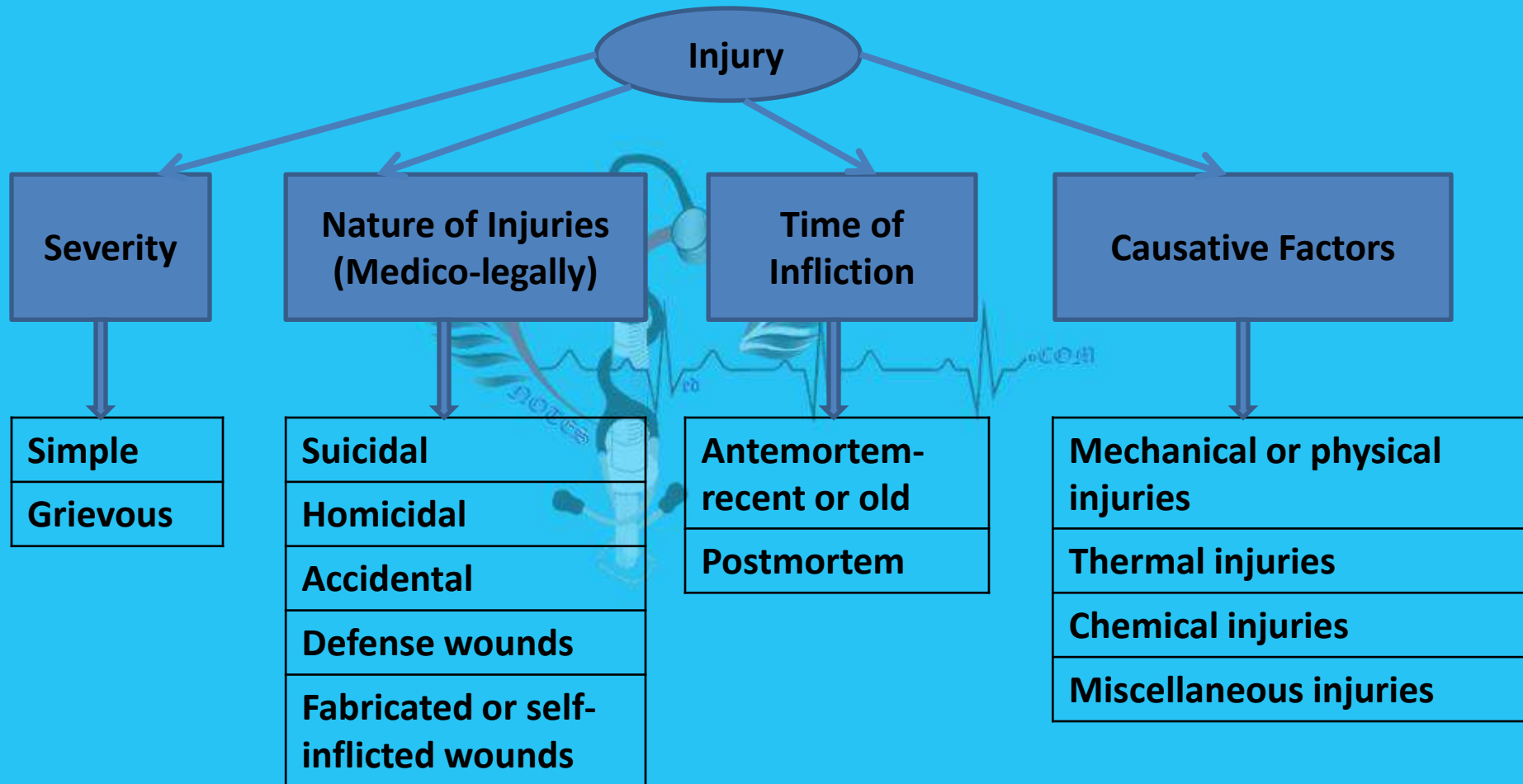
- To know about injuries and its type
- To know the law of the land
- To know about mechanical injuries
- To document injuries and make an injury report

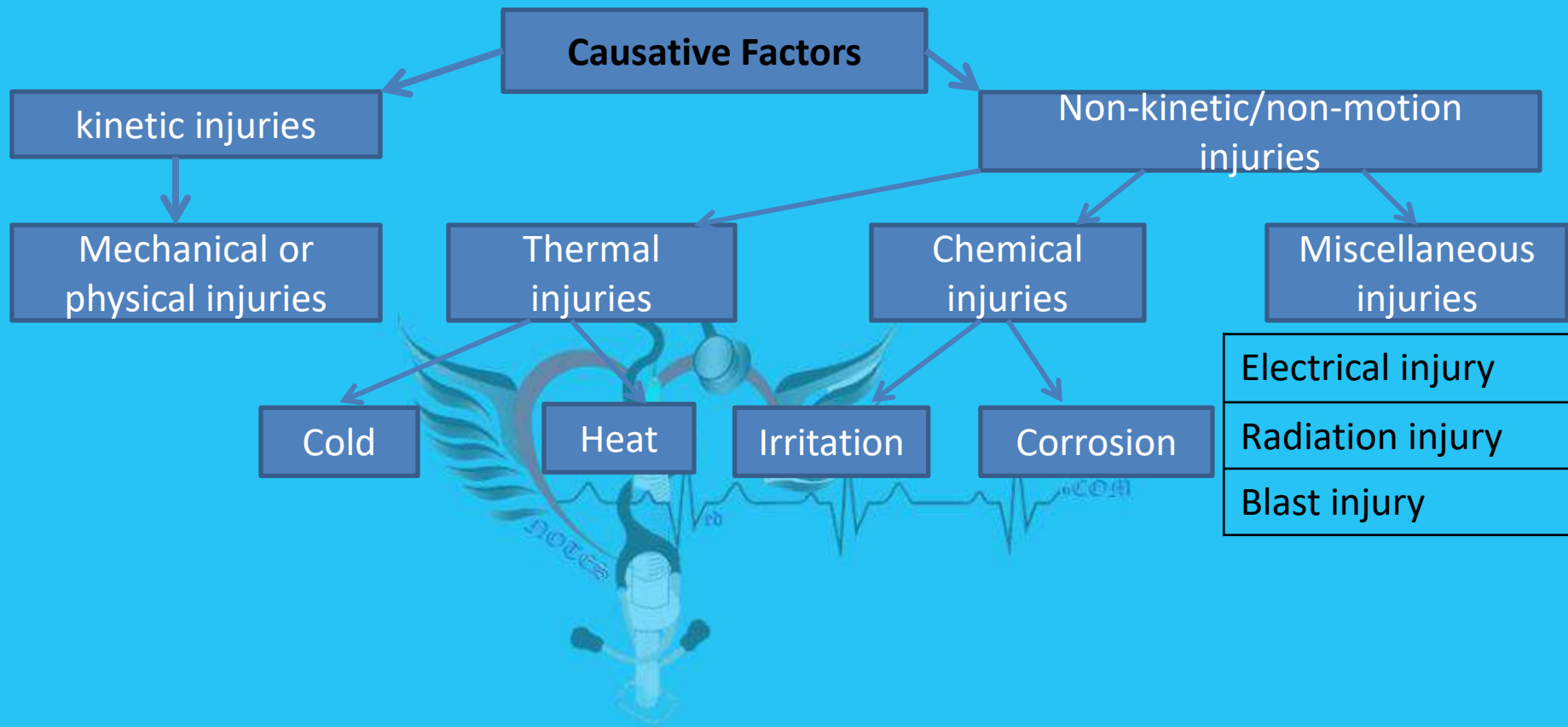
Injury

Medical Definition: Injury/Wound

- **Clinically:**
 - It is the breach of the natural continuity of any tissue (skin or mucous membrane)
 - It can also be defined as damage to any part of the body due to the application of mechanical force
- **Legal definition:**
 - Any harm caused illegally to a person that is to his body, mind, property or reputation

Classification





Mechanical or physical injuries

Blunt force trauma

Abrasion

Bruise or contusion

Lacerated wound

Firearm wound

Fracture/dislocation of bone, tooth or joint

Sharp force trauma

Incised wound

Stab wound

Chop wound

Grievous hurt

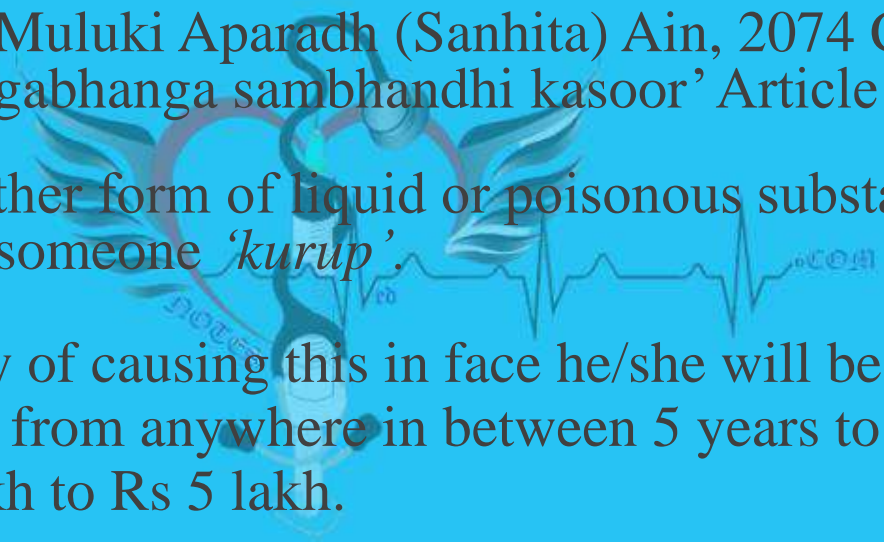
- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 ‘Kutpit wa angabhanga sambhandhi kasoor’ Article number 192, It is said to be grievous hurt when:
 1. Permanent privation of vision
 2. Permanent privation of smelling power of nose
 3. Permanent privation of hearing capacity of ears
 4. Permanent privation of talking power of tongue
 5. Cutting breasts of female to loss of function
 6. Emasculation in male and infertility in female due to injuries
 7. Fracture and dislocation of joints of spine, hands and legs leading to disability
 8. Not being able to involve in occupation due to physical assault (*asakchyam*)

Grievous hurt

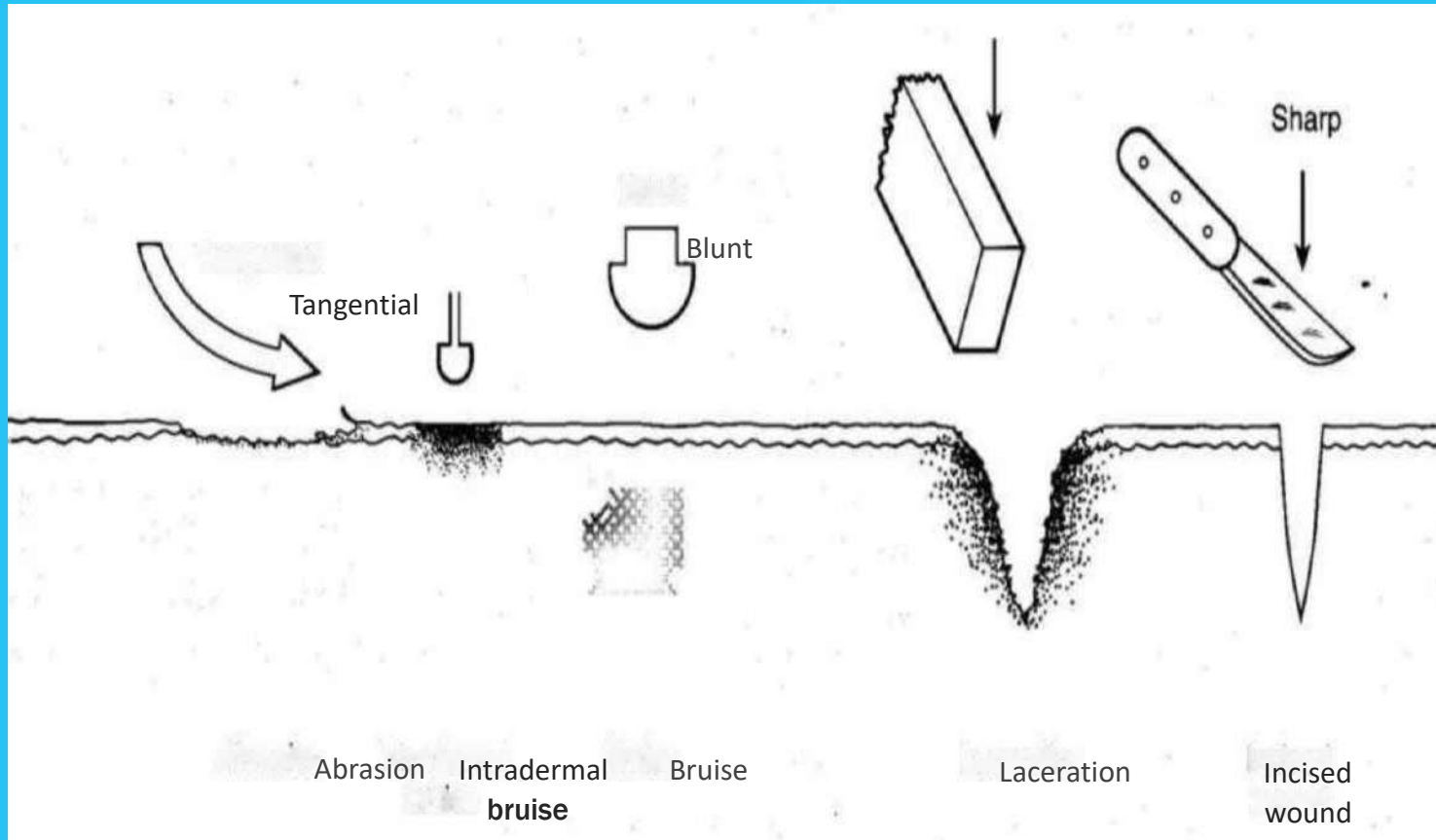
- If found guilty of causing grievous hurt:
 - He/she will be punished with up to 10 years of imprisonment with up to 1 lakh fine
 - If one of the twin organ is damaged then punishment will be half of grievous hurt
 - If the individual recovers and functions properly from grievous hurt then the punishment will be up to 3 years imprisonment with Rs. 30,000 fine

Simple hurt

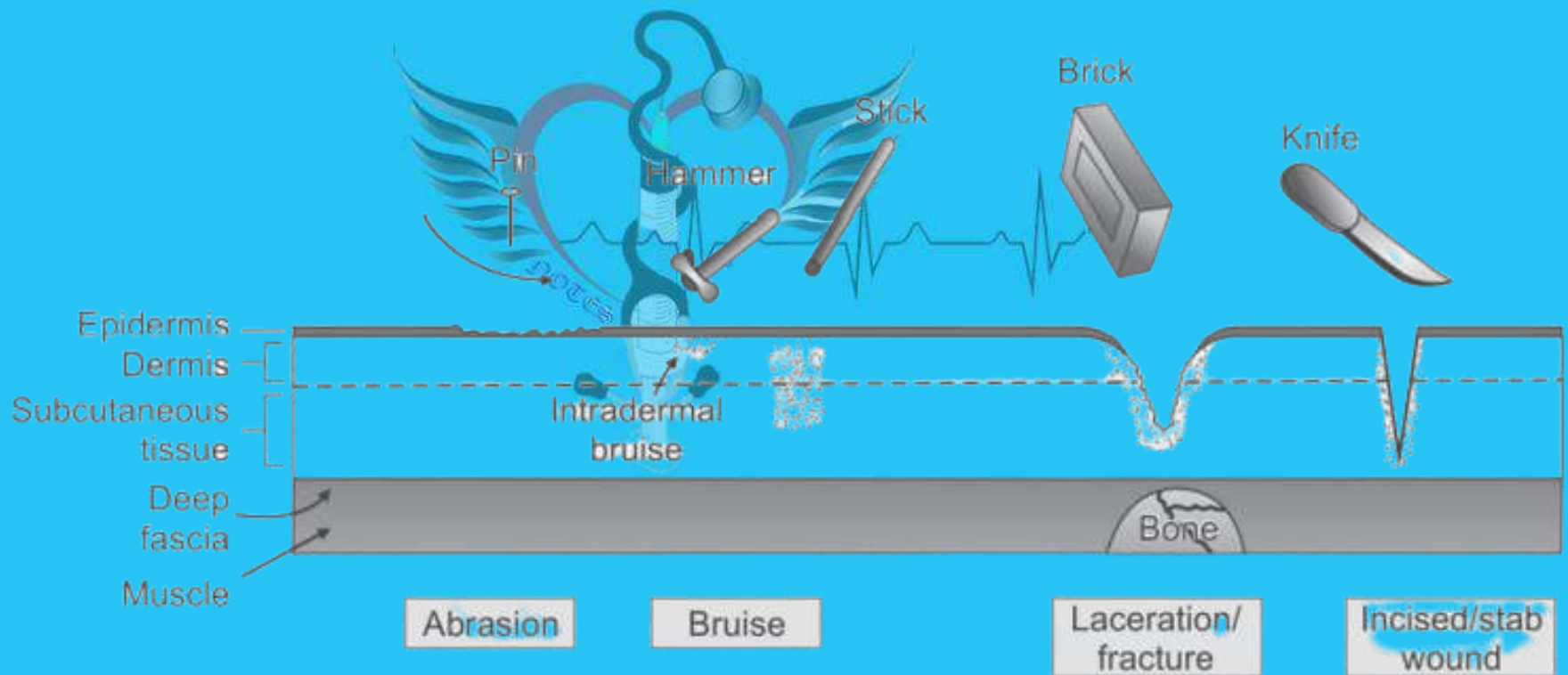
- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 'Kutpit wa angabhanga sambhandhi kasoor' Article number 191:
 - Any form of physical assault (other than grievous hurt)
 - If it is considered physical assault if:
 - If any bodily pain is caused.
 - If disease is transferred.
 - If any form of physical disability (*asakta*) is caused.
- If found guilty of this:
 - He/she will be punished with up to 3 years of imprisonment or up to Rs. 30,000 fine

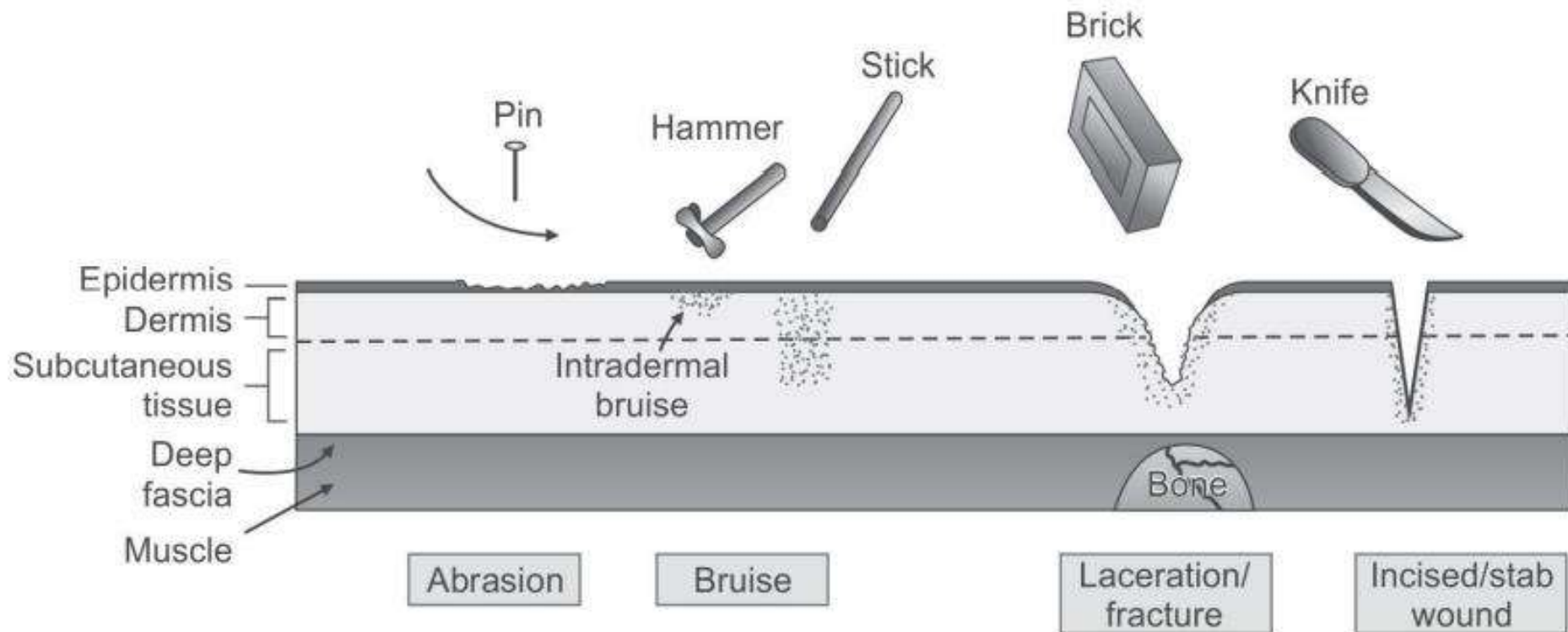
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- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 ‘Kutpit wa angabhanga sambhandhi kasoor’ Article number 193:
 - Acid or any other form of liquid or poisonous substance can’t be used to make someone ‘kurup’.
 - If found guilty of causing this in face he/she will be punished by imprisonment from anywhere in between 5 years to 8 years and fine from Rs. 1 lakh to Rs 5 lakh.
 - If found guilty of causing this anywhere else in the body he/she will be punished by imprisonment from anywhere in between 3 years to 5 years and fine from Rs. 50,000 to Rs. 3 lakhs.
 - The total sum of the fine will be given to the survivor.

Mechanical Injuries



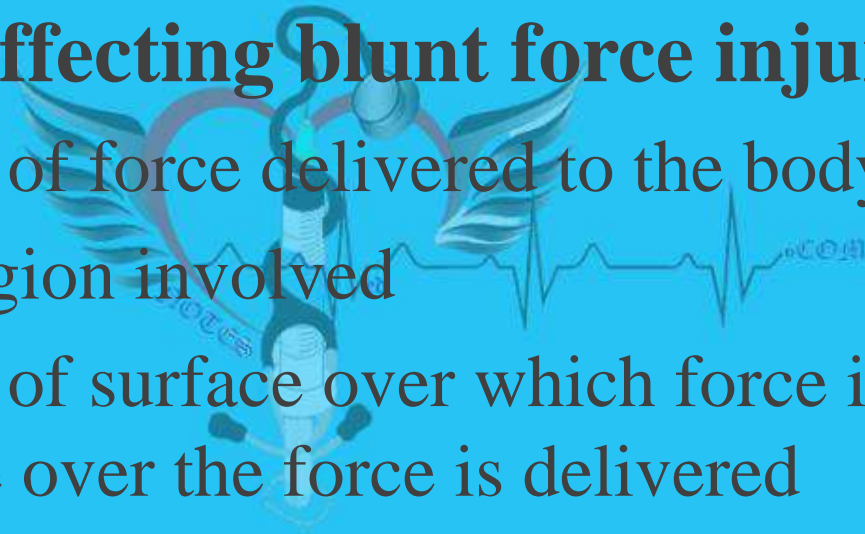
Mechanical Injuries





Blunt force injuries

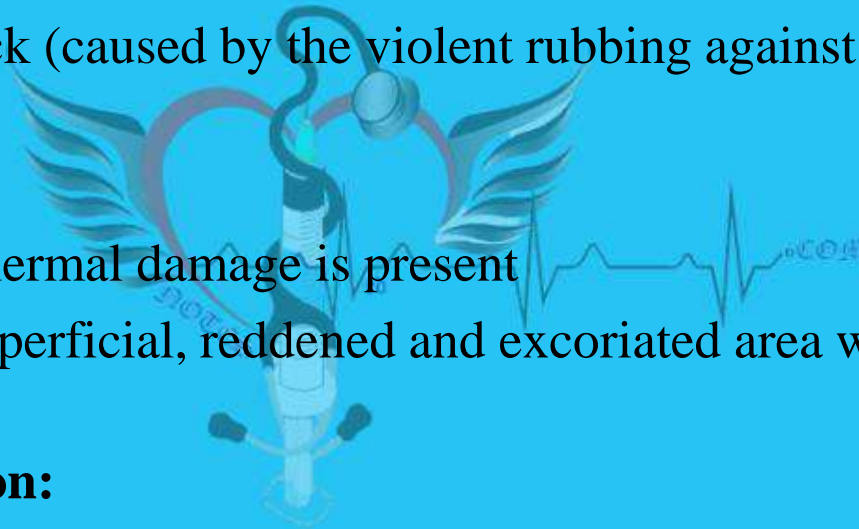
- **Factors affecting blunt force injuries:**
 - Amount of force delivered to the body
 - Body region involved
 - Amount of surface over which force is delivered and time over the force is delivered
 - Nature of the weapon



Abrasion

- Destruction of the skin, which usually involves the superficial layer of the epidermis and papillary dermis by friction against rough surface
- Types:
 1. Scratch/linear abrasions:
 - Abrasion with length but no significant width
 - Caused by sharp or pointed object passing through the skin
 - For example: fingernails-throttling, sexual assaults and child abuse
 2. Grazes (sliding/scrape/grinding abrasion):
 - Due to movement between skin and rough surface
 - Caused by horizontal or tangential friction
 - Uneven, longitudinal, parallel lines (direction)
 - For example: RTA

- **Brush burn:** involves a large surface area, no true scab is formed
 - Example: back (caused by the violent rubbing against a surface, dragging)
- **Friction burn:**
 - Element of thermal damage is present
 - Extensive, superficial, reddened and excoriated area with little or no linear marks.
- **Pressure abrasion:**
 - Caused by the direct impact or linear pressure of the rough object over the skin,
 - Crushing of the superficial layers of the skin and is usually directed inwards. Eg- nooses or ligatures in hanging and strangulation



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- **Impact abrasion (imprint/contact/patteredened):**
 - Caused by the impact with a rough object, when the force is applied at or near 90 degree of the skin surface.
 - It is usually seen over bony prominences where thin layer of the skin covers bone.
 - **Imprint abrasion:** brownish and parchmented (hanging), bicycle chain, serrated knife

Age of abrasion

Time	Presentation
Fresh	Bright red, oozing of serum and blood
12-24 hours	Lymph and blood dries up leaving a bright red scab Polymorphonuclear cell infiltrates (scab formation)
2-3 days	Reddish brown scab
4-7 days	Dark brown to brownish black scab Epithelium grows and cover defect under the scab (epithelial regeneration)
After 7 days	Scab dries and falls of leaving a de-pigmented area







Differential diagnosis

- Postmortem insect bites (pale brown, dry with irregular margins and arranged in linear tanner), vital reactions are absent
 - Dry skin of scrotum & vulva exposed to open air
 - Decubitus ulcers, excoriations of skin by diaper rash
 - Postmortem abrasions



Differences

Features	Ante-mortem abrasion	Postmortem abrasion
Site	Anywhere on the body	Usually, over the bony prominences
Color	Bright red	Yellowish, translucent and parchment like
Exudation	More, scab slightly raised	Less, no scab
Vital reaction	Present	absent
Healing process	May be evident	Not seen

Medico legal importance of abrasion

- Site of impact and direction of force
- Nature of injury (simple /grievous)
- Causative weapon connection
- Age of injury
- Character and manner of injury known from its distribution
- For example:
 - Throttling- crescentic abrasions which are made by fingernails usually found on neck
 - Smothering- mouth and nose
 - Sexual assault- abrasions found on the breasts, genitals, inside the thigh and around the arms



Circumstances of Abrasions

- Accidents and assaults
- Abrasions on the face or body of the assailant - struggle
- Abrasions may be found in the palmar aspect of the hand in a conscious person while falling and puts hands to save himself
- Alcoholics tend to fall backwards and strike the occiput on the ground
- Hysterical women- accessible areas (front of the forearm of over the face to fabricate charge of assault)

Contusion/Bruise

- Effusion or extravastation of blood into the tissue due to the rupture of blood vessels, usually capillaries
- Caused by blunt trauma
- **Types (include)**
 - Intradermal
 - Subcutaneous
 - Deep

Features

- Margins are blurred
- When large vessels are contused hematoma is formed
- Fresh bruise may appear swollen and slightly raised above



Factors influencing the contusion

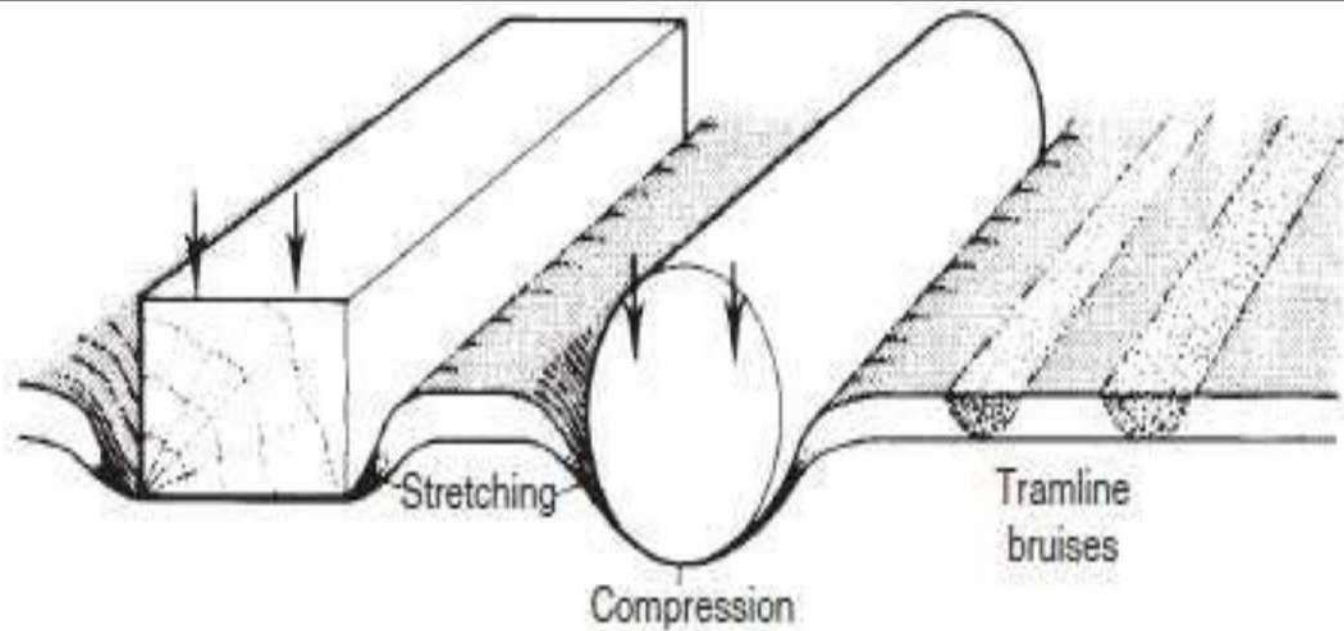
- **Site/type involved** - soft, lax and vascular tissues- face, scrotum and eyelids
- **Large bruises:**
 - firm and fibrous tissue covered by thick dermis (abdomen, back, scalp, palms and sole)
- **Overlying bony prominences**
- **Boxers and athletes-** bruises are less seen due to good muscle tone
- **Chronic alcoholics and aspirin intake**

Factors influencing the contusion

- Age (children and elderly due to delicate skin and softer tissues)
- Sex (Women- tissues are more delicate and subcutaneous fat is more)
- Color of skin (fair skin than dark)
- Natural diseases, are more prominent in people suffering from atherosclerosis, scurvy, leukemia, hemophilia, bleeding diathesis, Vitamin K and prothrombin deficiency
- Ectopic bruise (appearances of the bruises at the site other than the site of the injury, e.g. black eyes)
- Patterned bruise (tram line bruise), suction bruise

Age of bruise	
Time	Presentation
Fresh	Red (oxygenated blood)
Few hours to 3 days	Blue (deoxygenated blood)
4 th day	Bluish black to brown (Hemosiderin)
5 th and 6 th day	Greenish (Biliverdin)
7 th to 12 th day	Yellow (Bilirubin)
2 week	Normal









- Delayed bruising: in deep bruising, they become visible after some time or days.
- Migratory or ectopic bruising does not tell about the exact site of impact (**black eyes**)
- Patterned bruising provides a manner of infliction.
- Spontaneous bruising may be taken for inflicted by others.
- Hypostasis and bruises may be mistaken.
- Fingertips bruises are clues for criminal cases
- Love bite is a suction bruise





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Medico legal importance

- Age of injury
- Patterned injury
- Nature of injury
- Difference between contusion and hypostasis
- **Character and manner of injury**
 - Bruises or contusion present over the arm may be sign of the restraining a person
 - Small bruises present over the inner aspect of the thigh of the women indicates sexual abuse
 - Bruises found in soft tissues in a child such as in cheeks and trunk and multiple bruises in various stages of healing, six penny bruises indicates- **child abuse**

Laceration

- They are the split or tears of the skin, mucous membrane, muscles or internal organs which are caused by the application of blunt force to large area of the body, which crush or stretch tissue beyond the limit of their elasticity.

Types

- Split lacerations:
 - It occurs when the soft tissues are sandwiched between a hard underlying deeper structure and the agent applying the force.
- Stretch laceration:
 - It results due to heavy forceful frictional impact by a blunt force exercising localized pressure with pull.
- Avulsed laceration:
 - These are produced when sufficient force is delivered at an acute angle to detach a portion of traumatized surface from its attachment.
 - Flaying Scalp lacerations can look like incised wounds upon cursory examination.

- When the scalp is shaved and the wound examined more carefully, the characteristics of a laceration will be evident





Characteristics

- Margins: Ragged, irregular and uneven
- Site: bony prominences
- Bruising and abrasion
- Edges (indicates direction)
- Depth of wound
- Soiling of the wound
- Hair bulbs- crushed
- Hemorrhages- less (vessels are crushed and torn irregularly)
- Shape (correspond with the weapon or object)
- Gaping: due to the pull of elastic and muscular tissues



Medico-legal Importance

- Cause of injury/ shape of blunt weapon
 - blunt round end (hammer)- stellate laceration
 - blunt object with an edge (hammerhead)- crescentic laceration
 - long, thin objects like pipes or sticks-linear or elongated lacerations
- Objects with flat surfaces produce- irregular, ragged or y-shaped lacerations
 - Nature of injury (simple/ grievous)
 - Accidental/homicidal/suicidal injury
 - Foreign matters on the wound give clue about the object causing it
 - Skin flaps which overhang the cut margins - direction of force applied

Incised wound

- It is a clean-cut wound through tissues (usually the skin and subcutaneous tissues including vessels).
 - Example: objects used- sharp cutting end or point - knife, box cutter, glass, scalpel or razor
- The wound is longer than it is deep

Characteristics of Incised wound

- Margins are clean cut, well defined and usually everted and free from contusions and abrasions
- Width is greater than the edge of the weapon
- Shape- spindle-shaped
- Depth and direction- usually deeper
- Hemorrhage- vessels are clean cut
- Bevelled cuts- if the blade of the weapon enters obliquely, tissues will be visible at one margins and other margins will be undermined

Medico-legal significance

- Tailing - Direction of wound
- Nature of weapon - Sharp Manner
- Hesitation /tentative cuts (suicidal motive)
- Defense cuts (homicidal motive)





Stab wound

- Produced from penetration with long narrow instruments having pointed ends into the depths of the body, which are deeper than its length and width
- **For example: Knife**
 - **Puncture wound:** When soft tissue involved (Superficial penetration)
 - **Penetrating:** Terminating in organ or cavity.
 - **Perforating wound:** Through and through wound that is having entry as well as an exit.

Characteristics

- **Margins** are clean usually no abrasion or bruises over the margins but patterned abrasion may be seen due to the hilt guard of the knife striking the skin
- **Length** is slightly less than width of the weapon because of stretching of the skin

Characteristics

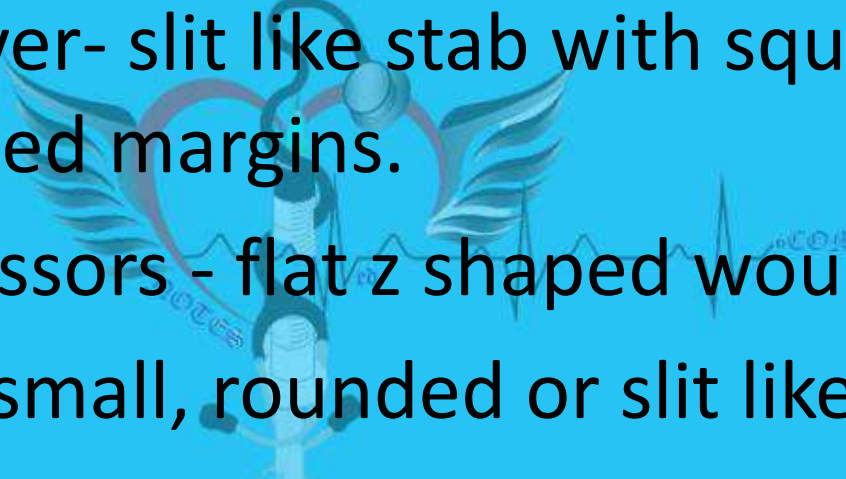
- **Breadth** is more than thickness of the blade due to gaping
- **Depth** is greatest
- **Direction**- horizontally, vertically or obliquely
- **Shape**- slit shaped or gape depending on their locations and their orientation



Patterns of wound

- Single edged weapon- *wedged shaped, tear drop, fish tail (v-shaped)*
- Double edged dagger- *spindle shaped*
- Spear- *circular wound*
- A pointed square weapon - *cross shaped or stellate shaped.*
- Broken bottles- *cluster of wounds of different sizes and shapes*

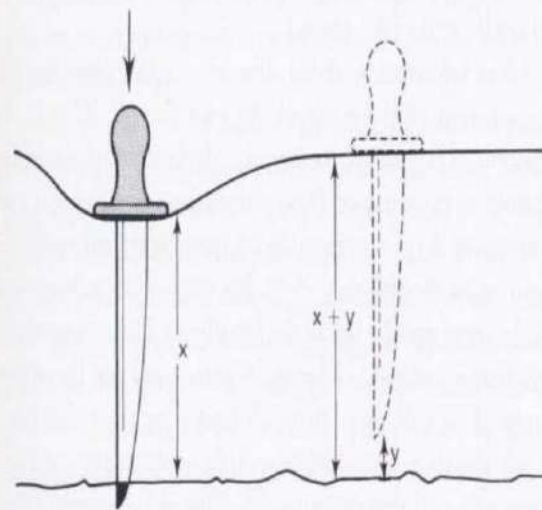
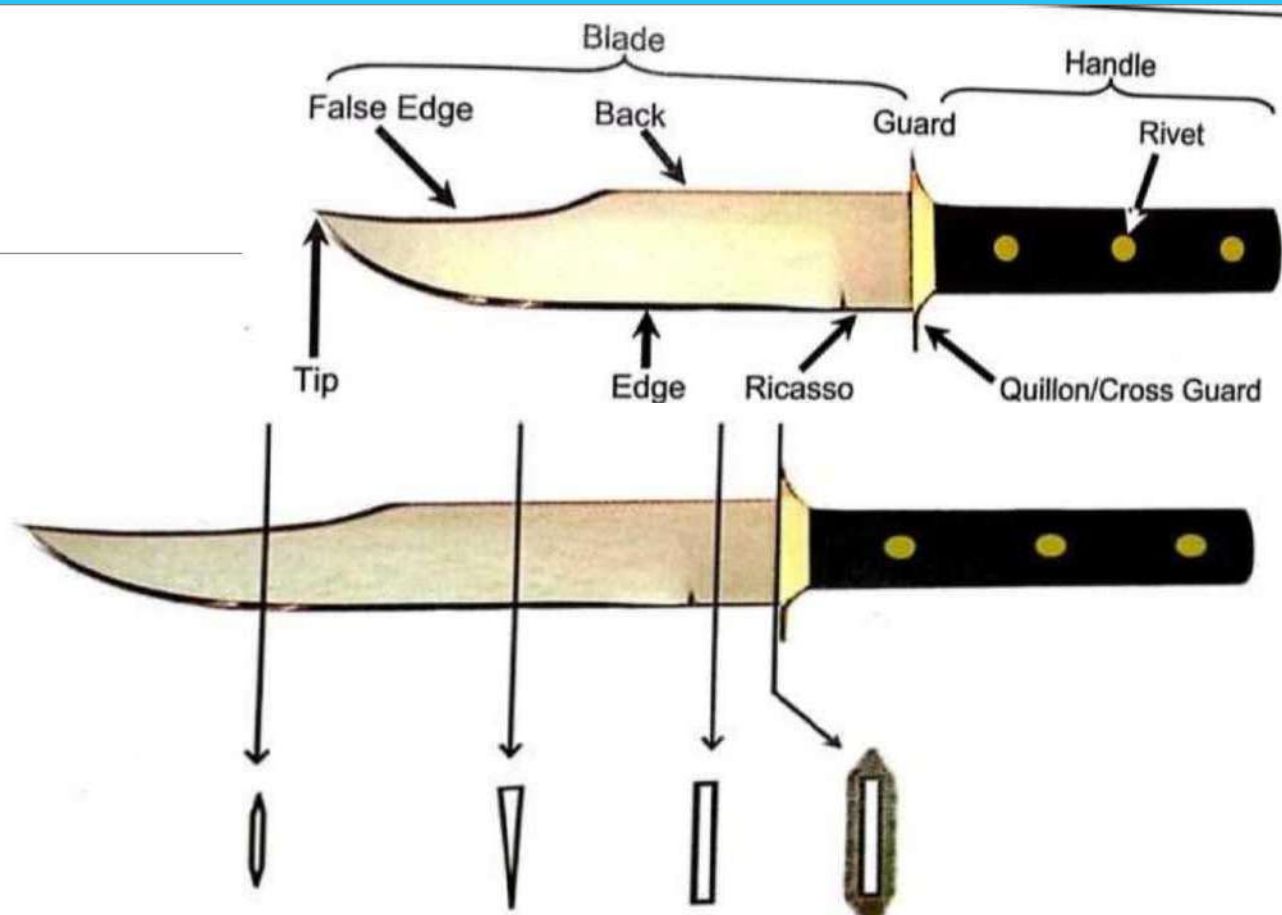


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- Screw driver- slit like stab with square ends and abraded margins.
 - Closed Scissors - flat z shaped wound
 - Ice picks- small, rounded or slit like wounds
 - Fork- clusters of 3-4 wounds depending upon number of prongs.

Medico-legal significance

- Shape and size of weapon
- Direction of force
- Degree of force
- Manner







Chop wounds

- Chop wounds are sharp force injuries produced by a sharp, heavy weapon resulting in a sharp penetrating injury caused by the sharp edge combined with crushing injuries caused by the heavy weapon.
 - Deep gaping wound.
 - Combination of blunt and sharp force injury.
 - Margins are sharp and may show abrasion, bruising and some laceration with severe injury to the underlying organs.
 - Dimensions of wound correspond to cross section of the penetrating blade.

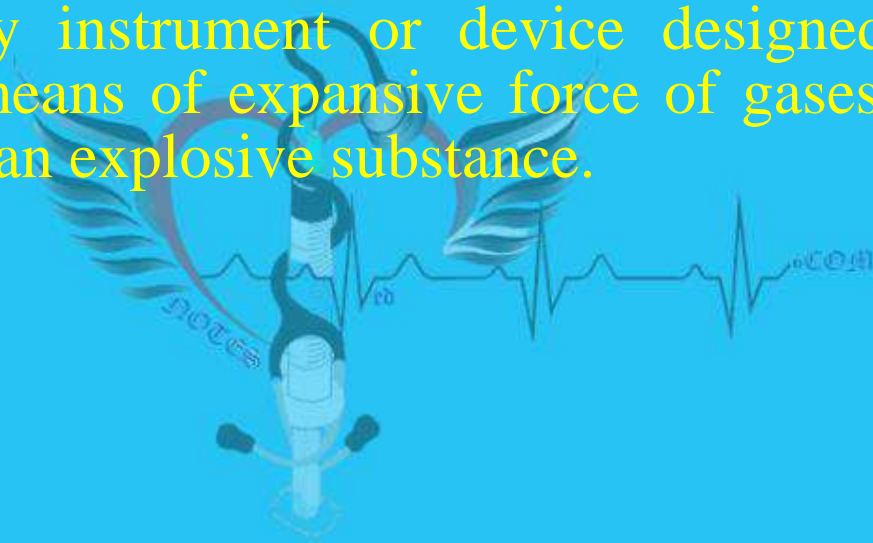
Medico legal importance

- Most of the injuries are homicidal
- Few are accidental
- Rarely suicidal
- Causative weapon





Firearm is any instrument or device designed to propel a projectile by means of expansive force of gases generated by combustion of an explosive substance.

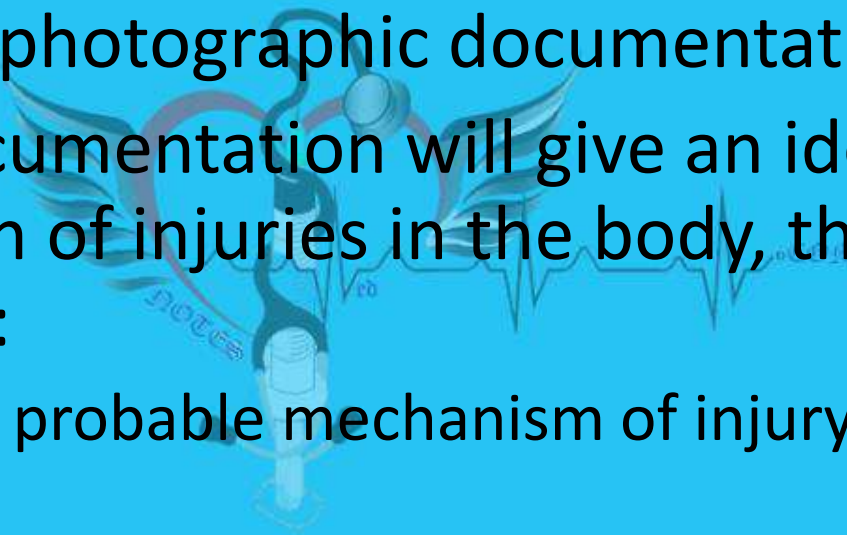




Injury Documentation

- Type
- Size
- Site
- Location
- Age, Area, numbers
- Orientation
- Direction



- 
- If possible photographic documentation.
 - Proper documentation will give an idea about the distribution of injuries in the body, that can help determine:
 - The most probable mechanism of injury (Fall or Assault)
 - Correlate with history.
 - Relative position of victim and assailant.
 - Handedness of assailant (Right handed or left-handed).

Injury Report Writing

- Except in cases of insurance, the requisition letter for the injury report should be brought by police.
- An injury report is a legal document, which is valuable evidence in court.
- The injury report will only be valid in court as evidence only if it is filled according to a format specified by Janaswastha.
- If the format is not followed the court can consider the report invalid.

Injury Report Writing

- Registration Number
- Police office sending for examination with the date and reference number
- Information about the examinee (name, age, sex, occupation)
- Name of accompanying police personnel
- Date, time and place of examination.
- Consent
- Identification marks (Huliya)-at least 2.

Injury Report Writing

- Type of weapon/object used:-
 1. Blunt force
 2. Sharp force
 3. Pointed objects
 4. Projectile
 5. Heat
 6. Chemical
 7. Others (Specify) Condition of the patient at the time of examination



Injury Report Writing

- A brief history about the incident (how and when the injuries were produced, alcohol, use of weapons):-
- Medical history of the examinee:
 - General
 - Physique and vitals:-
 - Degree of Consciousness:
 - Injuries: (Type, Size, Site, Location, Age)
 - Type of injury:
 - Simple
 - Grievous (Angabhanga)
 - Others remarks

Injury Report Writing

- Severity (Explain the severity in terms of an existing condition and possible complication)
- Investigation and reports (for example X-ray, USG, Blood, Urine etc)
- Treatment provided (briefly)
- Referral (Where and Why?)
- Follow up (if necessary)
- Re- Examination (Whether case needs information about grade of disability)

Injury Report Writing

- Opinion: (Condition of the inee, the rity of the injury, age of the injury and possible causative objects should be considered to frame opinion)
- The report should be made in 2 copies.
 - 1st copy is handed to the ce (not the victim or the family members)
 - 2nd copy is for hospital records
- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 'Kutpit wa angabhanga sambhandhi kasoor' Article number 89

Injury Report Writing

- No medico legal document should be falsified or such circumstances should not be created, if done will result in imprisonment for 5 years and Rs. 50,000 fine.
- If that false document results in lifelong imprisonment of the alleged it will result in imprisonment for up to 7 years with Rs. 70,000 fine.

References

- Pekka Sauko, Bernard Knight. Injuries. Knight's Forensic Pathology. 2004; 3(461)
- Krishna Vij. Blunt Force injuries. Textbook of Forensic Medicine and Toxicology. 2014: 202-213
- Krishna Vij. Sharp Force injuries. Textbook of Forensic Medicine and Toxicology. 2014: 214-223
- Gautam Biswas-Review Of Forensic Medicine And toxicology
- MulukiAparadh (Sanhita) Ain, 2074 Chapter 14 'Kutpit wa angabhanga sambhandhi kasoor' Article number 89
- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 'Kutpit wa angabhanga sambhandhi kasoor' Article number 191
- According to Muluki Aparadh (Sanhita) Ain, 2074 Chapter 14 'Kutpit wa angabhanga sambhandhi kasoor' Article number 192