

# Forensic Medicine

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**Marrow Edition 8**

**MARROW**

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# DEFINITIONS IN FORENSIC MEDICINE

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## Common Terminologies

00:00:13

### Forensic medicine :

- Application of medical knowledge to legal purposes, to aid the administration of justice.
- AKA state medicine/legal medicine.

### medical jurisprudence :

Application of knowledge of law in the practice of medicine.

### medical ethics :

- Set of moral principles.
- Guiding the members : Doctor-doctor/Doctor-patient/Doctor-state relationship.
- Self imposed conduct (National medical council).
- Violation is **punishable**.

### medical etiquette :

Conventional laws of courtesy in dealing with colleagues.

## DEATH

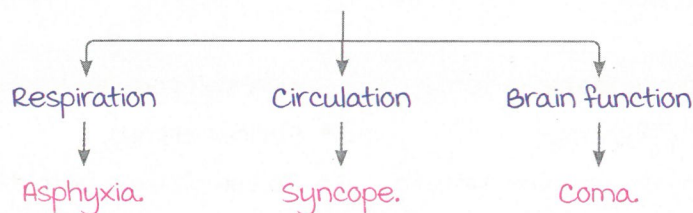
### Cause :

Any injury/disease resulting in death.

### mode :

System that initiates the process of death.

### Bichat's tripod of life :



### Manner :

How the death occurred.

- Natural.
- Suicidal.
- Homicidal.
- Undetermined.
- Accidental.

**New laws :**

To come into force from July 1, 2024.

Indian Penal code (IPC) → **Bharatiya Nyaya Sanhita (BNS)**.

- Describing offences/punishments.
- 358 sections.

Criminal Procedure Codes (CrPCs) → **Bharatiya Nagarik Suraksha Sanhita (BNSS)**.

- Describes procedure in cases of crime.
- 531 sections.

Indian Evidence Act (IEA) → **Bharatiya Sakshya Adhiniyam (BSA)**.

- Admissibility of evidences/recording of evidences in court.
- 170 sections.

**TYPES OF OFFENCES**

Based on arrest :

Type	Cognizable offence	Non-cognizable offence
Section	2(g) BNSS	2(o) BNSS
Procedure	Police can arrest without warrant from magistrate. Eg : murder, dowry death, rape, dacoity.	Police cannot arrest without a warrant.

Based on punishment :

Summons cases	Warrant cases
<ul style="list-style-type: none"> <li>• Imprisonment &lt; 2 years.</li> <li>• 2(x) BNS.</li> </ul>	<ul style="list-style-type: none"> <li>• Imprisonment &gt; 2 years.</li> <li>• 2(z) BNS.</li> </ul>

Based on compromise :

Compoundable offence	Non-compoundable offence
<ul style="list-style-type: none"> <li>• minor offences.</li> <li>• Victim can compromise with accused &amp; drop the case.</li> </ul>	<ul style="list-style-type: none"> <li>• Serious crimes.</li> <li>• No compromise permitted between victim and accused.</li> </ul>

## CIVIL AND CRIMINAL CASES

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Features	Civil cases	Criminal cases
Conditions	Dispute b/w two parties.	Life-threatening injury/assault.
Various terminologies	Plaintiff : Person filing complaint. Defendant : Person defending themselves.	Assailant : Person committing crime. Victim : Person suffering injury/assault. State/prosecution : Files the complaint. Defendant : Party who needs to defend.
Burden of proof (Onus of proof)	Plaintiff (Reasonable evidence).	Prosecutor (Beyond reasonable doubt).
Verdict	Compensation/direction.	Fine/imprisonment.

## JUDICIAL AND EXECUTIVE MAGISTRATE

Type	Judicial magistrate (Jm)	Executive magistrate (Em)
Concerned department	Judiciary.	Administration.
Appointment	High court and state government.	State government.
Hierarchy	Chief Jm (Supervisory role). 1 <sup>st</sup> class Jm. 11 <sup>nd</sup> class Jm.	District magistrate (Dm)/ Additional Dm (Supervisory role). Subdivisional magistrate. Executive magistrate.
Function	maintain court of law (Trial).	maintain law and order in society.

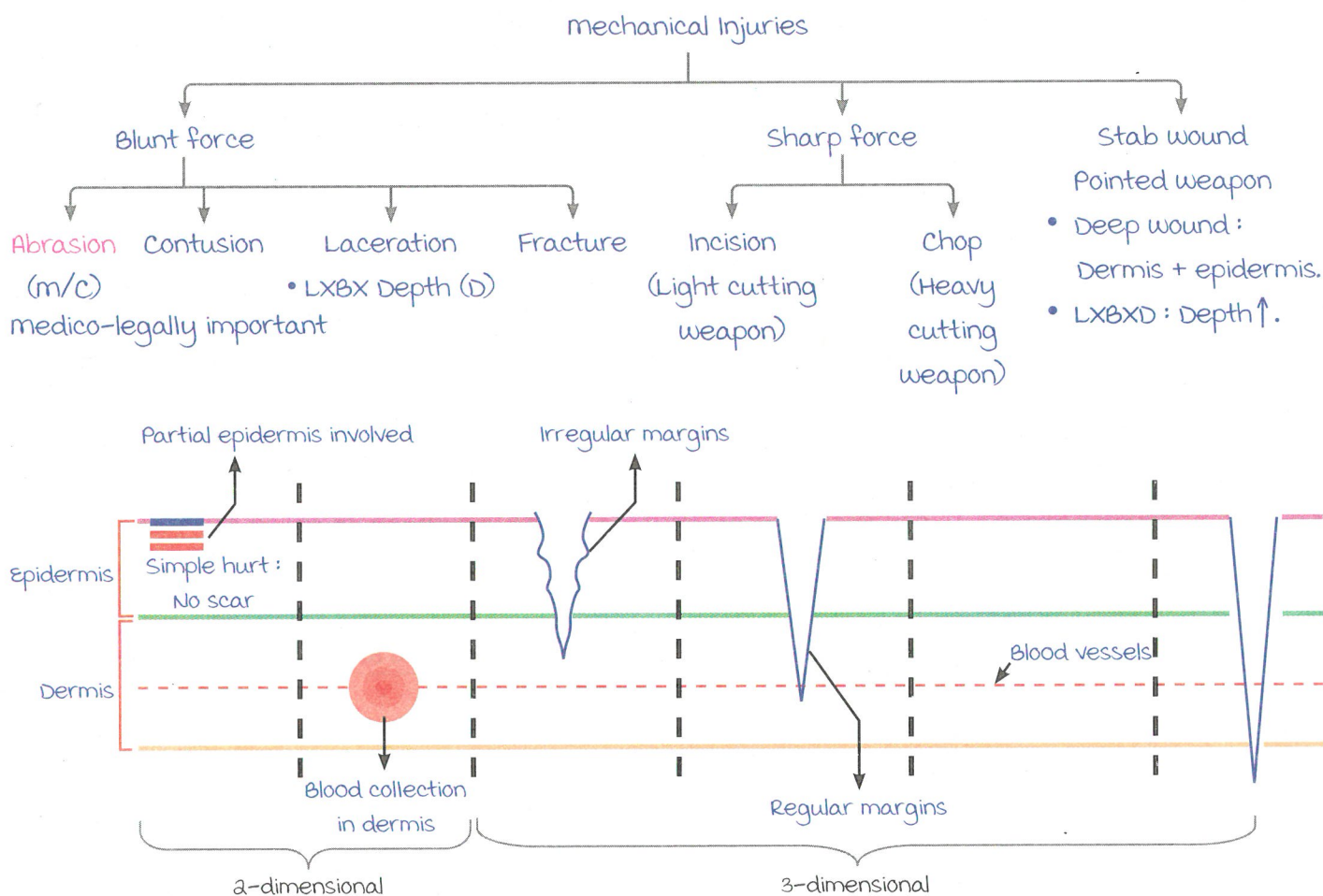


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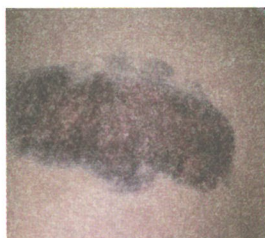
# BLUNT TRAUMA INJURIES

## Mechanical Injuries

00:01:06



Abrasion



Contusion



Laceration



Incision : ↑↑ length

Stab wound :  
↑↑ depth

Note :

- Any wound that involves dermis will scar.
- Corneal abrasion is a **grievous injury** as it causes opacity (Scarring) → Loss of vision.




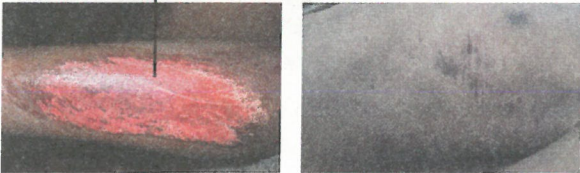
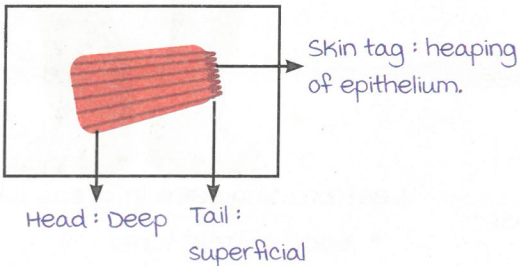

## Abrasion

00:07:29

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- most medico-legally significant wound.
- 'Abrade': To scrape.

### Types of abrasions :

Caused by tangential force (scraping off epithelium)	Caused by perpendicular force (crushing of epithelium)
<p>1. Scratch abrasion :</p> <p>Injury with pin, fingernails, thorn.</p> 	<p>1. Pressure abrasion : ↓force, ↑duration.</p>  <p>Ligature mark</p> 
<p>2. Graze abrasion (m/c) :</p> <p>Due to friction between skin and rough surface.</p> <p>multiple scratches over a wide area.</p>  <p>• AKA Gravel rash (RTA)/ brush burn/Sliding abrasion/ friction burn.</p> <p>Direction of force →</p>  <p>Head : Deep Tail : superficial</p>	<p>2. Impact/Imprint abrasion : ↑force for ↓duration.</p> <p>Eg : Tyre mark, radiator grill mark.</p> 
	<p>3. Patterned abrasion :</p> <p>Imprint/pressure + pattern of weapon abrasion.</p>

### Aging of abrasion :

- Healing time : 1 week.
- Heals with formation of scab.
- Aging based on color of scab: mnemonic : R<sup>a</sup>RBB<sup>a</sup>.

R : Raw → &lt; 12hrs.

R : Reddish scab → &gt; 12hrs.

Hypopigmented areas



Scab



----- Active space -----

RB : Reddish Brown scab → 2-3 days.

B : Brown scab → 4-5 days.

B : Black scab → 6-7 days.

**Differential diagnosis :**

1. Ant bite mark : Usually at mucocutaneous junction.

Interspersed with normal skin : Sand paper appearance.

2. Skin excoriations.
3. Decubitus ulcers.
4. Post-mortem abrasion.

	Antemortem abrasion	Post-mortem abrasion
Site	Anywhere on body	Over bony prominences
Appearance	Reddish	Yellowish (no bleeding) + parchment-like
Scab	Present	Absent
Vital reaction	Present	Absent

**Contusion/Bruise**

00:22:12

Bruise : Skin.

Contusion : Viscera.

**mechanism of Injury :**

Blunt trauma → Rupture of dermal vessels → Extravasation of blood → Contusion.  
(veins/venules/arteries/arterioles).

Note : When the skin over a bruise is incised, a collection of clotted blood is seen that cannot be washed away.

**Factors influencing bruising :**

more bruising seen in :

- Lax, vascular areas (Eg : Scrotum, face).
- Delicate subcutaneous tissue (F > M).
- Age : Children, elderly.
- Pre-existing diseases (Bleeding disorders, leukemia).



Less bruising seen in areas with :

- Good muscle tone.
- Firm fibrous tissue (Eg : Palms, soles).

**Types of bruises :**

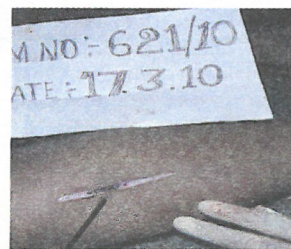
1. Intradermal bruise (Superficial).
2. Subcutaneous bruise (Subepidermal).
3. Deep bruise (AKA come-out bruise) : Delayed appearance.
4. Patterned bruise : Pattern of striking surface of weapon seen.



Intradermal bruise

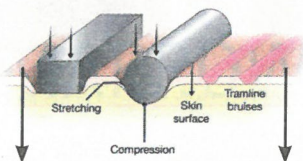


Deep bruise : Incision shows clotted blood.



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## Patterned bruise

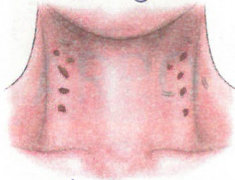
Railway-line bruise  
AKA Tram-line bruises

Weapon : Iron rod/Lathi/Cane

- Central pallor + adjacent bruise

Indicative of diameter of weapon

## Six-penny bruise



- D/t finger-tip pressure.
- Seen in :
  - Throttling.
  - Child abuse/ Battered baby syndrome.

## Butterfly bruise

- Skin pinching  
(Child abuse)

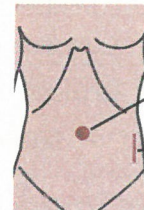
## Doughnut bruise



Weapon : Spherical surface

## 5. Ectopic bruise (AKA migratory/percolated bruise) :

- Shifting of blood d/t gravity → Bruise away from site of impact.

Black-eye/raccoon eye : Forehead injury  
(B/L : spectacle hematoma)Battle sign : Diagnostic of  
fracture of middle  
cranial fossaPeri-umbilical  
bruise :  
Cullen's SignBruise on flanks :  
Grey Turner's SignAbdominal  
ectopic bruise

## 6. Artificial bruise :

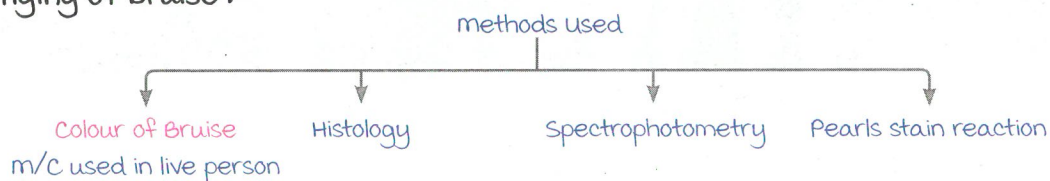
- Fabricated bruise with extracts from **irritant plants**.
  - Bhilawa (Semecarpus anacardium : marking nut), calotropis, Plumbago.
- Can be used to malingering.

	True Bruise	Artificial Bruise
Cause	Trauma	Irritant plant extract
Site	Anywhere on body	Accessible parts of body
Colour change during healing	Present	Absent
margins	Irregular	Regular
Vesication/blisters	Absent	Present (D/t inflammatory reaction)
Content	Blood	Inflammatory fluid
Itching	Absent	Present



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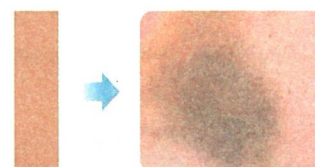
	True Bruise	Artificial Bruise
Inflammation	Only on the bruise	Surrounding skin involved
Pain	Present	Absent

**Aging of bruise :****Colour of bruise :**

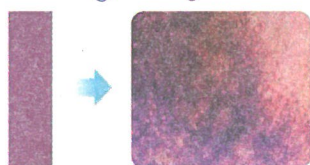
1. Red : at first  
(Oxy-hemoglobin)



3. Bluish : black to brown  
(Hemosiderin) - 4<sup>th</sup> day



5. Yellow (Bilirubin) : 7 to 12 days



2. Blue : few hours to 3 days  
(Deoxy-hemoglobin)





4. Greenish (Hematoidin/  
biliverdin) : 5 to 6 days



6. Normal : 2 weeks

- multiple bruises of different colour : Sign of child abuse (Battered Baby Syndrome).
- Bruises with no typical colour change :
  - Sub-conjunctival hemorrhage : Red → Yellowish → Normal (Little exposure to atmospheric O<sub>2</sub>).
  - Sub-dural hematoma.

**Livor mortis vs Bruise :**

	Livor mortis (Hypostasis)	Contusion
Site	Dependent parts	Can occur anywhere on body
margins	Regular	Irregular
Blanching	Present	Absent
Extravasation of blood	Absent	Present
Colour changes	Absent	Present
Water poured after incision	Washes away	Remains
Appearance		



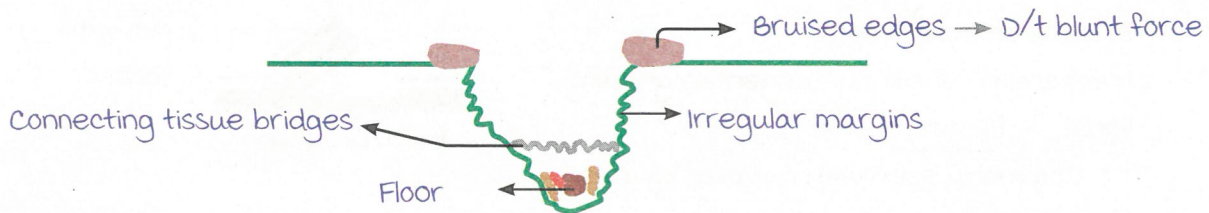
## Laceration

00:48:58

----- Active space -----

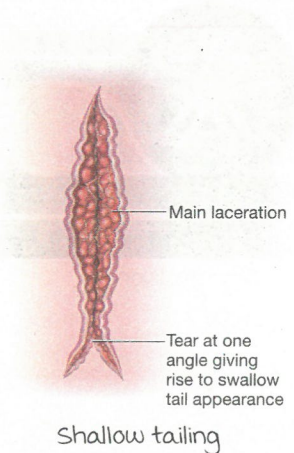
- Lacer : To tear.
- Tearing of skin with irregular margins.

### CHARACTERISTICS



Crushed :

- Neurovascular bundles.
- Hair bulb.
- Blood vessels (Less bleeding).



↓ Bleeding in lacerations



Laceration

### TYPES

#### I. Split laceration :

AKA **incised looking laceration.**

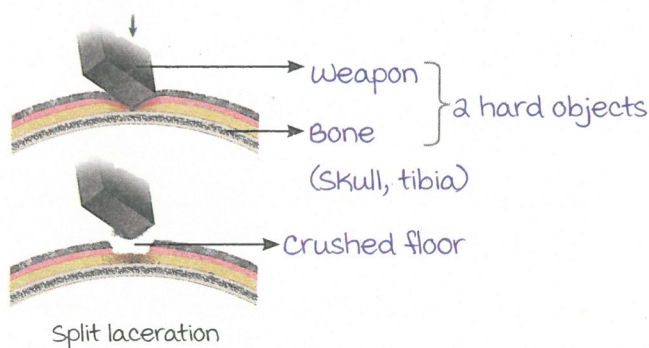
Mechanism : Skin crushed between two hard objects.

Appearance :

- Naked eye : Regular margins.
- Hand lens : **Differentiates from incision.**
  - Small irregular margins.
  - Crushed floor.



Split laceration: Skull



Split laceration

----- Active space -----

**2. Stretch laceration :**

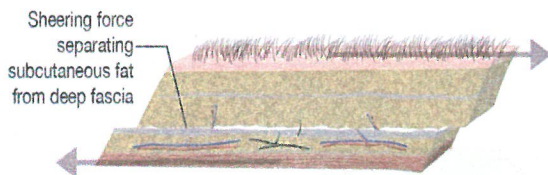
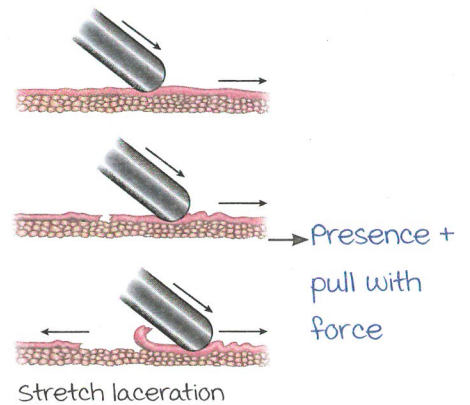
mechanism : Pressure with pull force →  
Overstretching of skin.

- Commonly seen with compound fractures.

**3. Avulsion laceration :**

mechanism : Shearing/tangential/grinding  
force → Flaying of skin.

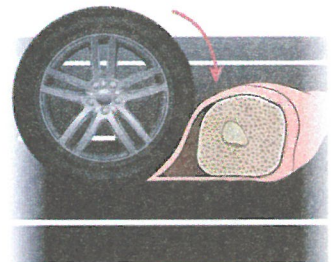
- Commonly seen with run over injuries.  
- Eg : Degloving injury, scalping.



Avulsion laceration



Avulsion laceration



Avulsion

**4. Tear laceration :**

mechanism : Hard protruding objects → Tearing the skin.

**5. Cut laceration :**

mechanism : Semi sharp weapon → Cut laceration.



# SHARP TRAUMA INJURIES

----- Active space -----

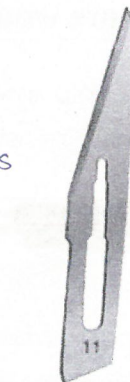
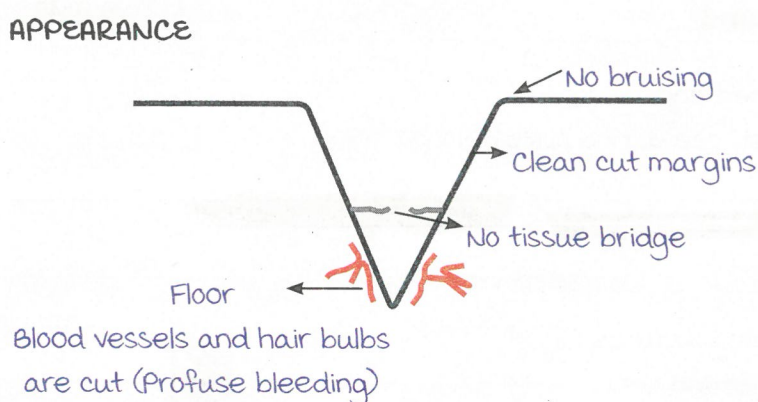
## Incised Wounds

00:00:11

AKA cut wound/slash/slicing injury.

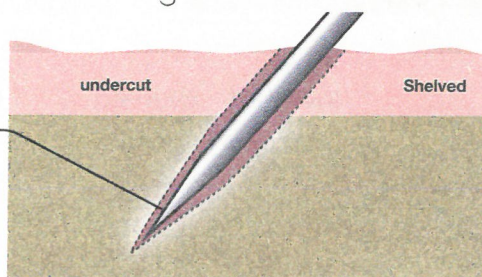
Weapon : Light cutting weapon, sharp surface. Eg : Surgical blade.

### APPEARANCE



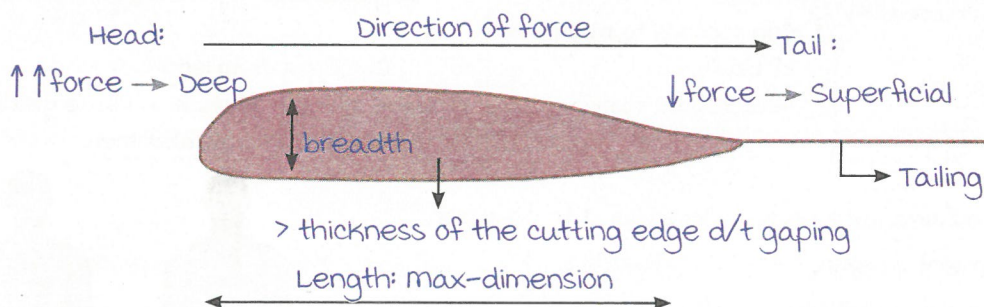
### Oblique incisions :

- Blade enters the skin **obliquely** → **Bevelled cuts** → undermining edges.
- Feature of homicidal wound.



### FEATURES

Dimensions :



Shape : Spindle-shaped.

### LACERATED LOOKING INCISED WOUND

An incised wound that looks like a laceration.

Weapon : Knife with serrated edge.

Common site : Areas with skin folds (Axilla, scrotum).

----- Active space -----



Hesitation cuts

**MEDICOLEGAL IMPORTANCE**

1. Aging of wound → Time since injury.

2. Manner :

- Homicidal → Cuts on nose/genitalia/bevelled cuts.
- Suicidal cuts/ hesitation cuts : AKA tentative cuts, intentional cuts, feeler's strokes, trial cuts.
  - multiple superficial, linear cuts in the accessible parts of the body.

**Stab injury/Puncture wound**

00:10:40

Injury d/t weapon with pointed end.

Skin provides maximum resistance during a stabbing.



Weapon with pointed end

**Penetrating and perforating wounds :**

Penetrating : Only an entry wound seen.

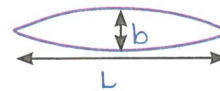
Perforating : Entry and exit wounds seen.

↓                  ↓

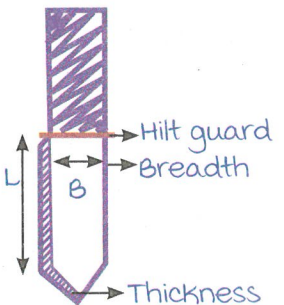
Inverted    Everted

margin      margin

**Dimensions:**



Dimensions of wound

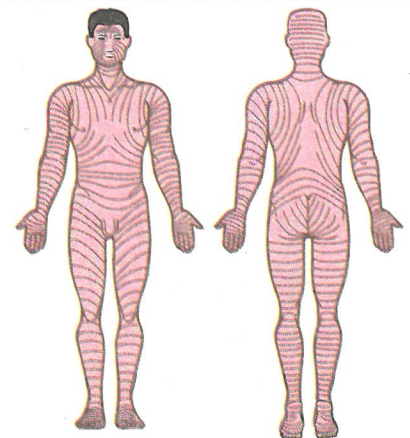


Dimensions of weapon

Length of the wound	Breadth	Depth
<ul style="list-style-type: none"> <li>• Corresponds to breadth of the blade.</li> <li>• maybe lesser d/t elasticity of skin.</li> </ul>	<ul style="list-style-type: none"> <li>• Corresponds to thickness of blade.</li> <li>• Affected by gaping.</li> </ul>	<p>Only assessed in penetrating wounds</p> <p>↓</p> <p>Corresponds to length of blade.</p> <p>Can be &gt; length of blade in tissue yielding.</p> <p>Eg : Thorax, abdomen.</p>

Lines of Langer/cleavage lines : Correspond to collagen fiber arrangement of skin.

- Stab wounds parallel to lines of langer : Less gaping.
- Stab wounds perpendicular to lines of Langer : ↑ gaping.



Lines of Langer/cleavage lines



Note : Assessment of wound permitted only during surgeries autopsy.

- Probing in an alive person → Clot dislodgment → Fatal bleed.

### Shape of stab wound :

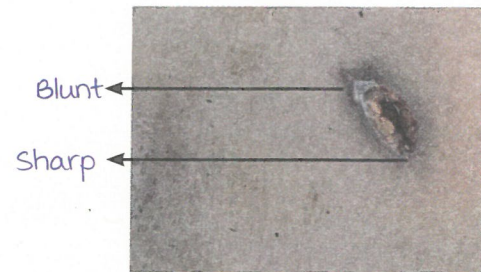
Single edge knife :

- Tear drop/triangular/wedge shaped.
- Fish tailing is seen.

Double edge knife :

- Oval or spindle-shaped wound.
- Stellate part of screw driver : ✦
- Dining fork : ○○○○

----- Active space -----



Blunt double edged knife



Sharp double edged knife

### Complete penetration :



- Complete penetration.
- Type of weapon.
- Direction of stabbing
  - ↳ B/L → Perpendicular
  - ↳ W/L → Oblique
- Aging of injury.

### Hara-kiri/Seppuku :

Honorary suicide performed by ancient Japanese soldiers.

method :

Long wound → Stab the left iliac fossa and cut the abdominal wall → upto right hypochondrium till the right iliac fossa.

Features :

- Big L-shaped incision.
- Cause of death : Evisceration → Circulatory collapse (Hypotension) → Instant death.



Hara Kiri: L shaped incision

### Chop wound

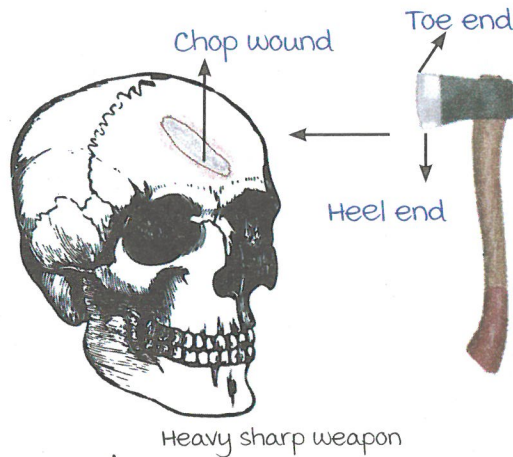
00:27:16

Produced by a heavy sharp weapon.

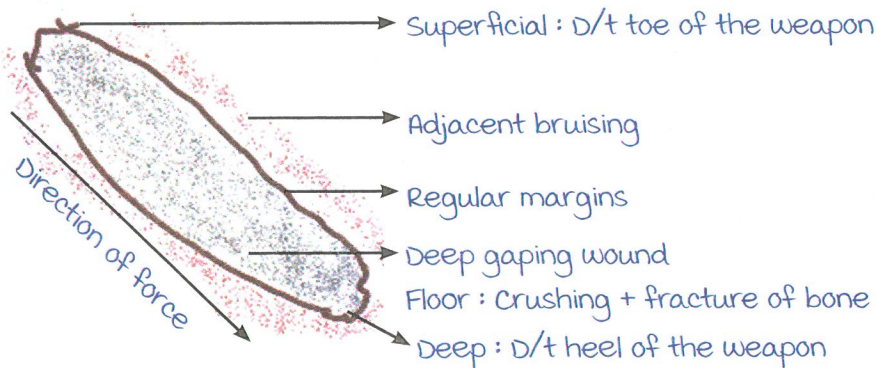
Eg : Axe or chopper.

- Force produced
- ↳ Sharp (Due to sharp blade)
  - ↳ Blunt (Due to weight of weapon)

----- Active space -----



### Examination of chop wound :



Chop wound

### medicolegal importance :

Chop wounds are usually homicidal.

### Defense injuries

00:30:40

Due to defensive reaction of the victim to the injury.

#### Active defense injuries :

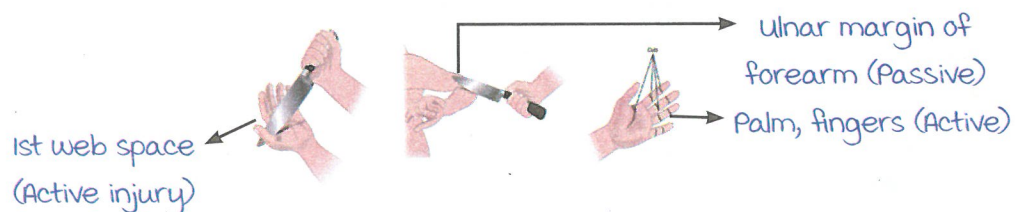
D/t grasping the weapon.

#### Passive defense injuries :

While protecting yourself.

#### medicolegal importance :

- Suggestive of homicide.
- Absent if victim was attacked from behind/while sleeping/unconscious.



Defensive injuries



# REGIONAL INJURIES : PART 1

----- Active space -----

Head injury  $\left\{ \begin{array}{l} \text{Closed : Intact dura.} \\ \text{Open : Ruptured dura.} \end{array} \right.$

## Skull Fractures

00:01:28

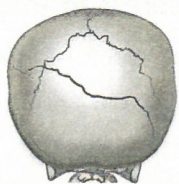

### MECHANISM OF FRACTURE

Direct : Direct impact (Eg : Impact with rod, bullets, rock).

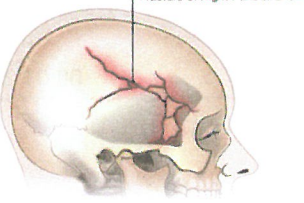
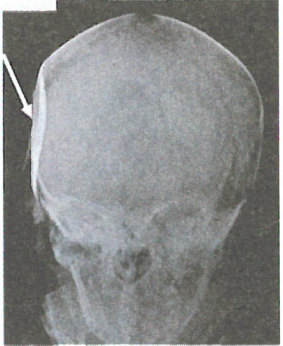
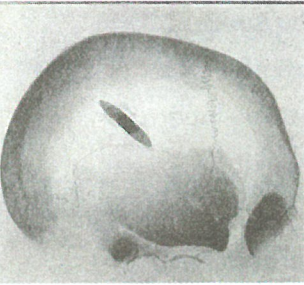
Indirect : Indirect impact (Eg : Falling from a height).

### TYPES OF SKULL FRACTURES

Skull vault fractures :

Type	Weapon/ mechanism	Characteristics
<p>1. Fissure fracture</p> 	Heavy weapon with broad striking surface.	<ul style="list-style-type: none"> <li>m/c type of skull fracture.</li> <li>General deformation.</li> <li>Thin linear fracture line.</li> </ul>
<p>2. Depressed fracture</p> 	Heavy weapon with narrow striking surface (Eg : hammer).	<ul style="list-style-type: none"> <li>Fracture segment is displaced inward/depressed.</li> <li>Signature fracture AKA fracture ala signature : Pattern of fracture represents pattern of striking surface.</li> <li>Complications : Brain contusion, laceration, cerebral injury.</li> <li>mx :               <div style="text-align: center;"> <p>Intracranial injury</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Present</p> <p>↓</p> <p>Sx elevation of fracture segment</p> </div> <div style="text-align: center;"> <p>Absent</p> <p>↓</p> <p>Conservative management</p> </div> </div> </div></li> </ul>

----- Active space -----

Type	Weapon/ mechanism	Characteristics
<p>3. Comminuted fracture</p>  <p>Comminuted Non-Depressed Fracture of Right Parietal Skull</p>	<p>Repeated blows ↓ multiple fracture lines ↓ multiple fracture segments</p>	<ul style="list-style-type: none"> <li>• Complication of fissure fracture or depressed fracture.</li> <li>• AKA mosaic fracture/ spider web fracture (No displaced segments).</li> </ul>
<p>4. Sutural/diastatic fracture</p>	<p>Blow to skull → Sutural separation</p>	<ul style="list-style-type: none"> <li>• Fracture line along sutures.</li> <li>• m/c in young adults.</li> <li>• Not seen in elderly due to fused sutural lines.</li> </ul>
<p>5. Pond/indented/ping pong ball fracture</p> 	<p>Trauma on soft skull ↓ Dent in suture (No fractures)</p>	<ul style="list-style-type: none"> <li>• Variant of depressed fracture.</li> <li>• m/c in children (&lt; 4 yr) d/t soft, elastic, pliable skull.</li> <li>• Seen in obstetric forceps delivery (D/t force on either sides of skull).</li> </ul>
<p>6. Gutter fracture</p> 	<p>Oblique/glancing bullets ↓ Gutter fracture</p>	<ul style="list-style-type: none"> <li>• Type 1 : Injury to outer table.</li> <li>• Type 2 : Injury to outer &amp; inner table.</li> <li>• Type 3 : Keyhole defect (Penetrate the skull over a small area).</li> </ul>