DEFINITIONS IN FORENSIC MEDICINE

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

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

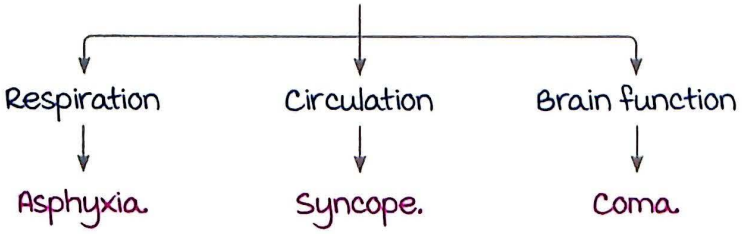
Cause :

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

Feedback

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

00:10:08

Legal Procedures

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
• Imprisonment <2 years. • 2(x) BNS.	• Imprisonment >2 years. • 2(z) BNS.

Based on compromise :

Compoundable offence	Non-compoundable offence
• Minor offences. • Victim can compromise with accused & drop the case.	• Serious crimes. • No compromise permitted between victim and accused.

Feedback

CIVIL AND CRIMINAL CASES

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

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). 1st class Jm. IInd 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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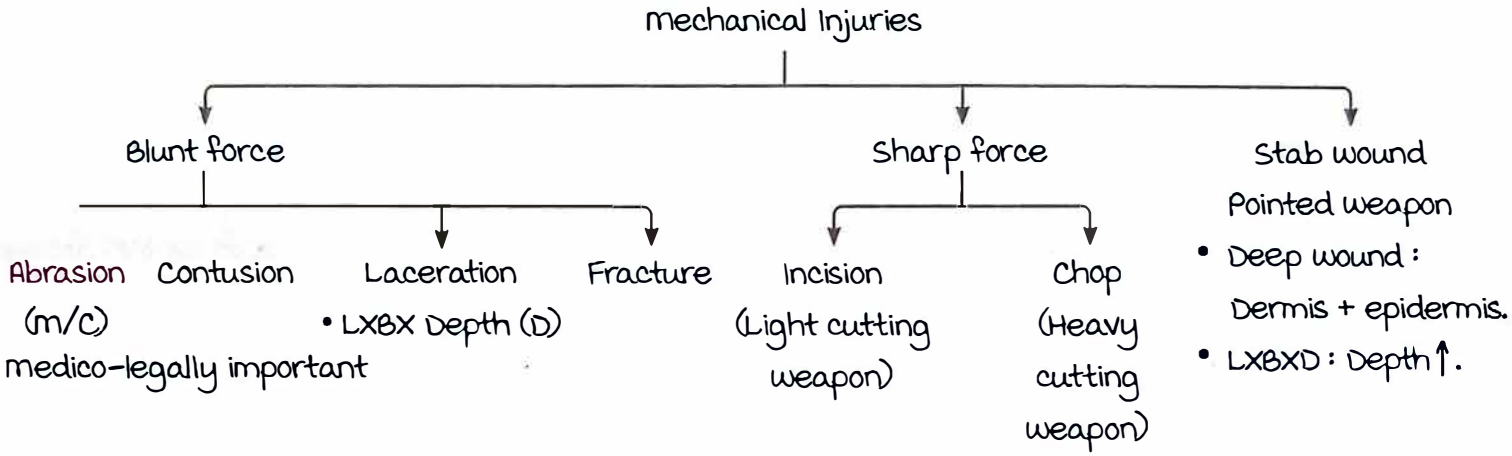
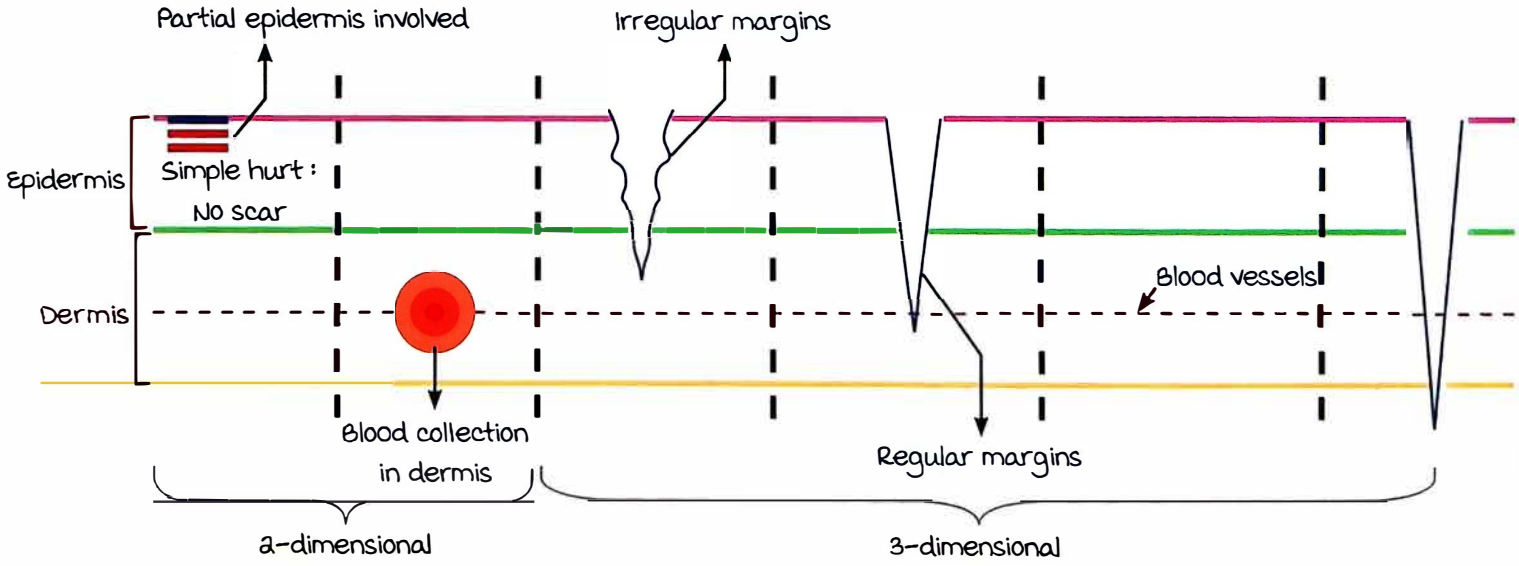
BLUNT TRAUMA INJURIES

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.

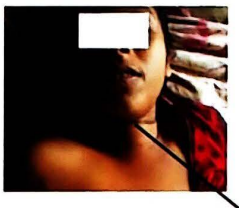
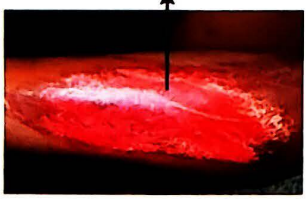
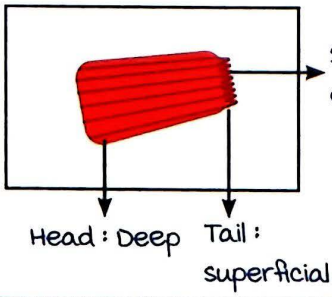
Feedback

Abrasion

00:07:29 ----- Active space -----

- 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)
1. Scratch abrasion : Injury with pin, fingernails, thorn. 	1. Pressure abrasion : ↓force, ↑duration.    Shoe bite Ligature mark  
2. Graze abrasion (m/c) : Due to friction between skin and rough surface. Multiple scratches over a wide area.   • AKA Gravel rash (RTA)/ brush burn/Sliding abrasion/ friction burn. Direction of force  Skin tag : heaping of epithelium. Head : Deep Tail : superficial	2. Impact/Imprint abrasion : ↑force for ↓duration. Eg : Tyre mark, radiator grill mark.  
	3. Patterned abrasion : Imprint/pressure + pattern of weapon abrasion.

Aging of abrasion :

- Healing time : 1 week.
- Heals with formation of scab.
- Aging based on color of scab: Mnemonic : R^aRBB^a.
  - R: Raw → < 12hrs.
  - R: Reddish scab → > 12hrs.

Hypopigmented areas  Scab

Feedback

----- 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.

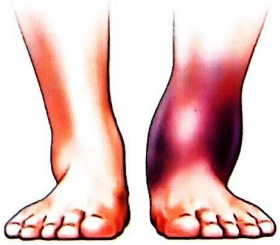
Contusion : Viscera.

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 :

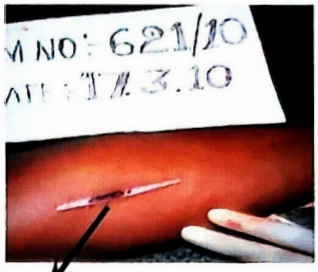
- Good muscle tone.
- Firm fibrous tissue (Eg : Palms, soles).

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.

Feedback


Intradermal bruise

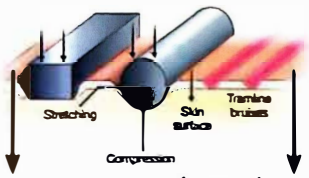



Deep bruise : Incision shows clotted blood.

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

Patterned bruise

Railway-line bruise
AKA Tram-line bruises



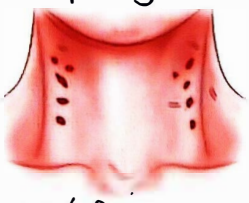
Weapon : Iron rod/Lathi/Cane

- 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

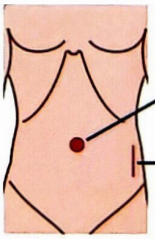
5. Ectopic bruise (AKA migratory/percolated bruise) :

- 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 fossa



Abdominal ectopic bruise

Peri-umbilical bruise : Cullen's Sign

Bruise on flanks : Grey Turner's Sign

6. Artificial bruise :

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

	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

Feedback

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

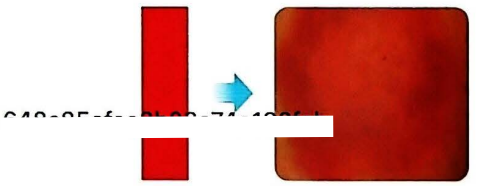
	True Bruise	Artificial Bruise
Inflammation	Only on the bruise	Surrounding skin involved
Pain	Present	Absent

Aging of bruise :

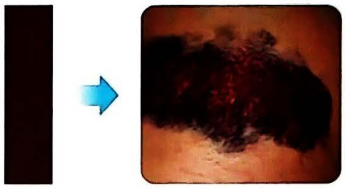
Methods used

- Colour of Bruise — m/c used in live person
- Histology
- Spectrophotometry
- Pearls stain reaction

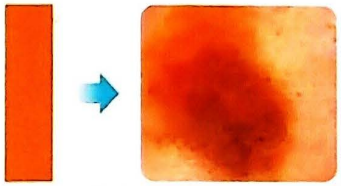
Colour of bruise :



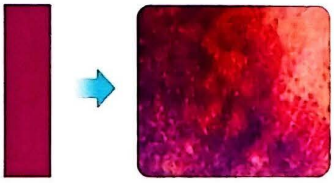
1. Red : at first (Oxy-hemoglobin)



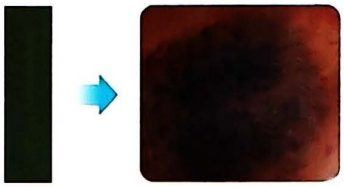
3. Bluish : black to brown (Hemosiderin) – 4th day



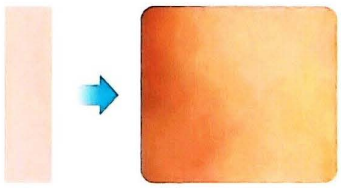
5. Yellow (Bilirubin) : 7 to 12 days



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 O2).
  - 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		

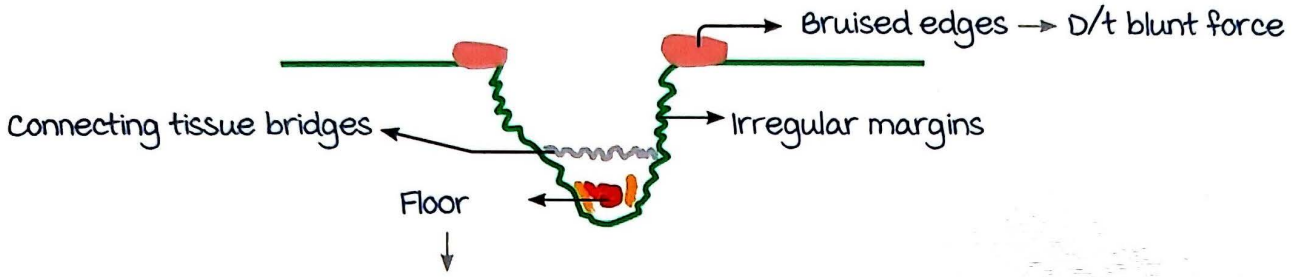
Feedback

Laceration

00:48:58 ----- Active space -----

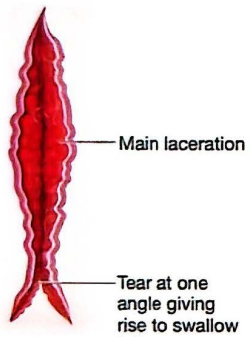
- Lacer : To tear.
- Tearing of skin with irregular margins.

CHARACTERISTICS



Crushed :

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



Shallow tailing

↓Bleeding in lacerations

Laceration

TYPES

1. Split laceration :

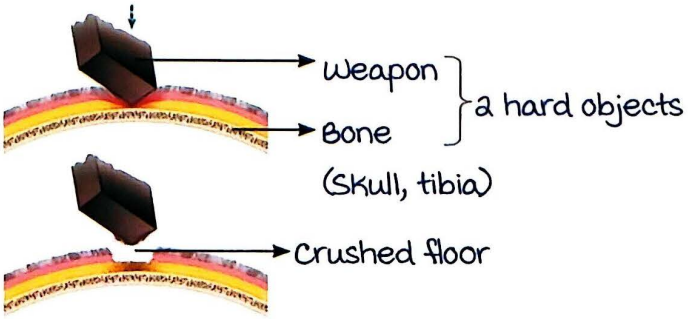
AKA incised looking laceration.

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

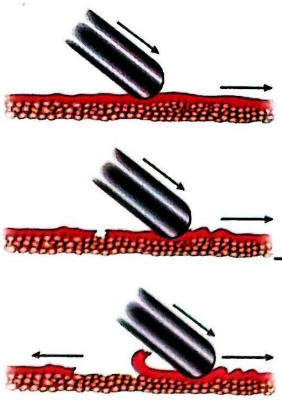
Feedback

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

2. Stretch laceration :

Mechanism : Pressure with pull force → Overstretching of skin.

- Commonly seen with compound fractures.



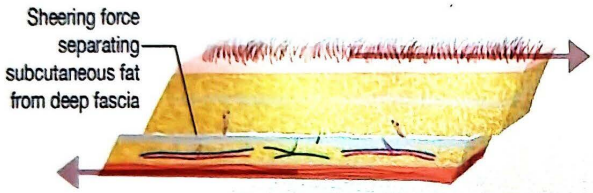
Presence + pull with force

Stretch laceration

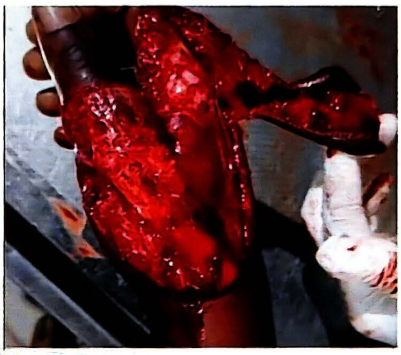
3. Avulsion laceration :

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

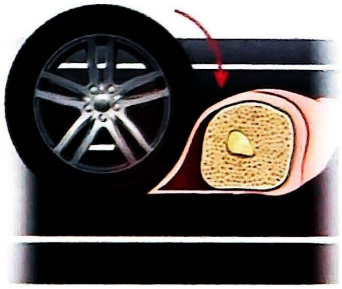
- Commonly seen with run over injuries.
  - Eg : Degloving injury, scalping.



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 -----

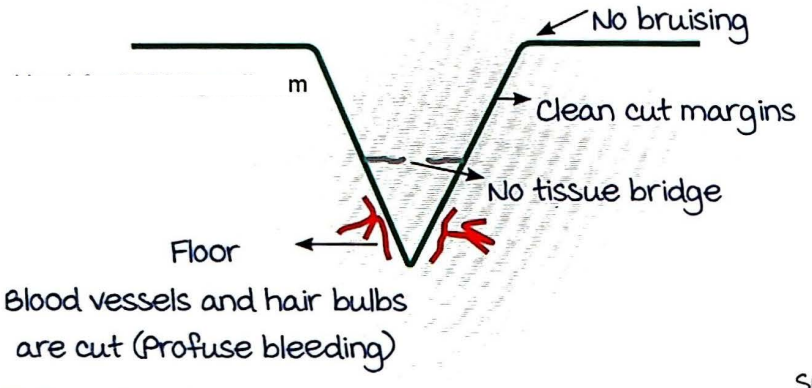
Incised Wounds

00:00:11

AKA cut wound/slash/slicing injury.

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

APPEARANCE



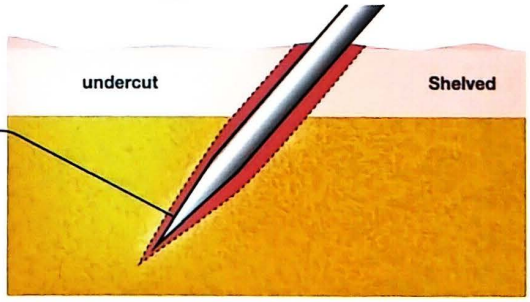
Blood vessels and hair bulbs are cut (Profuse bleeding)

Surgical blade

Incised wound

Oblique incisions :

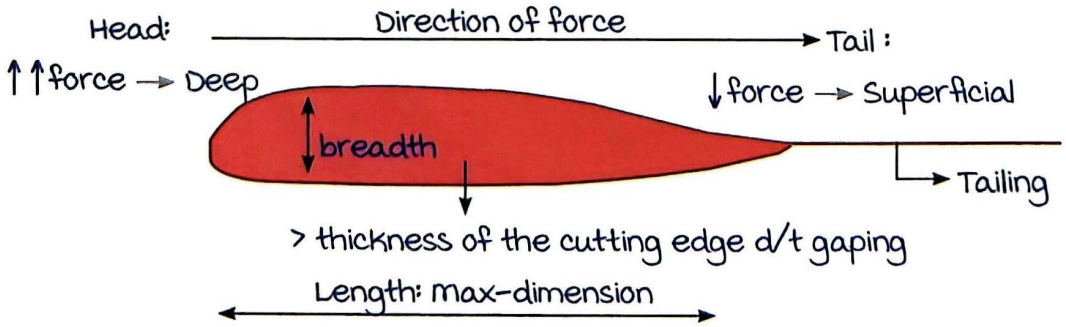
- Blade enters the skin obliquely → Bevelled cuts → Undermining edges.
- Feature of homicidal wound.

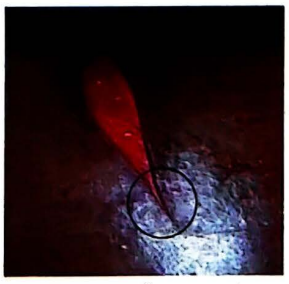


Bevelled cuts

FEATURES

Dimensions :





Tailing of wound

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/ hesitational 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

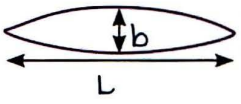
Penetrating and perforating wounds :

Penetrating : Only an entry wound seen.

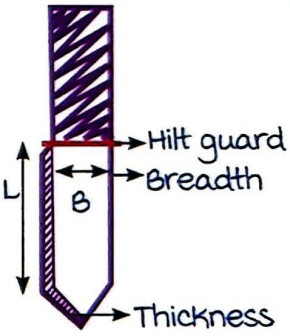
Perforating : Entry and exit wounds seen.

Inverted margin — Everted margin

Dimensions?



Dimensions of wound

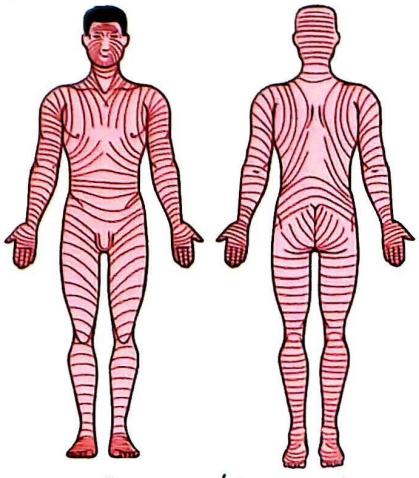


Dimensions of weapon

Length of the wound	Breadth	Depth
• Corresponds to breadth of the blade. • Maybe lesser d/t elasticity of skin.	• Corresponds to thickness of blade. • Affected by gaping.	Only assessed in penetrating wounds ↓ Corresponds to length of blade. Can be > length of blade in tissue yielding. Eg : Thorax, abdomen.

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

Feedback

Note : Assessment of wound permitted only during surgeries autopsy.

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

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

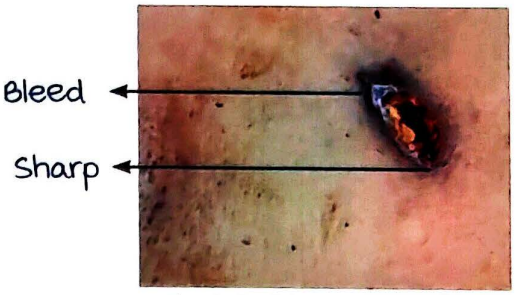
Shape of stab wound :

Single edge knife :

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

Double edge knife :

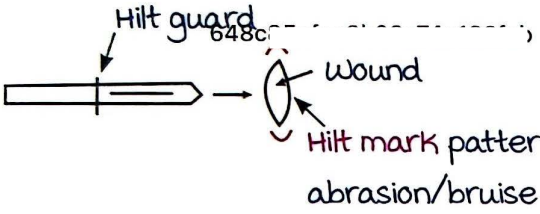
- Oval or spindle-shaped wound.
- Stellate part of screw driver : ✧
- Dining fork : oooo



Blunt double edged knife


Sharp double edged knife

Complete penetration :



Seen in

- Complete penetration.
- Type of weapon.
- Direction of stabbing → B/L → Perpendicular; U/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)

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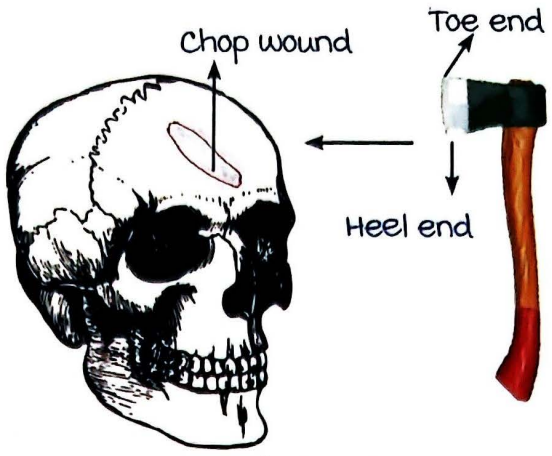
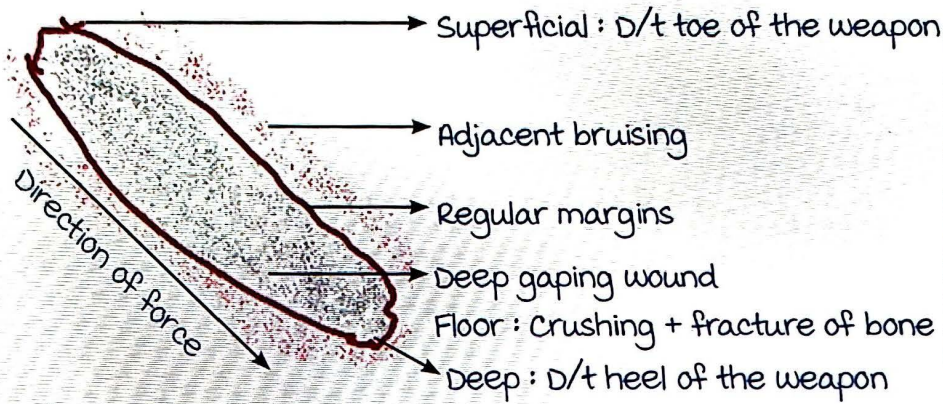


Heavy sharp weapon

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 :

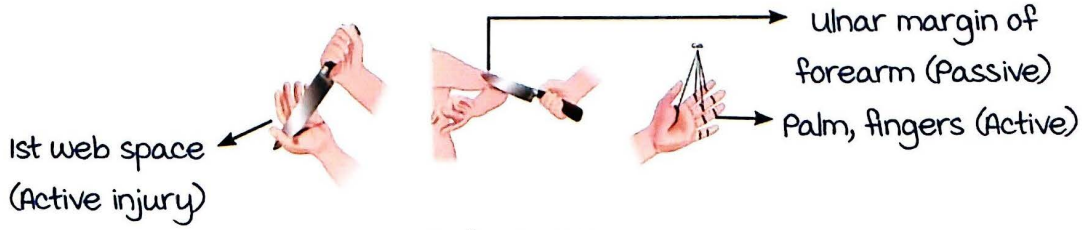
D/t grasping the weapon.

Passive defense injuries :

While protecting yourself.

Medicolegal importance :

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



Defensive injuries

Feedback

REGIONAL INJURIES : PART 1

Head injury → Closed : Intact dura.
Head injury → Open : Ruptured dura.

Skull Fractures

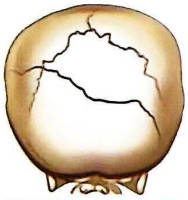
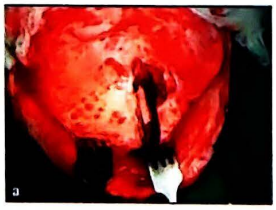
00:01:28

MECHANISM OF FRACTURE

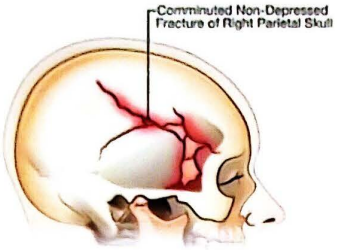
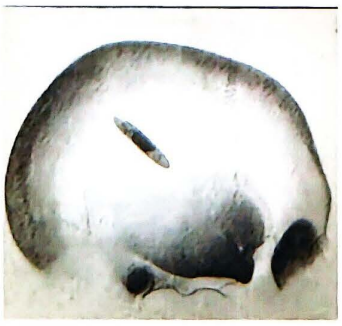
Direct : Direct impact (Eg : Impact with rod, bullets, rock).
Indirect : Indirect impact (Eg : Falling from a height).

TYPES OF SKULL FRACTURES

Skull vault fractures :

Type	Weapon/ mechanism	Characteristics
1. Fissure fracture 	Heavy weapon with broad striking surface.	• m/C type of skull fracture. • General deformation. • Thin linear fracture line.
2. Depressed fracture  	Heavy weapon with narrow striking surface (Eg : hammer).	• Fracture segment is displaced inward/depressed. • Signature fracture AKA fracture ala signature : Pattern of fracture represents pattern of striking surface. • Complications : Brain contusion, laceration, cerebral injury. • mx : Intracranial injury → Present → Sx elevation of fracture segment; Absent → Conservative management

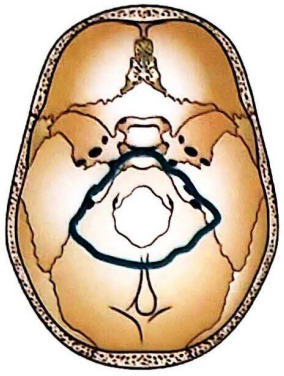
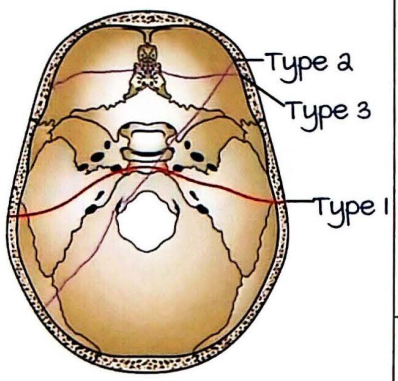
----- Active space -----

Type	Weapon/ mechanism	Characteristics
3. Comminuted fracture 	Repeated blows ↓ multiple fracture lines ↓ multiple fracture segments	• Complication of fissure fracture or depressed fracture. • AKA mosaic fracture/ spider web fracture (No displaced segments).
4. Sutural/diastatic fracture	Blow to skull → Sutural separation	• Fracture line along sutures. • m/c in young adults. • Not seen in elderly due to fused sutural lines.
5. Pond/indented/ping pong ball fracture 	Trauma on soft skull ↓ Dent in suture (No fractures)	• Variant of depressed fracture. • m/c in children (< 4 yr) d/t soft, elastic, pliable skull. • Seen in obstetric forceps delivery (D/t force on either sides of skull).
6. Gutter fracture 	Oblique/glancing bullets ↓ Gutter fracture	• Type 1 : Injury to outer table. • Type 2 : Injury to outer & inner table. • Type 3 : Keyhole defect (Penetrate the skull over a small area).

Feedback

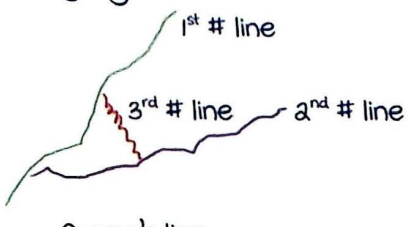
----- Active space -----

Skull base fractures :

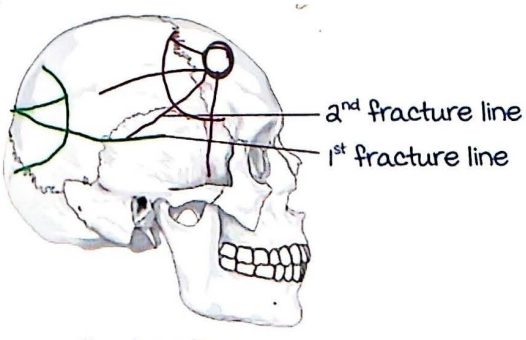
Type	Weapon/mechanism	Characteristics
1. Ring fracture 	1. Fall from height : a. Lands on feet Impact : Legs → Vertebral column → Base of skull b. Lands on buttock Impact : Indirect force to base of skull. 2. Heavy weight on the	• Fracture in base of skull : Around foramen magnum (Size : 3-5 cm). • Fracture in posterior cranial fossa.
2. Hinge fracture 	Type 1 : Sideway impact in middle cranial fossa	Fracture lines reach opposite side through sella tursica (Through middle cranial fossa). • Nodding face sign : Abnormal mobility of base of skull. • AKa motorcyclist fracture.
	Type 2 : Posterior impact	Fracture from posterior to anterior cranial fossa
	Type 3 : Sideway impact in anterior cranial fossa	Fracture in anterior cranial fossa

Puppe's rule :

- The new fracture line will never cross previous fracture line.
- Sequencing the fracture lines due to blows.
- Applicable to all skull fracture despite the mechanism of injury.



Puppe's line



Fracture lines

Feedback

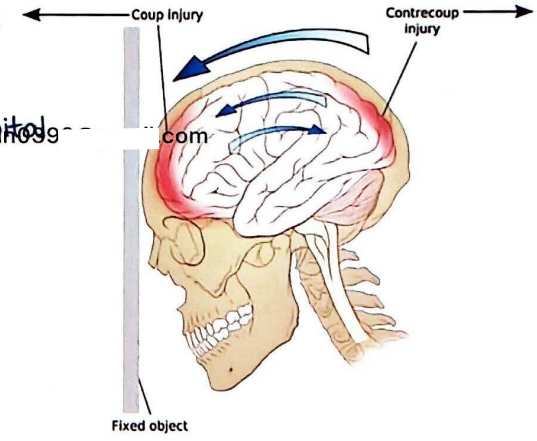
----- Active space -----

CLINICAL FEATURES

Fracture of anterior cranial fossa	Fracture of middle cranial fossa	Fracture of posterior cranial fossa
CSF rhinorrhoea : • Halo sign. • Glucose ↑, protein ↓. • β_2 transferrin (Specific). • Bleeding from nose. • Paraesthesia in tip of nose. • Periorbital hematoma (Black eye).	• CSF otorrhoea (CSF leaking the ears). • Battle sign : Echymosis in mastoid region. • Facial nerve palsy. • CSF rhinorrhoea (CSF leak through eustachian tube into the nose). • Hemotympanum.	Boggy swelling in the neck.

Coup and counter coup injury :

- Injury at site of impact.
- m/C site : Occipital lobe.
- Mild/no injury.



- Injury opposite to site of impact.
- Exception : Occipital lobe.
- m/C site : Frontal lobe.
- Frontal & temporal lobe are more prone (D/t rough surface of base of brain).
- Severe injury.

Presentation : Rare in < 3 yrs.
Mechanism of injury : Blow/ fall, seen in mobile head.
Theory : Struck Hoop theory (Vaccum theory).

Impact :

a. In occipital lobe → Injury in frontal lobe (Contusion).
b. In frontal lobe → No injury in occipital lobe (D/t smooth surface).
c. In temporal lobe → Injury in contralateral temporal lobe/ contralateral surface of ipsilateral lobe (D/t falx cerebri).

Note : Coup and countercoup is also seen in liver, lungs & spleen.

REGIONAL INJURIES : PART 2

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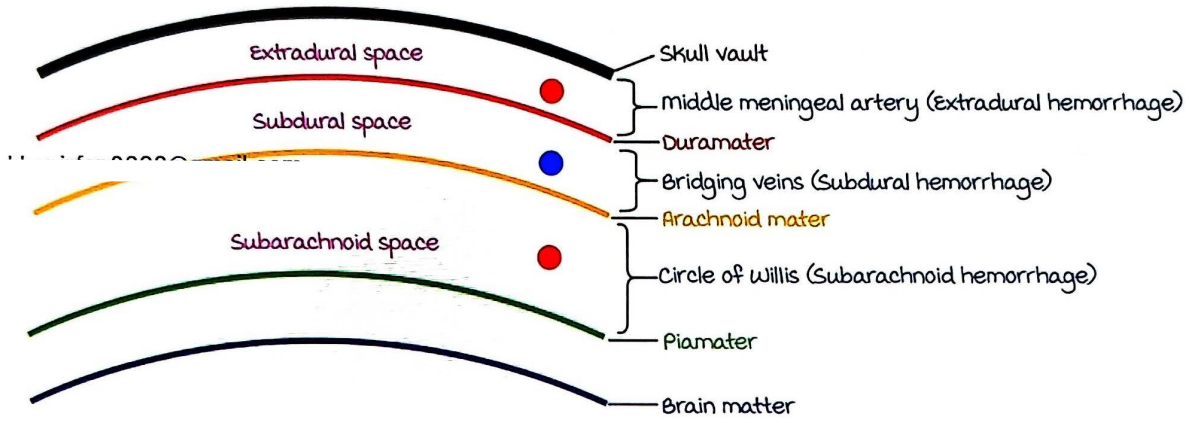
Intracranial Hemorrhages

00:00:10

ANATOMY OF MENINGES



EXTRADURAL HEMORRHAGE (EDH)

Least common intracranial hemorrhage.

Highest fatality.

Unilateral, coup injury.

Age group : Young adults (20-40 yrs).

Blood vessel involved :

a. Middle meningeal artery (Injury to temporal lobe) : m/c.
b. Anterior ethmoidal artery (Injury to frontal lobe).
c. Transverse sinus (Injury to occipital lobe).
d. Sagittal sinus (Impact on vertex).

Mechanism :

- Blow to temperoparietal region (Pterion) → Fracture of temporal bone (m/c : Fissure fracture)

↓

Bleeding in extradural space ← Rupture of middle meningeal artery

↓

↑intracranial tension → Brain compression

Brainstem herniation → Respiratory failure → Death.

EDH

Feedback

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

Clinical features :

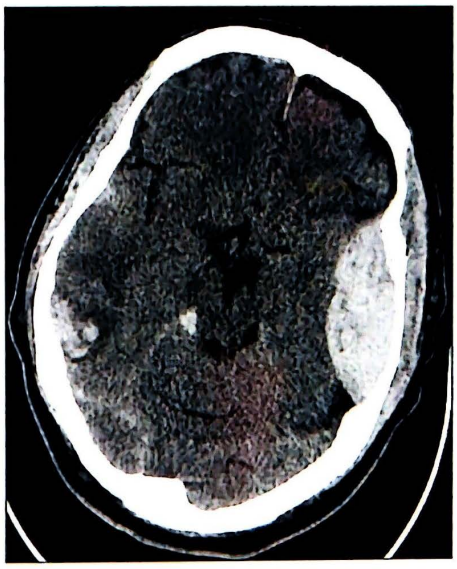
- 35 ml of blood : Clinical features, 150 ml of blood : Fatal.
- Lucid interval : Period of consciousness between unconsciousness.
  a. Concussion → Lucid interval → Brain compression d/t bleeding → Unconscious + death.
  b. Patient can provide valid evidence, will and is criminally liable.
  c. Death d/t failure in diagnosing lucid interval : Medical negligence.
- Dilated & fixed pupil (3rd cranial nerve palsy) + contralateral hemiparesis.
- Kernohan's notch phenomenon : Dilated pupil + Ipsilateral hemiparesis
  - False localising sign.
  - Mechanism : Uncal herniation → Compression of opposite area into tentorium cerebelli → Compression of fibres in cerebral peduncle → Ipsilateral hemiparesis and dilated pupils.

Note : Lucid interval : EDH > SDH.

Investigation :

Non contrast CT (NCCT).

- Biconvex/ lentiform/ lens shaped hemorrhage.
- Does not cross suture.



EDH

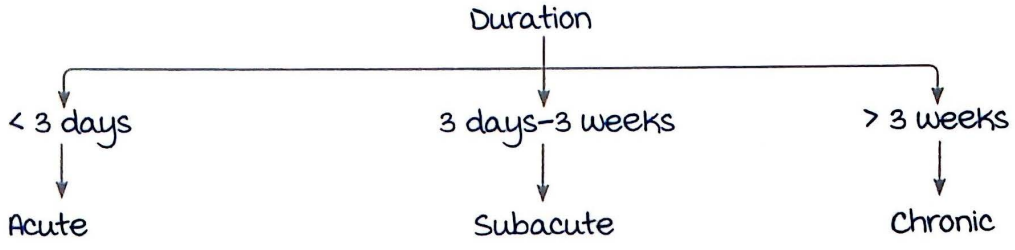
Management :

Surgical removal of clot : Craniotomy / burrhole.

SUBDURAL HAEMORRHAGE (SDH)

Age group : Children, elderly.
Blood vessels involved : Bridging vein.

Type :



Lucid interval +

Feedback