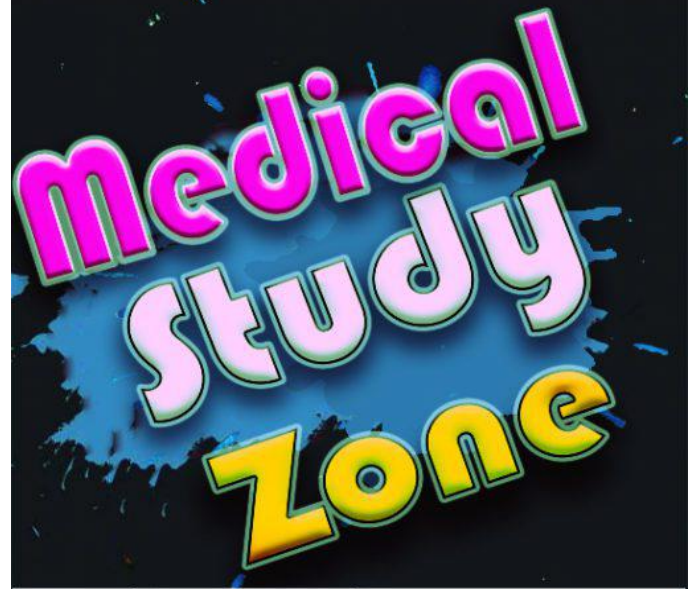


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1

TRAUMATOLOGY

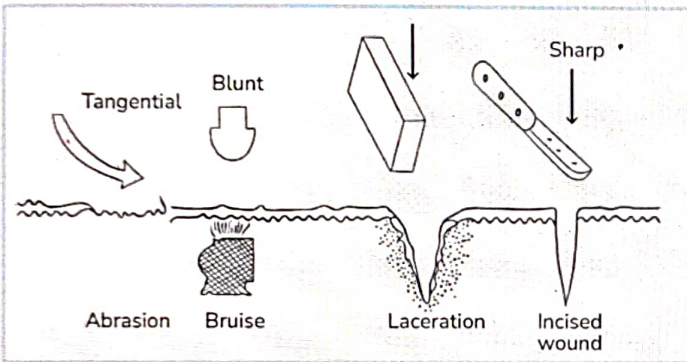


MECHANICAL INJURIES

Classification of Injury

00:00:16

Blunt	Sharp	Pointed
Abrasion	Incised	Stab
Contusion	Chop	
Laceration		



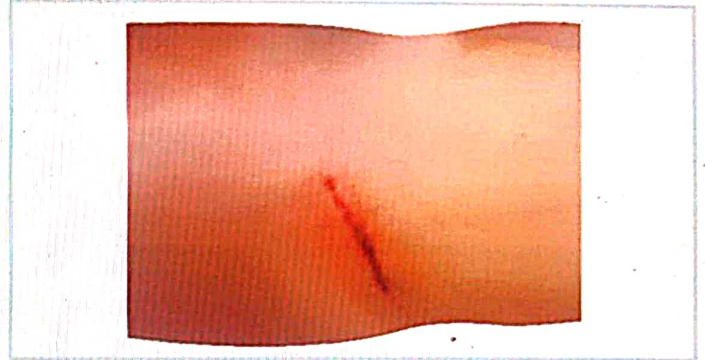
ABRASION

- It is a superficial injury
- Involves only epidermis
- No bleeding and no scarring
- In general abrasions are simple hurt except corneal abrasion which is a grievous hurt



Abrasion Types

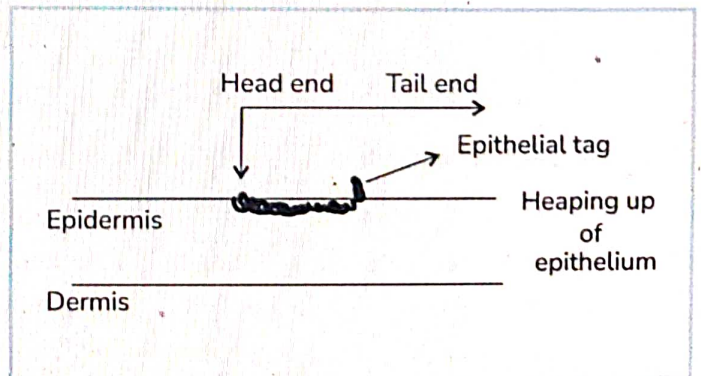
- **Scratch** - Single linear abrasion caused by thorn, nail.



- **Graze** - Multiple lines of scratches over a wide area.
 - Commonly seen with RTA.
 - **Most Common** type of abrasion.
 - Also known as **friction burn / brush burn / gravel rash**.



- Epithelium scraped during a graze is deposited at tail end, which is called as epithelial tag/heaping up of epithelium from which you can find out the direction of force.



Important Information

- Scarring is seen in corneal abrasion

- Pressure – Epithelium crushing due to perpendicular pressure



- Patterned – Epithelium crushing + Pattern of weapon



Ageing of abrasion is found by colour of scab

MNEMONIC: (R³B³)

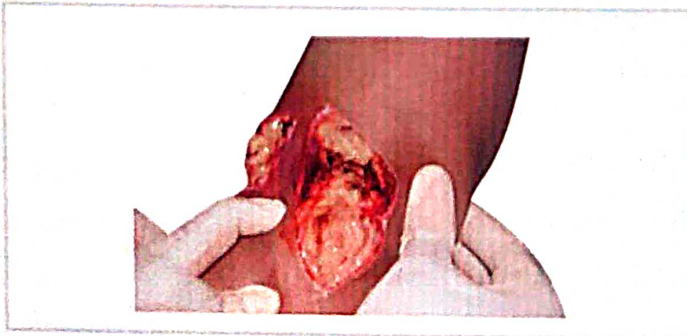
- Raw - < 12 hr.
- Reddish scab - > 12 hr.
- Reddish Brown scab - 2-3 days.
- Brown scab - 4-5 days.
- Black scab - 6-7 days.

Medicolegally most important injury is abrasion

CONTUSION / BRUISE

00:06:27

- Blunt trauma to skin will rupture dermal capillaries (epidermis is not involved) and results in blood collection in tissue that causes swelling and reddish discoloration, known as contusion / Bruise.
- Margins of contusion will be irregular.



- Extravasation of blood is seen in contusions.

Types of contusion / Bruise

Superficial	Deep	Ectopic/ Migratory	Patterned
<ul style="list-style-type: none"> • Lies over the skin. 	<ul style="list-style-type: none"> • Lies deeper to tissues. 	<ul style="list-style-type: none"> • Injury at one site, bruise will be on another site. • Ectopic – <ol style="list-style-type: none"> 1. Black eye. 2. Battle sign 	<ul style="list-style-type: none"> • It will give the pattern of weapon used. • Patterned – <ol style="list-style-type: none"> 1. Six penny bruises seen in Throttling and Battered baby syndrome, 2. Tramline bruise in stick injury.



Ageing of Bruise is found by colour

Oxy - Hb	FRESH
De oxy - Hb	FEW HR - 3 D
Hemosiderin	4 D
Biliverdin	5 - 6 D
Bilirubin	7 - 12 D

Timeline	Colour	Reason
Fresh	Red	Oxygenated Hb
Hours to 3 days	Blue	Deoxygenated Hb
4 th day	Brown	Hemosiderin
5 th - 6 th day	Greenish	Biliverdin
7 th - 12 th day	Yellow	Bilirubin
2 weeks	Normal	

Normally Abrasion heals in - 1 week
Contusion heals in - 2 week



Important Information

- Multiple bruises of varying colours is seen in child abuse/Battered baby syndrome.

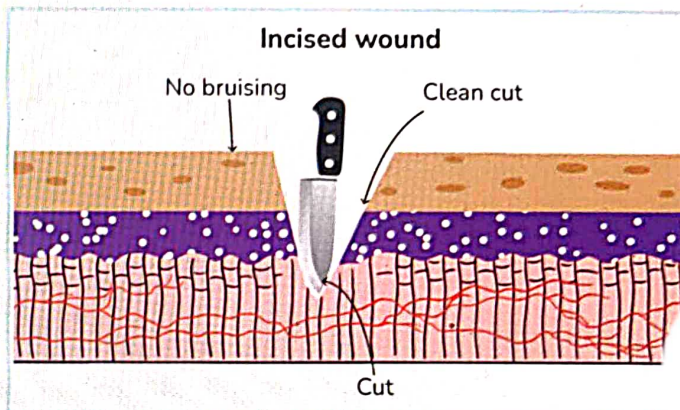
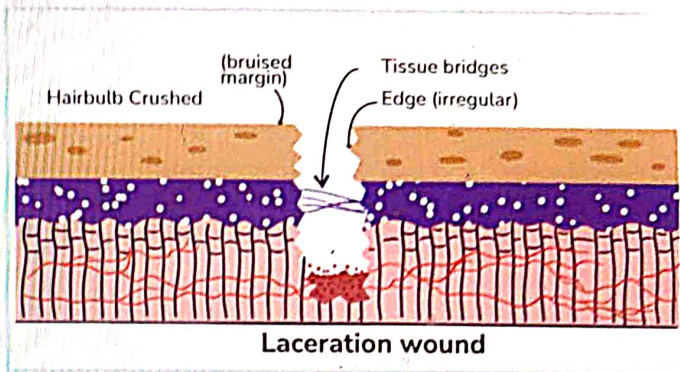
Difference between Contusion and Hypostasis

Refer Table 1.1

LACERATION & INCISED WOUND

00:19:20

Wound	Laceration	Incised
Force	Blunt (Tearing type)	Sharp (Cutting type)
Edges	Irregular	Clean, Cut & Regular
Margins	Bruising	No
Hair bulb	Crushed	Cut
Tissue bridges	Present	Absent
Bleeding	Less	More (Profuse bleeding)



LACERATION

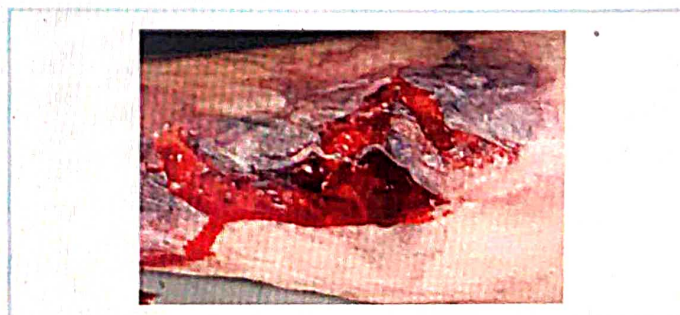
Types of laceration

- Split laceration
 - o Skin is crushed between 2 hard objects
 - o Located on bony prominences



• Stretch laceration

- o Overstretching of skin + Pressure with pull force.
- o Eg- Flapping (Will help in determining the direction of force)

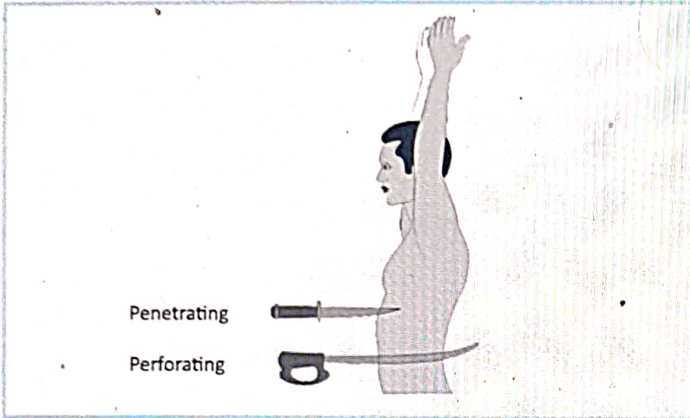


- **Avulsion** - Associated with any shearing force produced by grinding compression trauma.
 - Degloving is seen in avulsion laceration.
 - Flaying – Skin is separated from the underlying tissues

Important Information

- Split laceration will look like incision wound “incised looking laceration”

STAB WOUND



- Produced by any weapon with pointed end.
- **Types**
 - Penetrating - Only entry of the weapon
 - Perforating - Entry and exit as well

Shape

- Single edged knife - Wedge shape
- Double edge knife - Oval
- Screw driver - Stellate shape / Star shaped

INCISED WOUND

- The characteristic of incised wound is that it has got both the head & tail.



- Swallow tailing seen with Laceration.
- Fish tailing seen with Stab wound (by single edged weapon).
- Tailing is seen in Incision

Important Information

- Direction of incised wound - Tailing of the wound suggests the direction of force.

Hesitational cuts / Intentional cuts / Tentative cuts / Feelers strokes



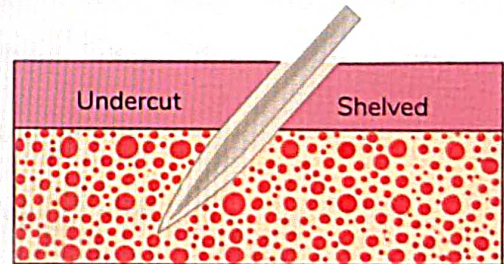
- Present in suicide cases.
- Multiple superficial linear cuts.

Important Information

- Hesitational cuts usually present over the accessible parts of body and are diagnostic of suicide.

HOMICIDE

1. Chop wound in head
2. Genital injury
3. Defence wound
4. Over kill
5. Bevelled cuts



DEFENCE INJURIES

- Injuries sustained while defending the attacks
 - Suggestive of “Homicide”
 - Their presence is not mandatory in all homicide victims.





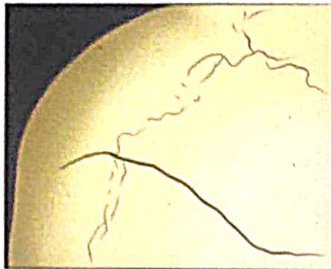
Important Information

- Common sites are palm, ulnar margin of forearm

SKULL FRACTURE

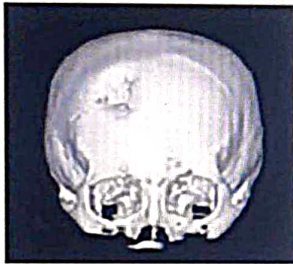
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- **Fissure fracture:** Has a linear fracture line



Fissure fracture

- **Depressed fracture:** Fractured fragment is depressed into cranial compartment.
 - E.g. - Seen with hammer weapon



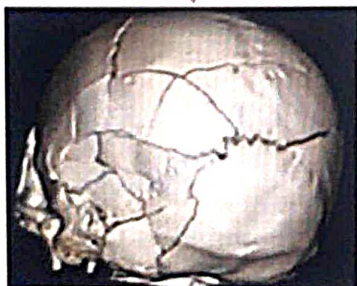
Depressed fracture



Important Information

- Depressed fracture Aka signature fracture as it tells about the pattern of the weapon

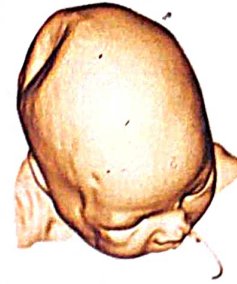
- **Comminuted fracture:** Has multiple fracture segments



Comminuted fracture

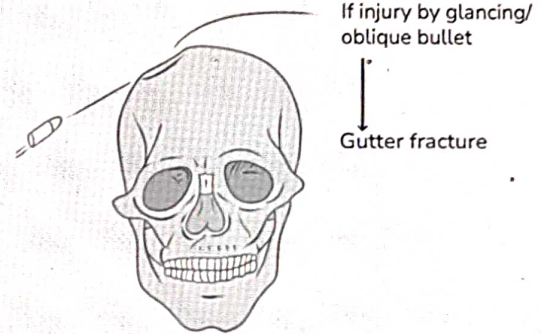
- **Sutural fracture:** Fracture along the suture
 - Aka **diastatic fracture**, commonly seen in parietal suture

- **Pond fracture / Indented fracture:** Usually seen in elastic skull (children)
 - A small depression present at skull



Pond Fracture

- **Gutter fracture:** Oblique bullet injury or glancing bullet can cause Gutter Fracture



Gutter Fracture



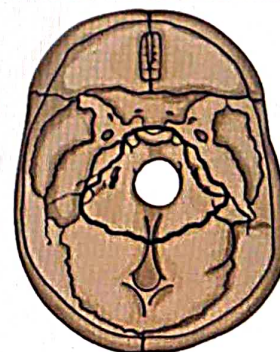
Important Information

- **Puppe's rule:** If there are multiple fracture lines then we can find out the sequence of blows
 - 2nd fracture line does not cross the old fracture line.

FRACTURE OF SKULL BASE

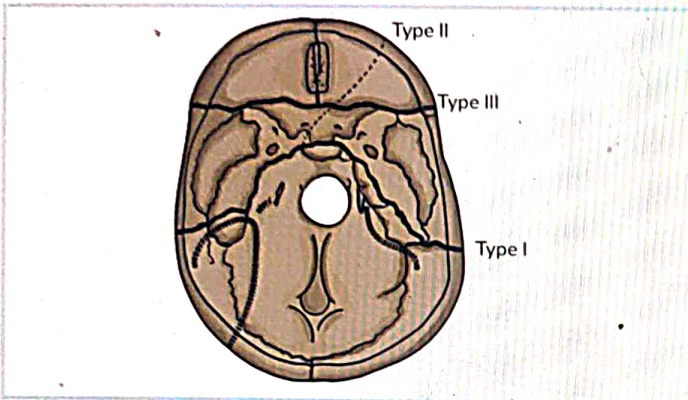
Ring Fracture

- Fracture line passes around the foramen magnum and it is usually present in case falling from height and landing on feet.
- Seen with posterior cranial fossa fracture



Hinge fracture / Motorcyclist fracture

- **Hinge Fracture Type 1**
 - Fracture line runs along with Middle Cranial Fossa from one side of temporal region to the other side of temporal region and divides the skull into front and back half
- **Hinge Fracture Type 2**
 - Hinge fracture is defined as oblique fracture running through sella turcica
- **Hinge Fracture Type 2**
 - Type 3 fracture denotes fracture line running in the anterior half

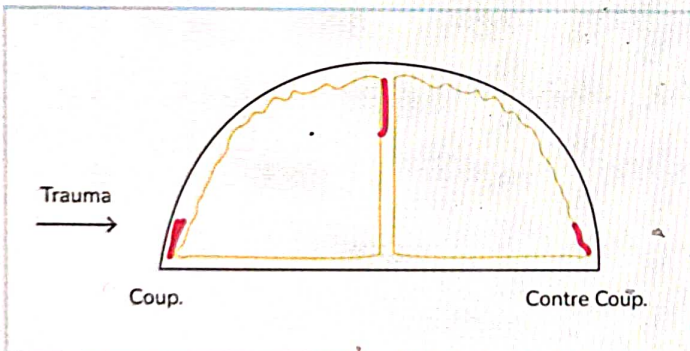


Important Information

- Nodding face sign seen in hinge fracture

Coup and Counter Coup Injury

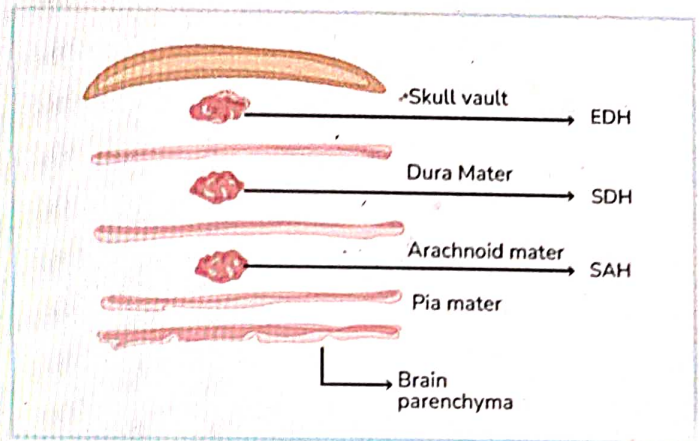
00:32:59



Coup injury	Contre Coup injury
<ul style="list-style-type: none"> • Present at the site impact 	<ul style="list-style-type: none"> • Present opposite to the side of impact • Can be present at the opposite side of the same lobe
	<ul style="list-style-type: none"> • MC site is frontal lobe contusion with occipital fall • Usually seen only when the head is mobile

Intra cranial Haemorrhages

00:34:30



Source of Bleeding

- EDH: Due to rupture of middle meningeal artery present near Pterion, purely due to trauma.
- SDH: Due to rupture of Bridging Veins. Mostly due to trauma but can also be spontaneous.
- SAH: Due to rupture of Arteries (Circle of Willis). Trauma or Spontaneous (due to rupture of aneurysm or AV malformation)

EDH

- Usually a coup injury
- Associated with fracture of temporal bone
- It is usually coup injury
- Clinical feature is that it presents with Lucid interval

Important Information

- In EDH, Lucid interval is seen. Period of Consciousness Between two Unconsciousness.

- Doctor can be liable under IPC 304 (A)
- CT SCAN shows Biconvex appearance



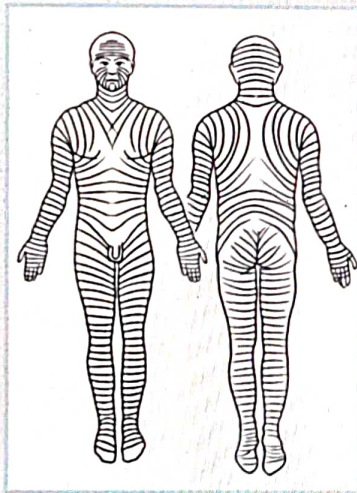
- **SDH**
 - **A - Alcoholics / Aged**
 - **B - Boxers**
 - **C - Child Abuse (Battered Baby Syndrome because of wild shaking)**
 - **E - Elderly person with a minor trauma**
 - **CTSCAN - Concavo-convex / Crescent shape**

- **SAH**
 - **Rupture of Aneurysm (Berry Aneurysm M/C) or AV malformations or trauma or systemic hypertension**
 - **Presentation - Young age, thunderclap headache, seizure, coma**
 - **On CSF - Xanthochromia is seen**

 **Extra Edge**

Lines of Langer

- These are collagen fibres arrangement in body which follow a specific direction



- **Lines of Langer determines the gaping of wound**

 **Extra Edge**

Bevelling

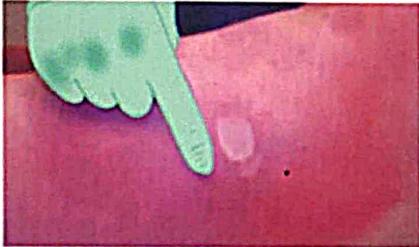

- It is an oblique cut produced by a sharp weapon.
- Suggestive of homicide.

Self-inflicted / suicidal stab injury



- **Hara-kiri / Seppuku**
- Practiced by Japanese soldiers
- **Cause of death in Hara-kiri is Evisceration and hypotension**

Table 1.1

Charecter	Hypostasis / Livor mortis	Contusion
Site	<ul style="list-style-type: none"> • Seen in dependent area 	<ul style="list-style-type: none"> • Any where
Edges	<ul style="list-style-type: none"> • Well defined edges 	<ul style="list-style-type: none"> • Ill-defined edges
Blanching	<ul style="list-style-type: none"> • Present 	<ul style="list-style-type: none"> • Absent
Extravasation	<ul style="list-style-type: none"> • Blood is retained in intact capillaries therefore, Extravasation is absent. 	<ul style="list-style-type: none"> • Blood escaped through ruptured capillaries therefore, Extravasation is present.
Colour changes	<ul style="list-style-type: none"> • Absent 	<ul style="list-style-type: none"> • Present
On incision, pour water	<ul style="list-style-type: none"> • Incision: Blood flows from the cut vessel. • Washable 	<ul style="list-style-type: none"> • Incision: Blood coagulates in tissues • Not washable. 

2

THERMAL INJURIES



HYPOTHERMIA

- Body temperature less than 35°C
 - Person has mental confusion and there is failure of vasoconstriction
- This causes all blood to suddenly rush to skin, so the person feels hot and removes all his clothing
- This results in death
- **Hide and die syndrome** - Seen in severe hypothermia
- **Pink hypostasis** - If the person dies in severe hypothermia aka white death this phenomenon is seen.
- **Wischnewsky's ulcer** - Stress ulcer seen in stomach in case of hypothermia



Important Information

- In Severe hypothermia - Paradoxical undressing is seen
- Mimics sexual assault

Peripheral Cold Injuries

1. Freezing

- **Frost bite** - Seen in Dry cold
 - Frost bite can be superficial and deeper
 - **SUPERFICIAL** - Anaesthesia / erythema is seen
 - **DEEPER** - Edema /blister/thrombosis can be seen
 - Rx- Rewarming (37-40 degree)
 - Frost nip - No freezing, it is followed by frost bite

2. Non Freezing - Chillblains

HEAT

General Effects

- **Heat cramps** - Muscle cramps due to excess sweating (Na depletion)
- **Heat exhaustion** - Na⁺ depletion and water depletion. Body temperature is normal
- **Heat stroke**

1. Triad of

- Core body temperature more than 40.5°C.
- CNS dysfunction - altered sensorium, delirium
- Heat stress exposure

2. Person has tachycardia, tachypnea, hypotension.

Heat Stroke Types

- **Classical** - No sweating, Skin dry and hot
- **Exertional** - Diaphoresis is seen
- Rx- Cooling of the body

Local Effects

1. **Dry** - due to exposure of fire, produces burns
2. **Moist** - due to hot liquid, produces scalds

Burns

Burns - Due to dry heat

- Any superficial burns - Painful / Non scarring
- Any deep burn - Painless / Scarring
- Burn body surface area calculated by - Rule of nine / wallace, lund and browder chart (in children), rule of palm (1%)

AUTOPSY FINDINGS

- **Non-specific signs**
 - **Heat stiffening / pugilistic attitude / Boxers attitude** - Protein coagulation, resembles rigor mortis
 - **Heat rupture** - Skin splits due to drying and dehydration, look like incised wound. Pale, no bleeding / intact vessels, nerves
 - **Heat hematomas** - Due to boiling of blood leading to rupture of blood vessel and resemble traumatic EDH. → Chocolate brown / honey comb appearance
 - **Heat fracture** - Seen in skull and long bones (street and avenue fracture). Due to pulling of muscle and also due to drying of bone
- **Specific finding** - Seen only in antemortem burns
- **External findings**
 - **F** - Fluid in blisters (increased proteins and chloride)
 - **I** - Inflammatory reaction (granulation tissue), infection
 - **R** - Redness / redline
 - **E** - Elevated enzymes



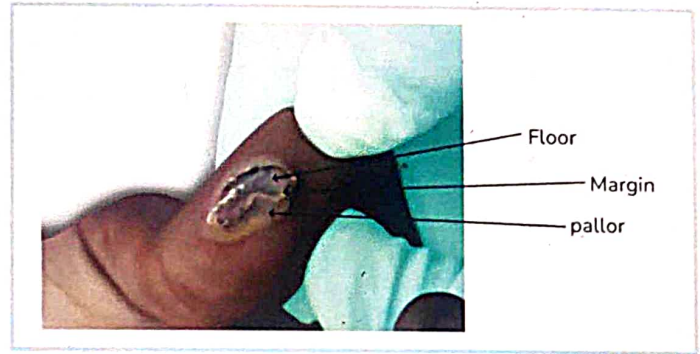
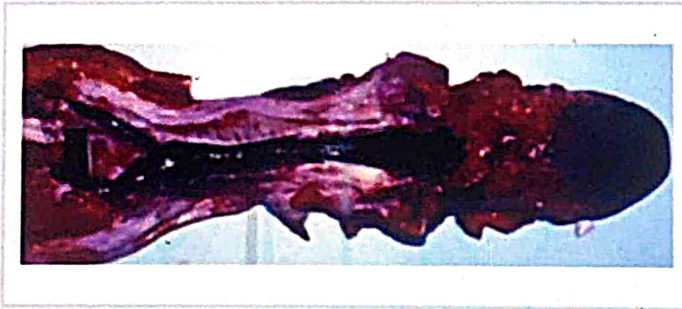
Important Information

- Gas in blisters is seen in postmortem burns

- **Internal findings** - All are antemortem signs 3C
 - Carbon deposition (Soot) into Airways due to inhalation

of smoke

- CoHb is increased in blood
- CN level raised

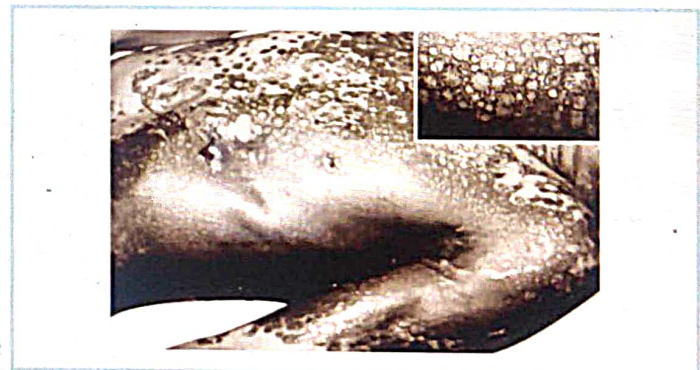


2. High Voltage Burns

- Flash Burn (diffuse burn)



- Crocodile burn (Multiple pitted)



- Metallisation of entry wound - Metallic ions deposited from wire on skin
- Current pearls - Ion deposition in subcutaneous tissue
- Bone pearls - Due to high voltage calcium get molten into bone

3. Filigree Burns



Important Information

- Curling's ulcer seen in duodenum in case of delayed death

	BURNS	SCALDS
Charring	+	-
Singeing of hair	+	-
Clothes	Burnt	Wet
Splashing	-	+
Lines of blisters	-	+
Level of contact	At / above	At/below

ELECTRIC BURNS

01:06:30

Two types of current - AC & DC

- DC is associated with lightning
- AC is more dangerous
- "Amperage" - More Imp factor for electrocution

Important Information

- Cardiac Arrhythmia - M/C/C of death in electrocution
- 2nd m/c is respiratory failure

Classification of Electric Burns

1. Low Voltage Burns

- Joule Burns (endogenous burn)
 - Central depressed floor
 - Pale peripheral areola
 - Due to tight contact with electricity
 - Aka endogenous burn

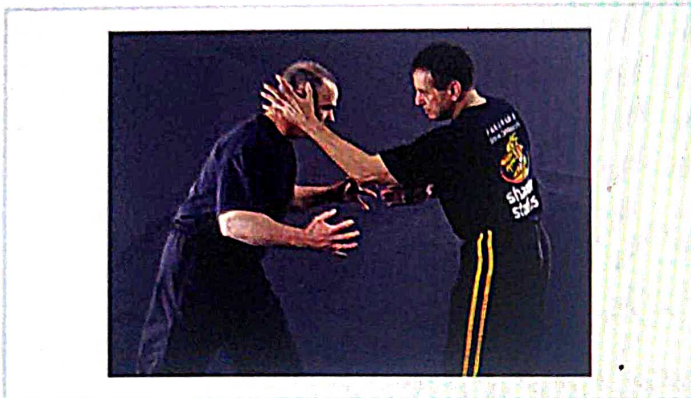
- It occurs due to lightning
- DC current burn
- Lichtenberg Flowers / Arborescent Markings
- Shows branching pattern - Ferning
- Aka Keraunographic markings

TORTURE

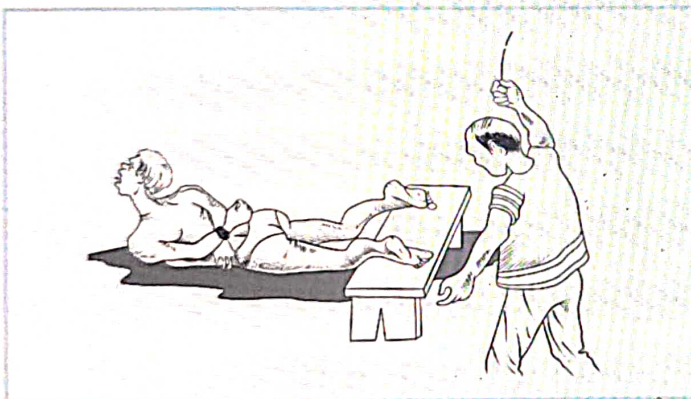
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Types of torture

- **Telefono:** It consists of repeated Slapping over ears by the open palms of the assailant.



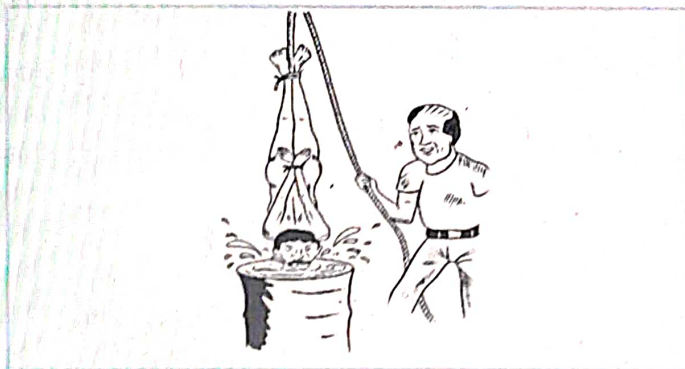
- **Falanga (bastinado):** In this canes or rods are used to beat on the soles of the feet.



- **Dry submarine:** Tying of a plastic bag over the head



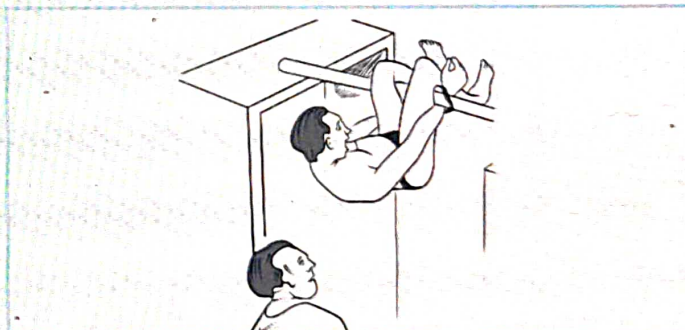
- **Wet submarine:** Forced immersion of head in water



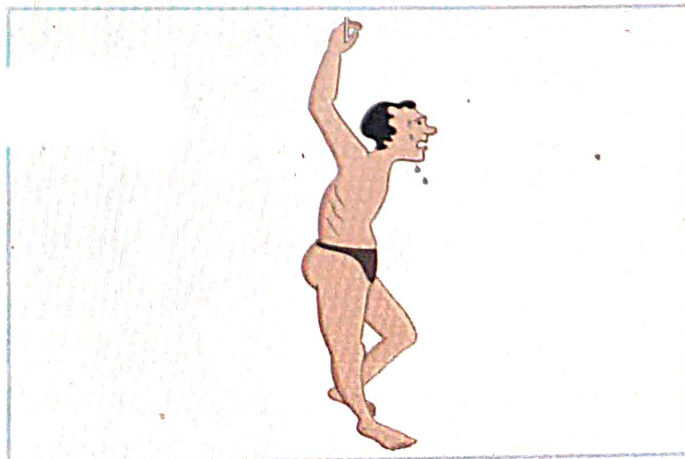
- **Dunking:** Immersion of whole body under water
- **Saw horse:** Forced straddling



- **Parrot's perch:** Head down from a horizontal pole placed under the knees with the wrists bound to the ankle



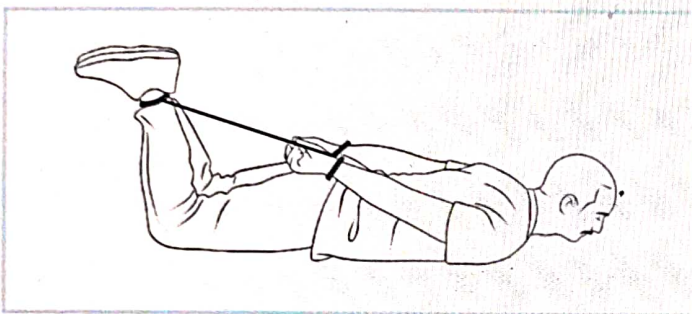
- **Planton:** Long standing



- Cattle's prod: Giving electric shock to genitalia



- **Hog Tying:** Person is in prone position and his wrist and ankle are tied together.

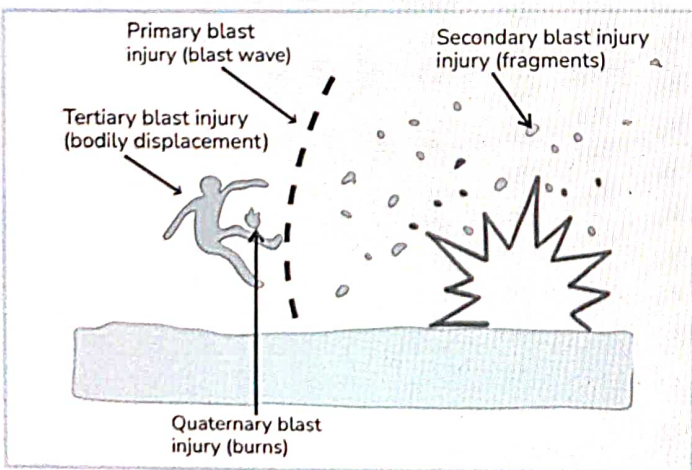


- **Black slave:** Heated metal skewer inserted into the anus

Important Information

- Declaration of Tokyo: Gives guidelines about handling the torture victim. Refrains the physician from helping in torture

BOMB BLAST INJURIES



1. **Air Blast**
 - **Blast wave:** Primary blast injuries affect ear drum (Tympanic membrane rupture), lung (blast lung), GIT

- **Flying missiles / projectiles:** Secondary blast injuries is combination of abrasion, contusion and laceration (aka Marshall's triad) can be produced at the same side of the body
- **Wind/Victim displacement:** Tertiary blast injuries (fractures)
- **Miscellaneous factors:** Quaternary blast injuries. It is due to building collapse causing traumatic asphyxia or die of burns

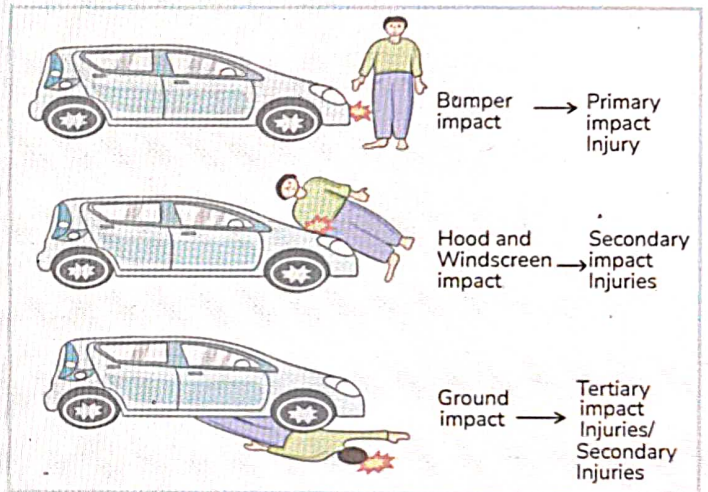
2. Underwater blast

- If head under water - Ear drum rupture
- If head above water - GIT injury

TRANSPORT INJURIES

01:14:54

- 3 types pedestrian, occupant or motor cycle rider injuries. Pedestrian Injuries



Injuries can be due to

- 1st impact with vehicle aka primary impact injuries aka Bumper injury. Tip of bumper fracture tells about direction of impact. Usually involves tibia in the legs.
- 2nd impact of vehicle aka secondary impact injuries
- Ground impact aka Secondary Injuries aka Tertiary impact injuries, can have head injuries, abrasions, lacerations.

OCCUPANT INJURY

Sparrow Foot Mark

- Due to broken glass of wind shield
- Multiple small cuts over the face

Whiplash Injuries

- Hyperflexion and Hyperextension.
- Spinal cord contusion
- Rarely vertebral fracture



Dashboard fracture

- Front seat passenger, posterior dislocation of hip is seen, patellar fracture.

Seat belt injury

- Most Common organ injured is - Mesentery > Small intestine.

Tail gating injuries (under running)

- Collision with rear side of vehicle in front. It can cause facial injury or decapitation.



Previous Year Questions

Q. Identify the injury shown in the image? (AIIMS June 2020)



- A. Incised wound
- B. Lacerated wound**
- C. Abrasion
- D. Contusion

Q. In entry wound of skull, beveling is seen in?

(FMGE Dec 2019)

- A. Inner table**
- B. Outer table
- C. Inner table & Outer table
- D. Multiple small fracture

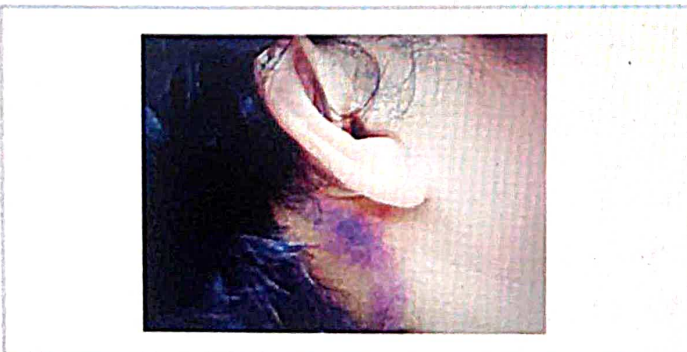
Q. Rupture of the skin and subcutaneous tissue is?

(FMGE May 2018)

- A. Incised wound
- B. Abrasions
- C. Lacerated wound**
- D. Contusion

Q. Identify the sign?

(NEET Jan 2020)



- A. Battle sign**
- B. Raccoon sign
- C. Romberg's sign
- D. McEwan sign

Q. Cricket player was hit in the head then becomes unconscious, after sometimes he becomes conscious. After the match, he lost consciousness and was taken to the hospital. The diagnosis could be? (FMGE DEC 2020)

- A. Extradural hemorrhage**
- B. Subdural hemorrhage
- C. Subarachnoid hemorrhage
- D. Intracerebral hemorrhage

Q. Identify the condition?

(FMGE Dec 2019)



- A. Extra Dural hemorrhage**
- B. Subdural hemorrhage
- C. Subarachnoid hemorrhage
- D. Intracerebral hemorrhage

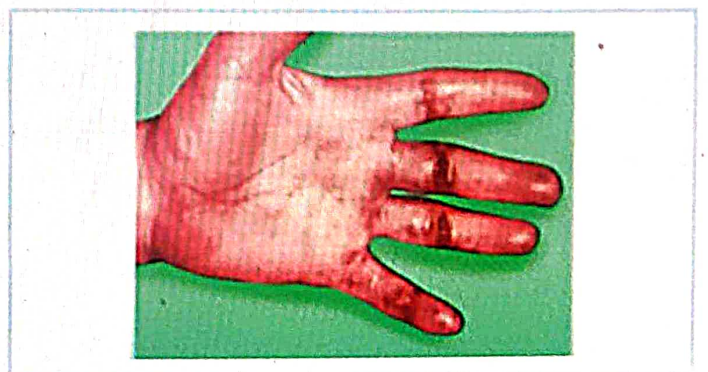
Q. Paradoxical undressing is seen in?

(AIIMS May 2019)

- A. Hypothermia**
- B. Hyperthermia
- C. Datura poisoning
- D. Sexual offence

Q. The injury is suggestive of?

(NEET PG 2022)



- A. Postmortem wound
- B. Self-inflicted cut
- C. Defence cuts
- D. Hesitential cut

Q. A dead body is brought with ligature mark over neck, which is encircling the neck, transverse, below the thyroid cartilage. No salivary dribbling noted. This condition is?

(NEET PG 2022)

- A. Throttling
- B. Mugging
- C. Ligature strangulation
- D. Hanging

Q. Identify the range ? .

(NEET PG 2022)



- A. Pistol near range
- B. Rifle Close range
- C. Pistol close range
- D. shot gun intermediate

Q. A 10 year old child with burns involving the front of anterior part of right chest, front of right upper limb, front of right side of abdomen, front of right leg. The percentage of burns involved is?

(NEET PG 2022)

- A. 5-10%
- B. 15-20%
- C. 25-30%
- D. 35-40%

Q. A patient presented to OPD, with burns of saddened skin, with clear line of demarcation, lines of vesicles running down the body. The probable cause is due to?

(INI CET 2021)

- A. Chemical burn
- B. Burn due to dry heat
- C. Burn due to moist heat
- D. Lightening

Q. Identify the mechanical injury given in the picture?

(INI CET 2022)



- A. Graze abrasion
- B. Hesitation cuts
- C. Six penny bruise
- D. Patterned abrasion

Q. Identify the mechanical injury given in the picture?

(INI CET 2022)



- A. Graze abrasion
- B. Hesitation cuts
- C. Six penny bruise
- D. Patterned abrasion

Q. During examination in injury, hair bulbs are noted to be damaged & crushed. The probable type of wound is?

(FMGE 2022)

- A. Abrasion
- B. Laceration
- C. Stab injury
- D. Incision

Q. Features of artificial bruise is ?

(FMGE 2022)

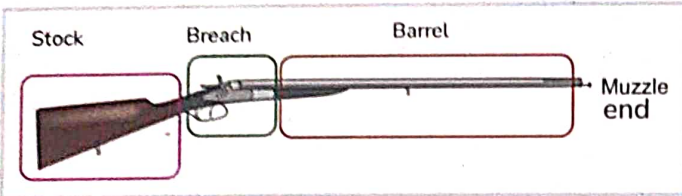
- A. Extravasation
- B. Vesicles
- C. Colour change
- D. Erythema at the site

3

BALLISTICS



- It is defined as the study of Firearm.



- **Proximal Ballistics:** Study of Bullet within the gun.
- **Intermediate Ballistics:** After bullet comes out.
- **Wound/terminal Ballistics:** Effect of Bullet on target

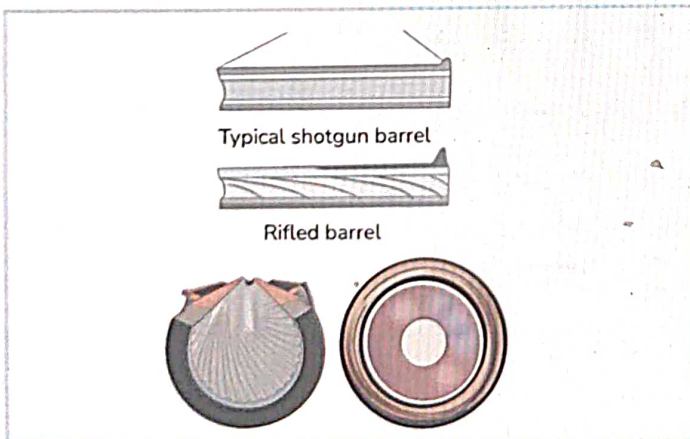
Important Information

- Inner surface of the barrel can be measured by Helixometer

Two types of firearms

01:19:57

- **Smooth Barrel Firearm**
 - Inner surface of barrel smooth
 - Smooth bored
 - Lead shots used
 - Also called as shot gun
- **Rifled Barrel firearm**
 - Inner surface of barrel rifled are grooved, produced by Broach cutter
 - This is known as Rifling

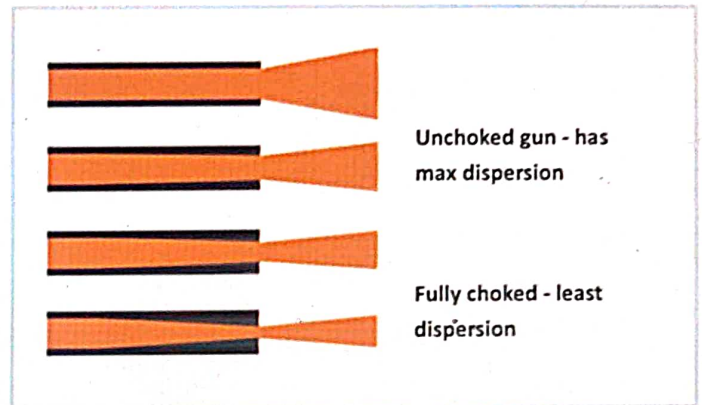


Benefits of Rifling

- ↑↑ Velocity
- ↑↑ Stability
- ↑↑ Power
- In smooth barrel firearm / Shotgun - Lead shots
- In rifled barrel firearm - Bullets

Smooth Bored Gun

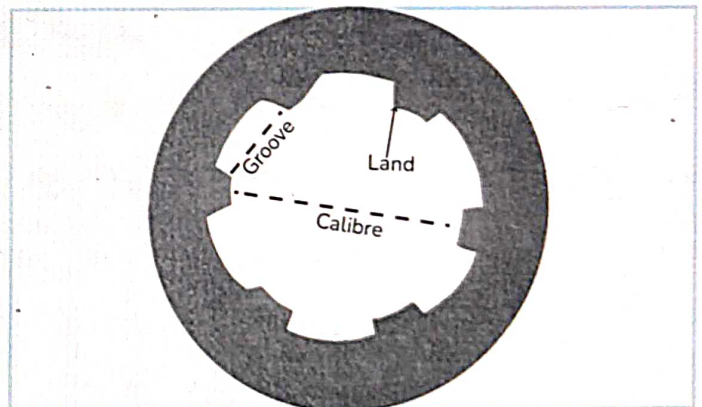
- Range is assessed by "Dispersion of Pellets"
- In smooth barrel firearm: Choking is done (The dispersion pattern is decrease)
- Choking is terminal constriction of barrel



Paradox gun

- Smooth bored gun with terminal rifling

Rifled Gun

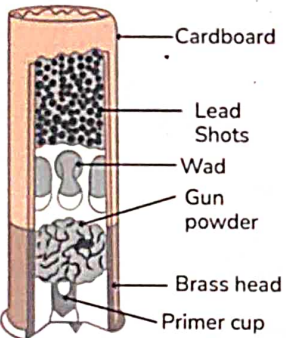
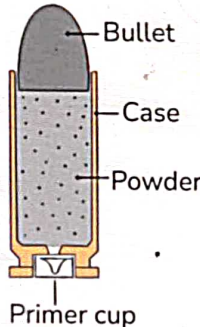


- Calibre: The distance between two opposite lands
- Calibre is used for rifled gun.

Shotgun/Smooth Bore / Barrel Firearm

- The number of lead balls made from one pound of lead = gauge / bore
 - Example: 12 balls made of 1 gm lead = 12 gauge
- As the number of gauge increases, size of the barrel comes down.
 - Example: 12-gauge gun will be larger than 24-gauge gun.

Bullets

Shot gun cartridge	Rifle gun bullet
<ul style="list-style-type: none"> Primer cup / detonator cup (highly inflammable) Gun Powder Wad <p>Functions</p> <ol style="list-style-type: none"> Separation Lubrication Obturation <ul style="list-style-type: none"> Lead Shots 	<ul style="list-style-type: none"> Primer cup Gun Powder Bullet NO WAD in Rifled Gun. 

Gun Powders

1. Black Powder: 1 gm gives 3L - 4L of gas

• Composition

- Charcoal (C): 15%
- Potassium Nitrate: 75%
- Sulphur: 10%

• Because of presence of Charcoal ↑↑ Smoke production ↓ Power

• Black gun powder can be termed as FG, FFG, FFFG, FFFFG - more fineness (F) of powder

2. Smokeless Powder: 1 gm gives 12L - 13L gas

• Composition

- Nitrocellulose: Single Base
- Nitro-glycerine + Nitrocellulose: Double Base
- Nitroguanidine + Nitro-glycerine + Nitrocellulose: Triple Base

3. Semi - Smokeless Powder

- 80% Black powder + 20% Smokeless powder
- Components causing injury in Rifled firearm

Sequence of Firing Events

- Pulling of trigger.
- Hitting percussion pin.
- Ignition of primer mixture
- Production of flame
- Ignition of gun powder.
- Propelling of the shots/bullet/pellet.
- Reporting of flame

DISCHARGES FROM A GUN

- Flame:** Burns / Singeing of Hair (Flame can travel upto 7 cm)
- Smoke:** Blackening (Smoke can travel upto 30 cm)
- Gun powder:** Tattooing / Peppering (Gun powder can travel upto 60-90 cm)
- Bullet:** Punctured wound with Abrasion collar/grease collar/bullet wipe also called as grease deposition.



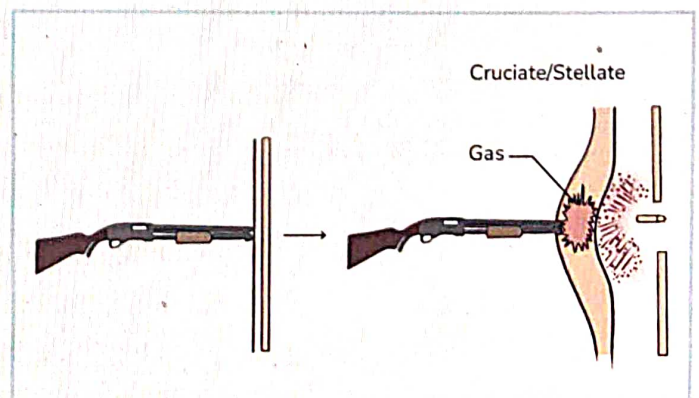
Important Information

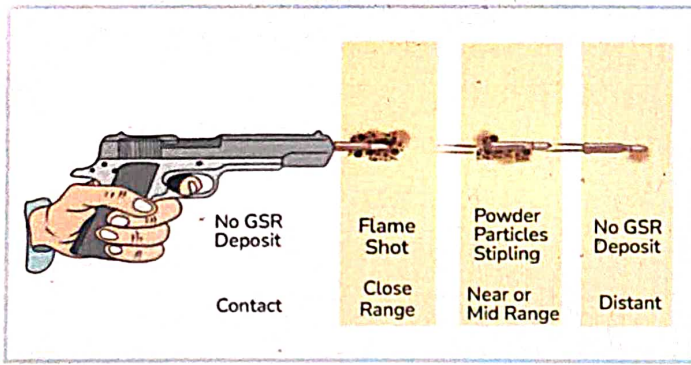
- Abrasion collar: due to spinning of bullet.

Ranges of Rifled Gun

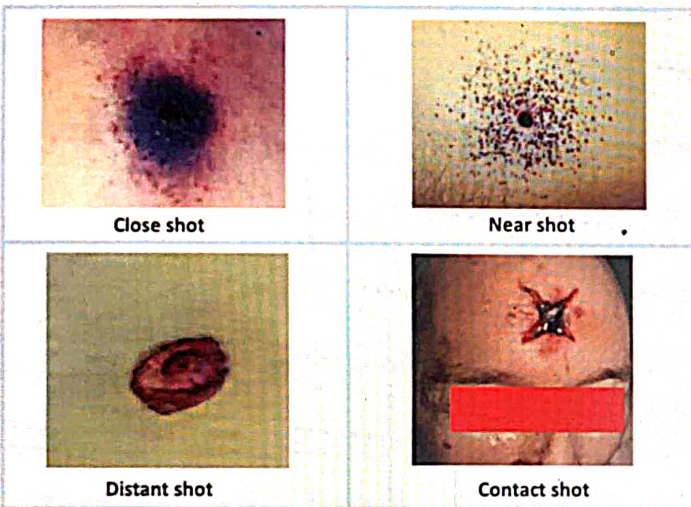
- Contact:** Tight contact (Cruciate / Stellate margins)
 - Recoil abrasion
 - Stellate / cruciate margin
- Close:** Within the range of flame
- Near:** Outside flame but inside gun powder
- Distant:** Outside gun powder

	Contact Tight Contact	Close (Inside Flame)	Near (outside flame/inside gunpowder)	Distant Outside Gun powder
Shape	Cruciate/ Stellate	Circular	Circular	Circular
Muzzle Impression	Present	Absent	Absent	Absent
Burning and Singeing	Absent	Present	Absent	Absent
Blackening	Absent	Present	Absent	Absent
Tattooing	Absent	Present	Present	Absent
Abrasion collar and Grease Collar	Present	Present	Present	Present



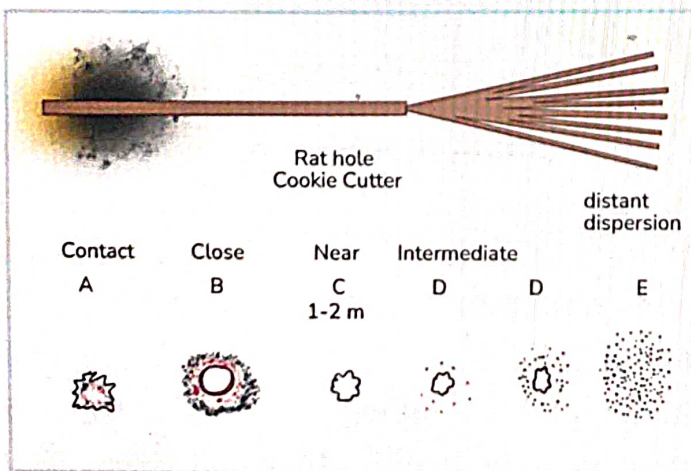


- When bullet enters normally - Perpendicularly, we get circular bullet injury.
- Oval injury by bullet occurs by oblique bullet.



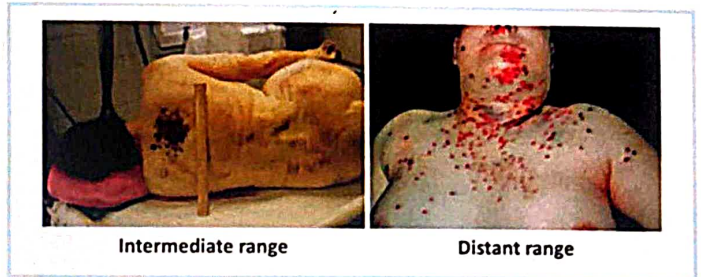
Range in Shot Gun

- Contact
- Close < 1 m
- Near 1-2m
- Intermediate 2-4m
- Distant > 4m



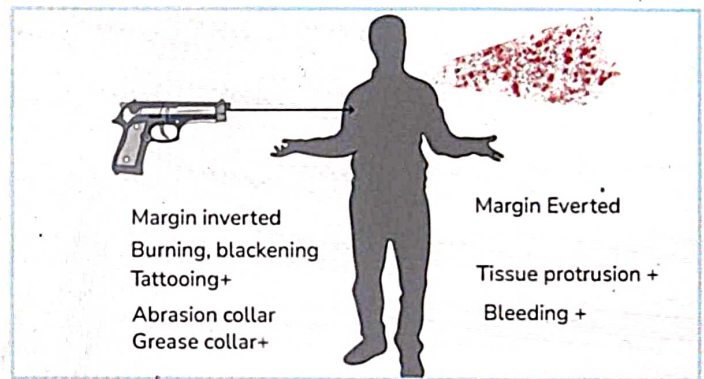
Important Information

- All the Effects in shotgun fire can be seen in maximum range of 1 m
- Dispersion start at 2 m and completed at 4 m.

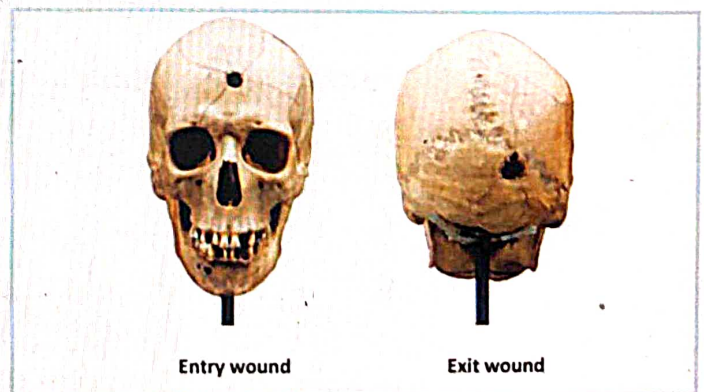


Entry vs Exit Wound

- Entry and exit Wound over skull can be differentiated by bevelling



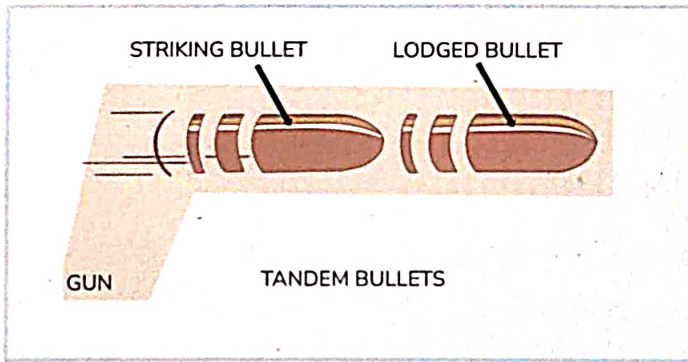
Bevelling	
Entry wound	Exit wound
Inner table – bevelled	Outer table bevelled



DIFFERENT TYPE OF BULLETS

1. Tandem bullets / Piggyback bullet

- The first bullet gets struck in the barrel. When it is fired again, the second bullet carries the first bullet and comes out. Two bullets come out of the muzzle end.

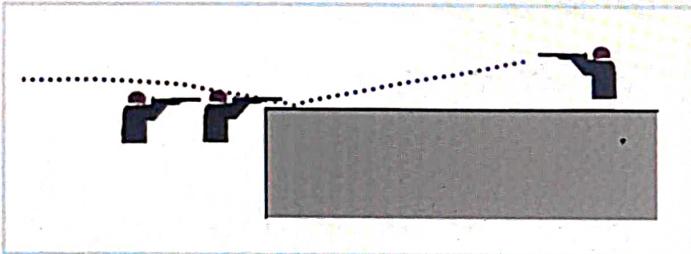


2. Tracer bullet

- We can trace the path of bullet via glowing base of bullet in the dark.

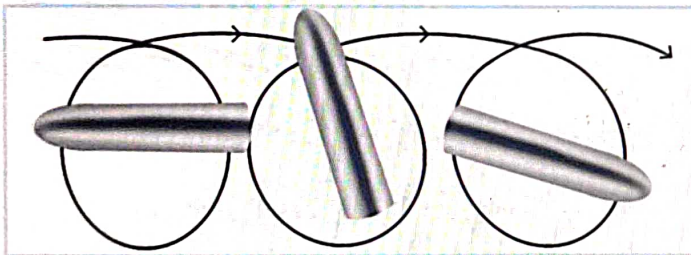
3. Ricochet bullet

- Deflected bullet from intermediate surface.



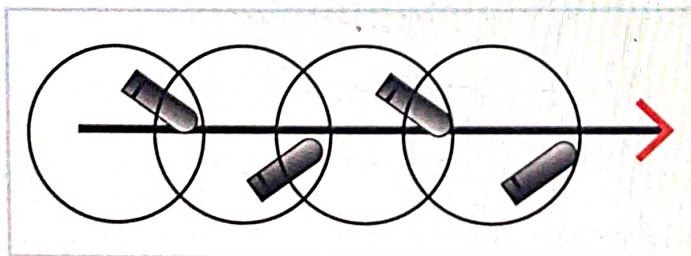
4. Tumbling bullet

- Rotating bullet



5. Yawing bullet

- Irregular pathway



6. Souvenir bullet

- Retained bullet inside the body
- May cause chronic lead poisoning

7. Incendiary bullet - Coated with phosphorous, fire on impact

8. Frangible bullet

- Bullet fragmented on impact.
- Made up of powder.



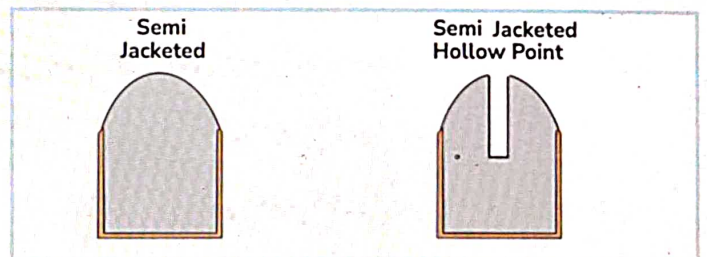
Important Information

Kennedy Phenomenon

- Iatrogenic alteration of appearance of gunshot wounds, so difficult to find the range during post-mortem.

9. Dum - Dum bullet / Semi jacketed bullet

- Deformation of bullet happens inside tissues also known as Mushrooming of bullets



BULLET FINGERPRINTING

02:01:30

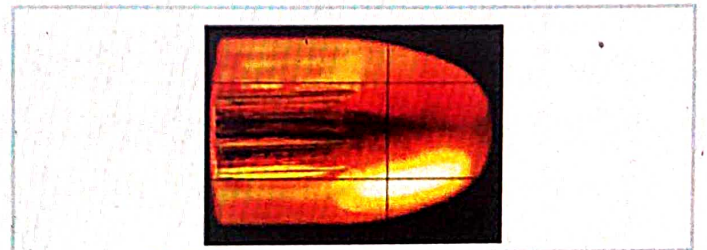
Primary Marking

- Due to rifling pattern of gun
- Also called as class characteristic



Secondary Marking

- Due to irregularities (Wear and Tear)
- Vary from gun to gun
- They are more specific.
- Also called as individual characteristics



- We use microscope for comparison of markings.

Tests for GSR

- Sample to be taken from dorsum of the hand

Mnemonic- HANDS

1. Harrison and Gilroy's test
2. Atomic Absorption Spectrometry (AAS)
3. Neutron Activation Analysis (NAA)
4. Dermal Nitrate
5. SEM - EDXA (definitive)



Previous Year Questions

Q. Assertion: Range of shot can be determined by the spread of pellets.

Reason: Shotgun cartridge contains pellets?

(AIIMS May 2019)

- A. Both assertion and reason are correct and reason is correct explanation of assertion.
- B. Both assertion and reason are correct but reason is not a correct explanation of assertion.**
- C. Reason correct assertion wrong
- D. Both assertion and reason are wrong.

Q. A middle aged lady was found in a robbed room lying in a pool of blood. On forensic examination there was an entry wound of size around 2 x 2 cm on the left temporal region with tattooing and blackening at the right temporal region. On further examination two bullet fragments were found inside the brain parenchyma. Which of the following could be used to determine the distance from which the weapon was fired?

(AIIMS Nov 2017)

- A. Hair**
- B. Clothes
- C. Bullet fragments
- D. Blood

Q. Bullet wipe term is used for?

(AIIMS May 2019)

- A. Gutter fracture of skull
- B. Blackening**
- C. Tattooing
- D. Dirt from barrel

Q. The poisoning caused by bullet retained inside the body is?

(FMGE Dec 2019)

- A. Iron
- B. Phosphorus
- C. Nitro cellulose
- D. Lead**

Q. Bullet fingerprinting is?

(AIIMS Nov 2018)

- A. Human fingerprints on bullet
- B. Primary marking
- C. Secondary marking**
- D. Distorted bullet

4 INDIAN LEGAL SYSTEM



OFFENCES

02:07:22

- **Cognizable Offence:** 2(C) CrPC, (Murder, Rape, Dowry Death)
 - Police can arrest without arrest warrant
- **Non-Cognizable Offence:** 2 (I) CrPC, (Simple Offences)
 - Arrest warrant needed
- **Summon cases:** Cases for which Punishment is < 2yr
- **Warrant cases:** Cases for which Punishment is > 2yr

Important Information

- Executive magistrate can conduct inquest in **dowry death and exhumation only.**

- **Panchnama:** Enquiry report at the end of police inquest and it is forwarded to magistrate.

Extra Edge

- **Bailable offence:** Police can give bail
- **Non Bailable offence:** Only court can give bail

HIERARCHY OF CRIMINAL COURTS

- Apex Court for Country - Supreme court
 - Apex Court for state - High court
 - Apex Court for District - Session court
- } Can give any punishment

If sessions court gives death sentence, that should be confirmed by high court

Inquest			
Police Inquest	Magistrate Inquest	Coroner's inquest	Medical Examiner system
174 CrPC	176 CrPC	Was followed in India, now Abolished	Best
Most Common Inquest in India Minimum rank – Head constable	Superior Inquest		

- Assistant Sessions } 10 yr
- Chief Judicial Magistrate } 7 yr
- 1st Class Magistrate } 3 yr
- 2nd Class Magistrate } 1 yr
- Additional Sessions court: Sessions court
- Supreme court & high court are appellate courts.
- Court of trial includes from 2nd class magistrate up till sessions court.

Important Information

- Lowest court to give death sentence in India: Sessions court

- Best system overall - Medical examiner system.
 - Magistrate Inquest (176 CrPC) indication
 - 2 types
 - Judicial - appointed by court of law
 - Executive - By Government officials
- e.g.
- A - Asylum (Mental Asylum) death
 - B - Borstal (Juvenile home) death
 - C - Custodial death / custodial rape - by judicial magistrate only
 - D - Dowry death
 - E - Exhumation - digging out body - No time limit. 176 (3) CrPC

Commutation

- Changing of sentence, if one court has a given a sentence then immediate above / higher court has the power to change/ commute the sentence, this is called as commutation
- **416 CrPC** - Commutation of death sentence in pregnant female.

Summon

- Document compelling the attendance of witness in the court
- Subpoena/under penalty: **61 - 69 CrPC**
- If 2 Summons at same time
 - If summon from Civil and criminal court then attend criminal court
 - If summon from high court and sessions court then attend

court high court

- If summon from 2 courts of same status then attend court which summoned first

• **Types:**

- Ad testificandum- For oral evidence
- Duces tecum- For producing document

• **Conduct Money**

- Money for travelling expenses
- In civil cases; money given at time of serving summon
- Party will pay
- Amount is fixed by the court

Types of witness	
Common Witness	Expert Witness
<ul style="list-style-type: none"> • Person who perceived the fact by his own senses 	<ul style="list-style-type: none"> • An expert witness is by virtue of <ul style="list-style-type: none"> ○ Knowledge ○ Experience ○ Training
<ul style="list-style-type: none"> • Example: <ul style="list-style-type: none"> ○ Any person ○ Eyewitness ○ Hearsay witness 	<ul style="list-style-type: none"> • Example: <ul style="list-style-type: none"> ○ Firearm expert ○ Hand writing Expert
<ul style="list-style-type: none"> • No opinions 	<ul style="list-style-type: none"> • Opinion can be given
<ul style="list-style-type: none"> • First hand knowledge rule 	

Order of trial (138 IEA)

- 1st → Oath taking i.e. → Compulsory , refusal to take oath is punishable
- **Oath - Compulsory except child < 12 yr.**
- Examination in chief/ Direct examination - Same side lawyer will ask questions.
- Cross Examination - Opposite lawyer will ask questions.
- Re-direct examination - Same side lawyer again asks the questions

For prosecution witness		For defence witness
Public prosecutor	Examination in Chief by Same side lawyer	Defence Lawyer
Defence lawyer	Cross examination by Opposite side lawyer	Public prosecutor
Public prosecutor	Re – examination by Same side lawyer	Defence lawyer

- No time limits in cross examination.

• **Leading Questions**

- They are permitted only in cross examination or hostile witness.

Questions by the judge can be asked at any stage of trial

Difference between Dying Declaration and Dying Deposition

Points	Dying Declaration	Dying Deposition
• Recorded by	Magistrate or a Doctor > police > public	Always by a Magistrate
• In Presence of	2 witnesses	Accused/ defence lawyer
• Oath	Is not necessary	Is necessary
• Leading questions		+
• Cross examination	No opportunity of cross- examination	Has opportunity of cross - examination, leading questions permitted
• Validity	Inferior to dying deposition	Superior to dying declaration
• India	Practiced in India 32 (1) IEA	Not practiced in India

If patient survives then dying declaration is invalid, statement is taken as corroborative evidence only



Previous Year Questions

- Q. In case of death in lock up, the quest is held by?
(FMGE May 2018)
- A. A police officer
 - B. Magistrate**
 - C. Panchayat officer
 - D. district attorney
- Q. A 14-year-old girl was kidnapped by a male. While the police arrested him, he died in police custody. The inquest is conducted by?
(FMGE Aug 2020)
- A. Judicial magistrate**
 - B. Medical examiner
 - C. Police
 - D. Coroner
- Q. The time limit for ordering an exhumation in India is?
(FMGE May 2018)
- A. 1 years
 - B. 10 years
 - C. 20 years
 - D. No limit**
- Q. Firsthand knowledge refer to?
(AIIMS May 2018)
- A. Opinion of a doctor in court
 - B. Handwriting expert
 - C. Common witness**
 - D. Fingerprint expert
- Q. When the victim is dying because of unlawful act, the police recorded dying declaration. The doctor certified that the victim was conscious and mentally oriented. Under what circumstances, the dying declaration is invalid?
(FMGE Aug -2020)
- A. If the victim is not dead
 - B. Victim didn't sign the declaration
 - C. Declarant is not expecting death**
 - D. It is done by the doctor
- Q. A female has come to gynecologist for hysterectomy. The doctor explains the benefits & risks of the procedure & obtained consent. This type of consent is? (NEET PG 2022)
- A. Implied consent
 - B. Informed consent**
 - C. Blanket consent
 - D. Emergency consent
- Q. In a court trial, leading questions are not permitted in all the following except?
(NEET PG 2022)
- A. Re-examination
 - B. Cross-examination**
 - C. Dying declaration
 - D. Direct examination
- Q. In case of alleged murder of 'A' by 'B' at a certain place on a particular day and time 'C' saw 'B' with a knife on that day at that place a few minutes before the murder. 'C' States this in the court of law. This type of evidence is? (INICET 2022)
- A. Direct evidence
 - B. Indirect evidence or circumstantial evidence
 - C. Hearsay evidence**
 - D. Hostile witness
- Q. Leading questions permitted in?
(FMGE 2022)
- A. Chief examination
 - B. Cross examination**
 - C. Re-examination
 - D. Direct examination

5 MEDICAL ETHICS



- Set of moral principle given by MCI.
- Violation of which is punishable.
- Infamous conduct professional misconduct.
- Unethical act by doctor.
- It is punishable which is given by state medical council.

Punishment by SMC (State Medical Council)

- SMC appeal to Central health ministry + MCI
- 1. Warning
- 2. Penal Erasure of Name
 - Temporary
 - Permanent - For serious offences is called as professional death sentence

List of unethical acts

- 6A's.
 - A - Adultery
 - A - Inappropriate Advertisement
 - A - Criminal Abortion
 - A - Association with any pharmaceutical company
 - A - Addiction
 - A - Alcohol
- } Treating the patient under the influence of these.
- Covering: Employing unqualified person
 - Dichotomy: Fee spitting.
 - Accepting gifts
 - Issuing false certificate.

MEDICAL NEGLIGENCE / PROFESSIONAL MALPRACTICES

- Commission of wrong things and omission of right things causing damage to the patient.
- 4D's
 - Duty owed to patient
 - Dereliction of duty
 - Damage
 - Direct causation
- Types:
 - Civil negligence
 - Criminal negligence
 - Contributory negligence

	Civil	Criminal	Contributory
Act	Due to simple lack of care / skill	Gross negligence sometimes causing death	Doctor negligent but patient also negligent
Burden of proof	Patient	Prosecution	Doctor
Court	Consumer court	Criminal court	Civil charges
Punishment	Fine	Fine, imprisonment	Amount of fine is reduced

DOCTRINES

Res Ipsa Loquitur (Facts speaks for itself)

- Negligent factor is so obvious that the thing (Act) speaks for itself.
- No needs of expert evidence.
- Burden of proof lies on the Doctor e.g. Surgery on wrong side of the body.

MEDICAL Maloccurrence

- Accidental damage to the patient - Doctor is not liable for this

Vicarious Liability

- Let the master answer / Respondent Superior
- Senior who is in charge of the junior should be answerable.
- Applicable only if
 - Employee - Employer relationship
 - Employee's conduct should be within the scope of employment
 - Act should occur when he was on job

RES INDICATA (LIMITATION PERIOD)

- It describe the time duration till which one can file a case against negligence of the doctor. It is 2 Years from the date of discovery of the negligence.

These two doctrine are used for Contributory Negligence

Last clear chance doctrine rule

- If the doctor fails to avoid the damage in the last clear chance.
- Doctor is liable
- **Avoidable consequences rule**
 - Patient could have avoided the damage but fails to do so
 - Patient is liable

CONSENT

- For physical examination: min age 12 yrs.
- For surgery: 18 yrs.
- **Doctrine of full disclosure:** Complete info given to the patient
- **Doctrine of extended consent**
 - In an unanticipated situation where doctor has to respond considering the risks associated with it for the benefit of the patient
 - Doctor is not liable for it
- **Doctrine of informed refusal**
 - Pt. has right to refuse and doctor has to document it in writing. Seen usually in examination (sexual assault examination)

- **Therapeutic privilege** - Doctor can decide how much info needed to be given. Usually applicable in psychiatry disease
- **Emergency Doctrine** - 92 IPC, consent is not needed for emergency cases to save the life of patient.
- **Locoparentis:** On vacation, if child get ill, the consent for treatment given by teacher. Person incharge will give consent.
- **Therapeutic waiver:** Patient waived his right to give consent
- **Consent Invalid** (under section 90 IPC) in cases of
 - Child <12 yrs
 - Insanity
 - Under the influence of someone
 - Intoxication



Extra Edge

- **No need of consent**
 - In emergency condition: 92 IPC
 - Therapeutic waiver
 - Medicolegal autopsy



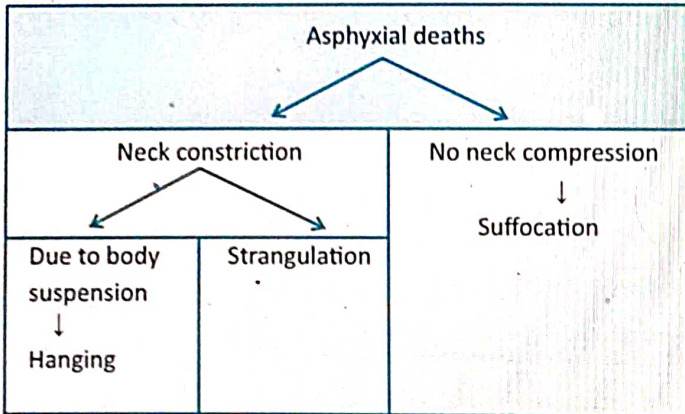
Previous Year Questions

- Q. Punishment of perjury is given by? (NEET Jan 2019)
- A. 191 IPC
 - B. 193 IPC
 - C. 197 IPC
 - D. 198 IPC
- Q. Punishment for causing death due to medical negligence is given by? (FMGE DEC 2020)
- A. 304 A IPC
 - B. 304 B IPC
 - C. 302 IPC
 - D. 338 IPC
- Q. While doing hysterectomy after informed consent for uterine fibroids. Ureter is damaged intraoperatively even after diligent measures. A doctor is not responsible under which doctrine? (FMGE DEC 2020)
- A. Medical maloccurrence
 - B. Novus actus interveniens
 - C. Physician error
 - D. Res ipsa loquitur
- Q. In case of professional misconduct, patient records are demand should be provided with? (AIIMS Nov 2018)
- A. 36 hrs.
 - B. 48 hrs.
 - C. 72 hrs.
 - D. 7 days
- Q. A doctor takes consent before surgical procedures and also, he may go beyond the consent if he feels the need for patients benefit? (AIIMS Jun 2020)
- A. Doctrine of extended consent
 - B. Doctrine of conjugated consent
 - C. Res ipsa loquitur
 - D. Doctrine of anticipation
- Q. A doctor who is drunk, while performing the surgery, injured a major vessel & death of patient. This is? (NEET PG 2022)
- A. Civil negligence
 - B. Criminal negligence
 - C. Therapeutic misadventure
 - D. Dichotomy

6 ASPHYXIA DEATHS



02:47:00



HANGING

- Compression of neck is due to body weight
- **It is the most common method of committing suicide** because it produces painless death.
- **Types based on knot position**
 - Typical hanging: Knot is placed at occiput
 - Atypical hanging: Knot is placed anywhere else
- **Types based on position of body**
 - Complete hanging: Whole body is suspended
 - Incomplete or partial hanging: If any part touches the ground and body is partially suspended

PM Findings

External findings

1. Glove and Stocking Distribution of Hypostasis
2. Face
 - Dribbling of Saliva (**SUREST SIGN OF ANTEMORTEM HANGING**)
 - LA facie Sympathique
 - One side eyelid open, pupil dilated, due to pressure over cervical sympathetic chain
 - These two are the signs of antemortem hanging
3. **Ligature Mark:** Oblique, Incomplete and above the thyroid
- Sometimes transverse mark can be seen in partial hanging, slip knot



Important Information

- **In case of ligature strangulation**
 - Transverse
 - Complete
 - Below thyroid

Internal Findings

- Hyoid bone: Fracture Hyoid bone usually occurs > 40 yrs of Age and they are usually abduction fracture or side to side compression fracture
- Carotid Artery: **AMUSSAT** sign - Transverse intimal tear
- Vertebra: Fracture of C2 (B/L pedicle Fracture) - **Hangman's Fracture**
 - Position of hangman's knot - Ideal is submental,
 - Common position - Below the angle of mandible
- Usually seen with hanging with a long drop (Judicial Hanging)

Manner of Death

- **Suicidal hanging is most common mode of hanging**
- Homicidal hanging: Lynching
- Accidental hanging is common with sexual asphyxia also known as Autoerotic asphyxia
 - Aka Kotzwainism / Asphyxiophilia
 - Person constricts own neck → asphyxia → cerebral ischemia → hallucination → orgasm → not able to relieve constriction → death
 - Manner of death is Accidental

STRANGULATIONS (NECK COMPRESSION)

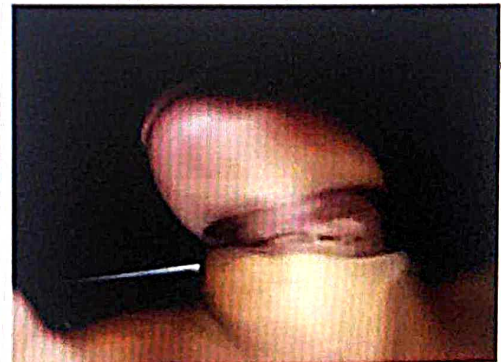
Types

- Ligature strangulation
- Manual Strangulation/ Throttling - Compression of neck by hands
- Mugging
- Garroting

PM Findings

External

- **Ligature Strangulation**
 - Ligature mark below thyroid
 - Complete and transverse mark



- **Manual Strangulation**

- Nail Scratches / bruises
- Fingertip bruises can be seen – aka six penny bruises



Internal Findings

- Hyoid bone Fracture: Adduction Fracture
- Extensive / Intense contusion of soft tissues



BANSDOLA: Done by Bamboo Stick

MUGGING: Using forearm/elbow

GARROTING: Thin ligature cord and twisted

SUFFOCATION DEATHS

- Smothering



- Obstruction of mouth and nostrils by hand or pillow.
- Can be accidental and homicidal
- Usually they are homicidal (perioral injuries can be seen,

Lip contusion, Nail scratch / Bruises)

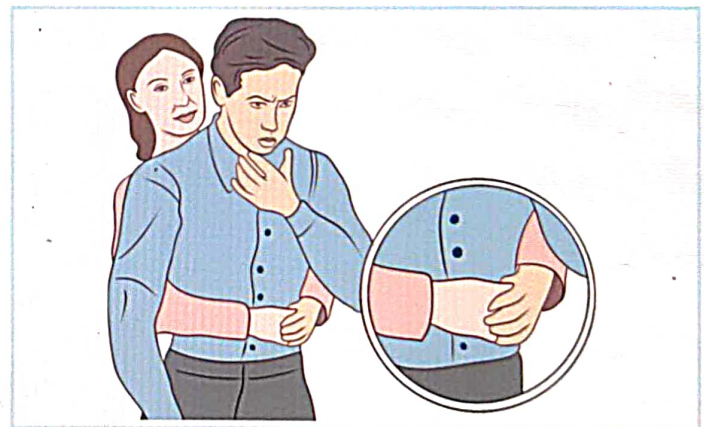
- **Gagging**

- Obstruction of pharynx by Cloth/gag being thrustured upon.



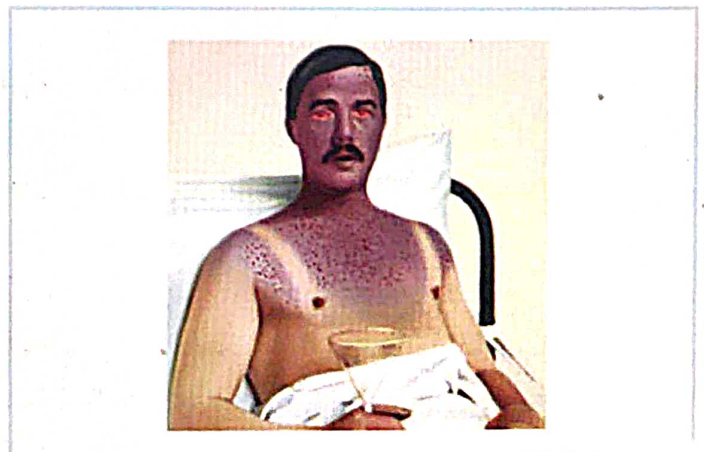
- **Choking**

- Obstruction of Airway by the foreign particle
- Usually it is Accidental
- E.g. Cafe Coronary Syndrome: Cause of Death - Asphyxia
- First aid - Hemlich manuvere



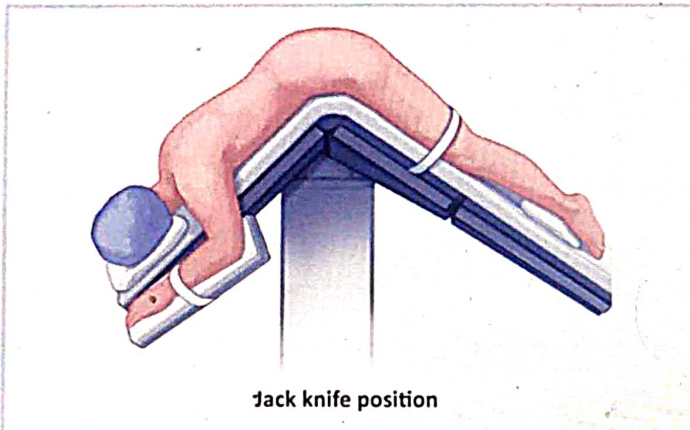
Traumatic Asphyxia

- Due to mechanical fixation of chest
- Cyanotic face seen – aka masque ecchymotique face
- At the level of weight area is pale.



Positional Asphyxia

1. Jack knife position
2. Inverted crucifixion



Burking

02:52:35

- Smothering + Traumatic Asphyxia



Overlaying

- Baby smothered by weight of mother while sleeping and rolled over the baby
- Combination of smothering with traumatic asphyxia

DROWNING

Types

03:13:20

- **Dry Drowning**
 - Vocal cord / Laryngeal spasm occurs and the water does not go into lungs - Dry lungs
 - Person dies because of asphyxia
- **Wet drowning** - two types
 - Fresh Water Drowning: Hypotonic water enters body → So **haemodilution** begins inside and due to it cell swells up and haemolysis occur. The haemolysis causes ↑↑ **Hyperkalaemia** leading to **Cardiac Arrhythmias** (Death)
 - Salt Water Drowning; Hypertonic water enters body → So **haemoconcentration** and all the fluid from the Blood comes to the alveoli → Severe **Pulmonary Edema** Occurs

leading to death.

- Hb, Cl, Na, Mg, **strontium (best)** levels in blood rise. It is a relative rise due to **haemoconcentration**.



Hydrocution/immersion syndrome

- Person falls in cold water which stimulates sensory receptors and vagus nerve gets stimulated which results in bradycardia → patient dies due to cardiac arrest (**Vagal inhibition of heart**)

Near drowning / secondary drowning – Patient dies of secondary complications like HIE and Pulmonary complication

PM Findings of Drowning

External

- **Cadaveric spasm**
 - Grass or weed clenched into hands
 - Specific sign of AM drowning
- **Froth in nostrils**
 - Due to water, mucus and surfactant - **Specific sign**
 - Froth nature - Fine, Tenacious, Persistent, lathery
- **Washer women's hands**
 - Wrinkling / bleached / soddened / peeling of skin.
 - Not specific for AM drowning.
 - Time since death can be find out.
- **Cutis Anserina / goose flesh**
 - Due to rigor mortis of erector pili muscles.
 - Not a specific sign of AM drowning.

Internal findings

- **Lungs**
 - Voluminous and edematous
 - Spongy/ Crepitant on touch because of the froth inside due to struggle of person in water known as **Emphysema Aquosum**. It tells that a conscious person drowned in water.
 - Mud particles in lower airway means person was breathing at the time of drowning **more specific**
 - **Paltauf's haemorrhage**: Haemorrhage on the surface of lung. Means person was struggling to breathe in water

which caused alveolar capillaries to rupture - **AM sign specific**

- Water in middle ear, stomach, small intestine - **AM sign specific**



Important Information

Emphysema Aquosum: Conscious person drowned

Edema Aquosum: Unconscious person drowned

Hydrostatic lung: Postmortem drowning

TEST IN DROWNING

Gettler's Test: Difference of chloride concentration in the heart chambers

	Right Side Chambers	Left Side Chambers
Normal	Cl ⁻ = Cl ⁻	
Fresh water Drowning (due to haemodilution on left side)	Cl ⁻ > Cl ⁻	
Salt water Drowning (because of haemoconcentration on left side)	Cl ⁻ < Cl ⁻	

- This test not useful in
 - Dry drowning
 - Hydrocution
 - Patent foramen ovale

Diatoms Test

- Algae (Silica) will enter the blood from the lungs and will further goes to blood circulating in all the organs (e.g. Brain, Spleen, Bone marrow). So, it is AM drowning as circulation was intact.



Important Information

- Outer wall of diatoms is made of silica.
- In case of PM drowning diatoms will be present only in lungs not in other organs.

Lungs	Distant Organs (BM, Spleen, Brain)	
+	+	AM Drowning
+	-	PM Drowning

- Diatom test is not useful in dry drowning, hydrocution and advanced putrefaction

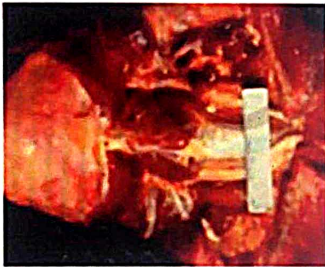


Previous Year Questions

Q. A person was found dead. Post-mortem shows nail scratches in the face, lip laceration in the inner side of the lip. Hypostasis is fixed. Which of the following cannot be the reason?
(FMGE Dec 2020)

- A. Cause was throttling
- B. Post-mortem was done within 24 hours
- C. Due to asphyxia
- D. It is Homicide

Q. A woman died in her room. Her room was unlocked. Her blood alcohol levels were 350 mg/ml. Image is shown below. On neck dissection, there was contusion present?
(AIIMS Nov 2018)



- A. Throttling
- B. Bandsola
- C. Cafe coronary
- D. Alcohol intoxication

Q. True about freshwater drowning?

(INICET NOV 2020)

- A. Hemodilution
- B. Hypokalemia
- C. Hyponatremia
- D. Arrhythmia

Q. Gettler's test is positive in?

(FMGE May 2018)

- A. Hanging
- B. Poisoning
- C. Strangulation
- D. Drowning

7

AUTOPSY



- Also known as **Necropsy**, PME (Post Mortem Examination)

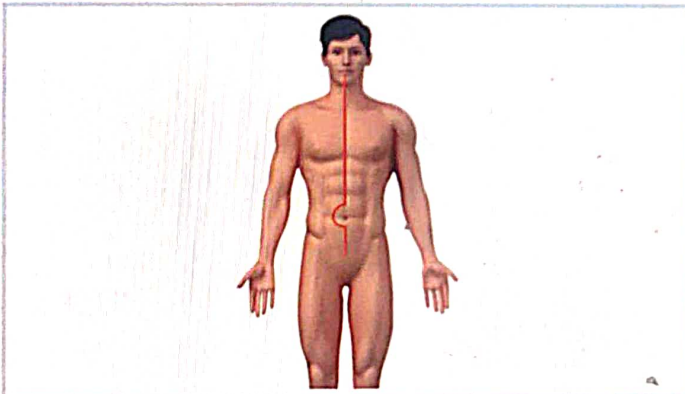
Refer Table 7.1

- **Psychological Autopsy (No Dissection)**
 - Done in suicidal deaths
 - Done to know about the psychological state of person before committing suicide.
 - Conduct interviews with parents/ friends.
- **Virtual Autopsy / Virtopsy (No Dissection):** Complete body scanning to find the structural lesion/ cause of death.
- **Negative autopsy:** Doctor will not be able to state the cause of death. It may be due to incorrect technique, lack of experience, incorrect preservation etc.

Different Types of skin Incisions

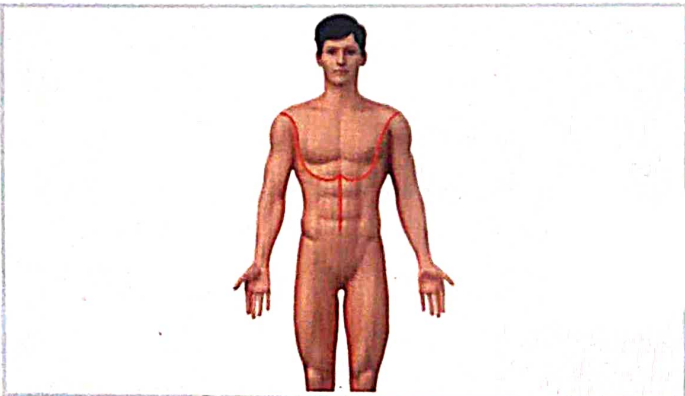
1. "I" Incision

- Starting from chin to pubic symphysis
- Most commonly used.



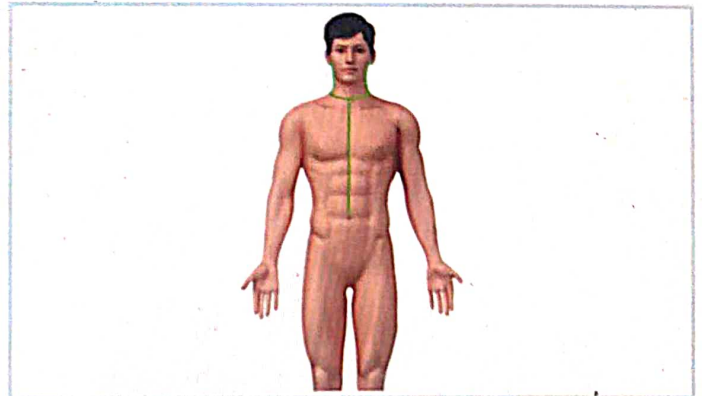
2. "Y" Incision

- Starting from shoulders on both sites reach Xiphi sternum and it comes down to the pubic symphysis.



3. Modified "Y" Incision

- Starts from mastoid comes down the lateral site of neck and then from suprasternal notch to Pubic Symphysis
- **Good for neck dissection**
- Preferred in **Asphyxial deaths**.



Different Techniques of Organ Removal in Autopsy

03:40:00

- **Virchow's Method**
 - One by one removal of organs
 - **M/C method used.**
- **Letulle's / En mass Method**
 - En-Mass Removal or Evisceration
 - **RAPID method**
 - Also used to study anatomical relation
 - Removal of attachment of tongue and from there we remove all the thoracoabdominal organs together as single mass. Then we dissect the organs.
- **Ghon's Method**
 - **En-block Removal**
 - Targets only one particular area.
 - Ex: In Sexual offence - Only pelvic organ are removed.
In Thoracic pathology / Trauma - Only thoracic organ are removed.
- **Rokitansky Method**
 - In-situ method
 - **Organ not removed outside the body to avoid spillage and exposure.**
 - Used for infectious diseases.
 - **Example: HIV, Hepatitis patient, Covid pt.**

Heart Dissection

- **Inflow outflow method:** Start cutting from RA → RV → LA → LV

Brain dissection

- Can be done as Fresh (commonly done) or Fixation with Formalin (best)

Stomach dissection

- Double ligation method
 - Cut stomach out by applying two ligatures at the ends and cut in middle.
 - The area along lesser curvature has max damage due to poisoning. This is known as **Magenstrasse**
 - So, we **open stomach along greater curvature in poisoning cases.**

Spinal cord dissection

- Not routinely opened unless we suspect spinal injuries
- 2 approaches: Anterior and posterior.
- **Posterior is easier and better.**

Air embolism

- **Pyrogallol test**, done to detect air embolism , Brown color indicates positive test

Which cavity to be opened first when starting autopsy?

- Cranium
 - **In poisoning cases**
 - Asphyxial death cases to decompress vessels
- Thorax
 - Pneumothorax case to demonstrate presence of air in thorax
- Abdomen
 - New born babies: **To check level of diaphragm**
- Asphyxia deaths: Cranium → Thorax → Abdomen → Neck
 - This is to provide **bloodless dissection.**

Table 7.1

	Medicolegal Autopsy	Clinical / Pathological Autopsy
Types of death	M/C type of autopsy in India <ul style="list-style-type: none"> • Done in unnatural deaths - Suicide, Homicide 	<ul style="list-style-type: none"> • Done in Natural deaths
Authorization by	<ul style="list-style-type: none"> • Consent from Investigation officer (IO), Police/ Magistrate 	<ul style="list-style-type: none"> • Relative give consent (cannot be done without consent)
Complete / Partial	<ul style="list-style-type: none"> • Complete autopsy 	<ul style="list-style-type: none"> • Partial autopsy



Previous Year Questions

Q. In autopsy, the doctor tied the bronchus and checked the floating and sinking of the lung. The test is identified as?

(FMGE Aug 2020)

- A. Getter's test
- B. Diatoms test
- C. Hydrostatic test
- D. Ploquet's test

Q. In corrosive acid case, stomach is opened along?

(FMGE Jun 2019)

- A. Lesser curvature
- B. Greater curvature
- C. Vertical
- D. Pylorus

8

THANATOLOGY



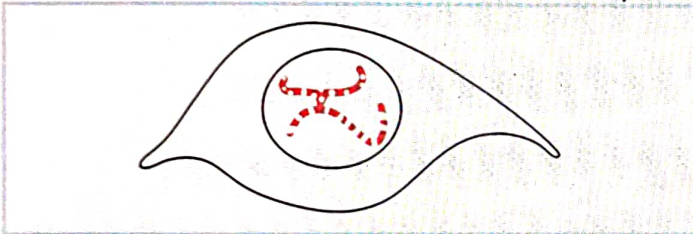
- **Study of Death**
- Defined by Sec. 46-IPC
- Somatic death: Clinically dead
- Cellular/Molecular death: Death at cellular level
- Gap between these two can be used for organ harvesting/cadaveric use
- Forensic Taphonomy: Study of PM resorption of the body.

PM CHANGES

Helps us to know Time Since Death (TSD)

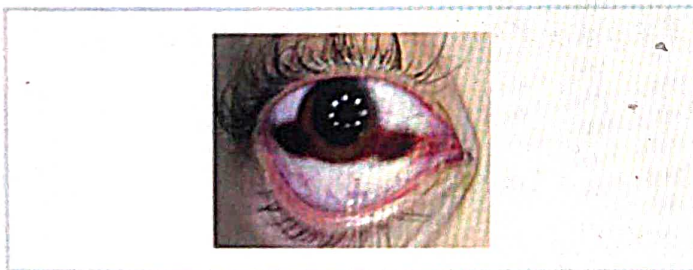
Eye Changes

1. **Kevoikian Sign / Railway tracking sign:** Retinal vessels appear fragmented due to sudden cessation of blood supply.



- Occurs within few minutes after death.
- **Earliest eye change.**
- Determine time since death/post mortem interval

2. **Tache Noire:** Two triangle shaped opacities on sclera. Eyelids are open, dust will deposit on the Sclera /drying. It takes 3-6 hrs to appear after death.



3. **Vitreous K' level:** Vitreous Sample is the best medium for TSD. Vitreous K' is the **reliable indicator** for time since death. K' level rise after death. It has linear correlation with death.

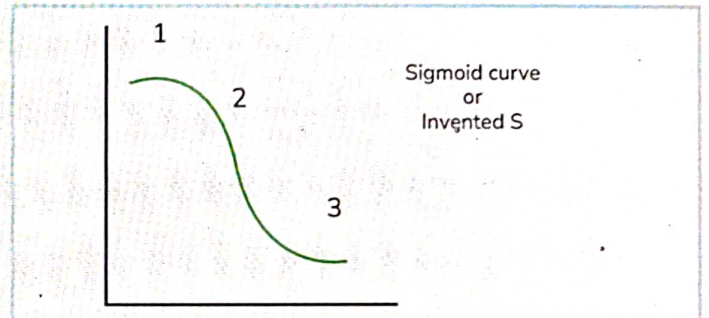
Algor Mortis

- PM cooling of body: $\downarrow\downarrow$ core body temperature. Starts within 15 mins after death
- Sites to Record Core Temp of Body
 - Ideal Site: **Sub hepatic Space.**

- Common site: Rectum (C/I in sodomy)

Temperature is measured by "Chemical thermometer" – **Thanatometer**

- 25 cm long
- Algor mortis curve: **Sigmoid or Inverted S.**
- Average rate of fall in temperature (0.4-0.7/hr)
 - Summer: 0.5° C/hr
 - Winter: 0.7° C/hr



$$\text{Time Since death} = \frac{\text{Normal body Temp.} - \text{Rectal Temp.}}{\text{Rate of fall of Temp.}}$$

PM Caloricity

- Body remains warm after death (1-2 hrs)
- Prolonged raised temperature seen in
 - Nux vomica (due to convulsions)
 - Tetanus
 - Heat stroke

This phenomenon is not seen in Burn cases

Livor Mortis / PM Staining / Hypostasis / Cadaveric Lividity / Suggillation / Vibices



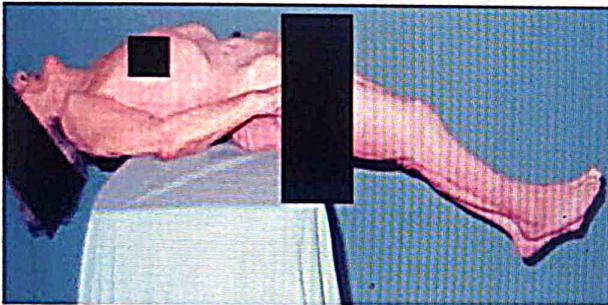
- Blood settles down in capillaries and venules of dependent parts of body.

- If supine position LM occurs in back of head, back of chest, back of abdomen and back of legs.
- If the body is suspended in the vertical position it causes "Glove and Stocking" distribution.

Important Information

- Onset = 30 mins - 2 hrs after death
- Significantly appears in 4 hrs
- Max in 6-12 hrs
- Livor Mortis is absent in severe anemia/severe bleeding / body in fast flowing river as body keeps on rolling.
- Fixation of LM - 8 hours (Average)
 - On applying pressure if blanching seen, it means not fixed
 - If no blanching seen, then fixed
 - Once fixed it will not change even if body position is changed
- Contact pallor - Pale areas on tight contact

Rigor Mortis / Cadaveric Rigidity



- PM Stiffening of Body
- Changes in Muscle after death
- Three phases of Rigor Mortis:
 - Primary relaxation
 - Rigor Mortis (Stiff)
 - Secondary relaxation (Decomposition)
- Rigor Mortis (Stiffness) begins when ↓↓ ATP occurs, and at 85 % of normal ATP level onset of RM begins
- RM is generalised involves both involuntary and voluntary muscles. Involuntary muscles are involved earlier than voluntary muscles.

Important Information

- Overall 1st site to Appear: Myocardium
- Externally 1st site to Appear: Eyelid

Nysten's Rule

- Sequence of Rigor Mortis progression
- Order of Appearance and Disappearance → Proximal to Distal / Descending pattern: Eyelids → Neck → Jaw, Facial muscles → Thorax → U/L → Abdomen → LL → Fingers & Toes

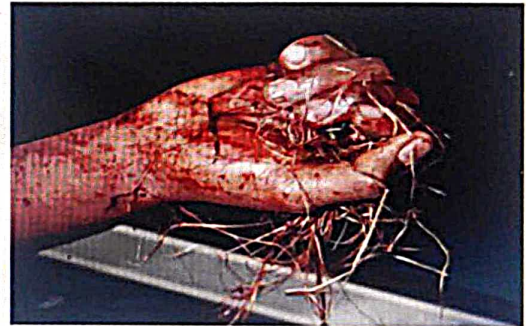
Rule of 12

- Starts in 60 minutes, reaches maximum in 12 hrs, stays in body for 12 hrs and disappears from body in another 12 hrs.
- Max 12 hrs, Persist 12 hrs, Disappears 12 hrs

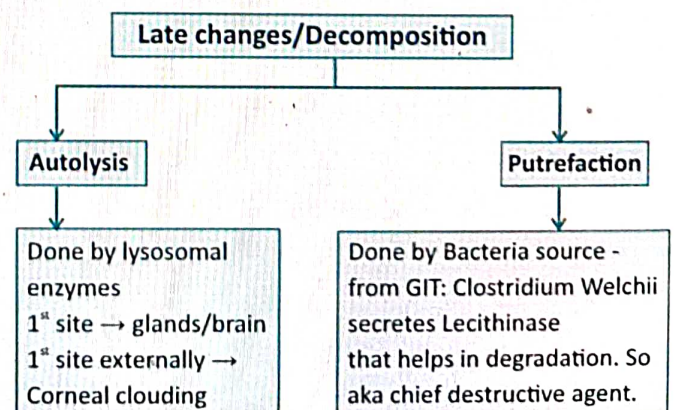
Situation mimicking Rigor Mortis

- Heat stiffening: Due to protein coagulation also called as Boxer's attitude/ pugilistic attitude
- Cold stiffening: Due to frozen body
- Gas stiffening: Due to decomposing gas
- Cadaveric spasm

Cadaveric Spasm



- Aka Instantaneous Rigor i.e., Occurs immediately after death
- No primary relaxation phases
- Whichever muscle used at the time of death, remains in spasm even after death.
- Tells the last act and manner of death.
- No Mechanism is known
- ALWAYS ANTEMORTEM
- Spasm of a group of Voluntary Muscle → which are in use at time of death



Changes in Decomposition

1. Colour change
2. Gas formation
3. Liquefaction of tissues (5-10 days)

1. Colour change

- Internally: Reddish brown discoloration in Aortic lumen (overall 1st)
- External: Greenish discoloration of "Right iliac fossa" i.e. caecum 1st external sign of putrefaction.



Important Information

- Green colour due to sulph haemoglobin
- Summer- 12-18 hr. Winter- 24-48 hr



2. Gas Formation

- H₂S: The most important gas being produced
- Hb + H₂S - Sulphhemoglobin leads to greenish staining of vessels seen as greenish marking on skin k/a Marbling.
- Time taken for it is 36-72 hrs
- Gas stiffening: Rigidity
- PM skin blisters (gas bubble inside them)



PM Blisters



Marbling



Gas Rigidity

Casper's Dictum

- The rate of Putrefaction in different Medium

Air (Fastest)	Water	Earth (Slowest - Soil)
1 week	2 weeks	8 weeks

Order of Putrefaction

- 1st Site: Larynx and Trachea
- Early: Stomach → Intestine → Spleen → Liver → Brain → Heart
- (Mnemonic- Sister Lily's Brittle Heart)
- Late: Prostrate / Uterus (Nulliparous) → Skin → Tendon
- Last Site: Bone, Teeth

Refer Table 8.1

Embalming

04:22:38

- Artificial method of preservation of dead body by injecting embalming fluid
- Ethanol is not used in Embalming.
- Best method: Discontinuous injection and drainage
- Best: When done within 4-6 hrs of death
- Should not be done before autopsy (Punishable)



Important Information

- Normal skin color after embalming = brown
- Embalming of jaundiced body gives green colour

Exhumation

04:24:12



- Digging out of the body, done only under magistrate inquest 176 CrPC.
- No time limit.
- Preserve soil sample to exclude any soil contamination of body (M/C metal - Arsenic)

Entomology

04:25:11

- Study of insects
 - Life cycle: Eggs → Larva → Maggots → Pupa → Flies
- Life cycle of insect in a dead body can determine time since death.
- We can also determine place of disposal.
- We can identify the cause (poising) of death.

Table 8.1

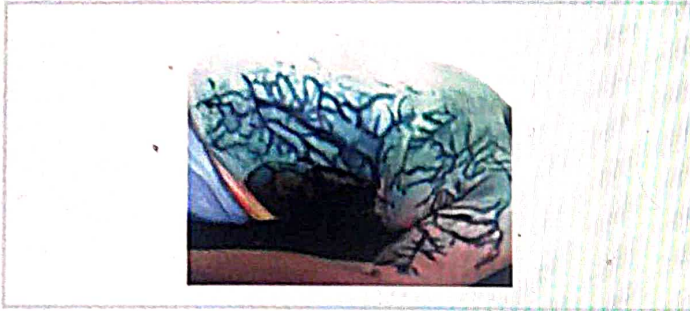
	Adipocere / Saponification	Mummification
Mechanism	<ul style="list-style-type: none"> • Fat converted to wax(fatty acids + calcium) like Substance 	<ul style="list-style-type: none"> • Drying and dehydration body: Mummification
Factors	<ul style="list-style-type: none"> • Body exposed to warm, moist climate • Lipase enzyme and Clostridium welchii needed 	<ul style="list-style-type: none"> • Body exposed to dry / hot climate.
Smell	<ul style="list-style-type: none"> • Ammoniacal smell 	<ul style="list-style-type: none"> • Odourless
Time	<ul style="list-style-type: none"> • 3 days - 3 month 	<ul style="list-style-type: none"> • 3 month - 1 year
		



Previous Year Questions

Q. Identify the Phenomenon?

(INICET NOV 2020)



- A. Filigree Burn
- B. Marbling
- C. Hypostasis
- D. Poisoning

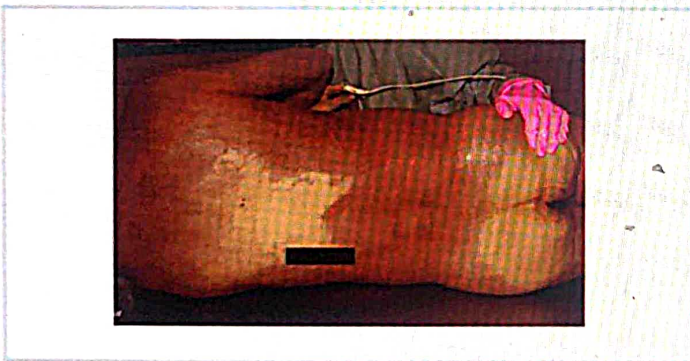
Q. First PM change in a dead body?

(FMGE May 2018)

- A. Maggot formation
- B. Putrefaction
- C. Greenish discoloration of right iliac fossa
- D. Mummification

Q. Which of the following is present in the image below?

(AIIMS May 2019)



- A. Rigor mortis
- B. Algor mortis
- C. Suggillation
- D. Marbling

Q. Rigor mortis first seen in?

(NEET Jan 2019)

- A. Eyelid
- B. Heart
- C. Limbs
- D. Neck

Q. According to Nysten rule, which of the following is the correct sequence of appearance of rigor mortis? (AIIMS Nov 2017)

- A. Eyelid - neck - thorax - upper limb
- B. Face - neck - upper limb - thorax
- C. Orbicularis oculi - facial muscle - jaw - neck - upper limb
- D. Orbicularis oculi - face - upper limb - thorax

Q. True about pugilistic attitude?

(AIIMS May 2018)

- A. Indicate only antemortem burn
- B. Indicate only postmortem burn
- C. Cannot differentiate between antemortem & Postmortem burn
- D. Indicate defense by victim during antemortem death

Q. In the case of RTA, the dead body showed spasm of a group of muscles immediately after death. In which of the following conditions primary relaxation is not seen?

(FMGE DEC 2020)

- A. Heat stiffening
- B. Cold stiffening
- C. Cadaveric spasm
- D. Rigor mortis

Q. Which of the following is the first organ to putrefy?

(NEET Jan 2018)

- A. Brain
- B. Heart
- C. Prostate
- D. Kidney

Q. Which of the following is not used as a preservative in chemical analysis?

(NEET Jan 2019)

- A. Glycerine
- B. Formalin
- C. Rectified spirit
- D. Salt solution

9

HUMAN IDENTIFICATION



For Presumptive Identification: We have 4 important parameters.

00:00:10

- Race
- Age
- Sex
- Stature

For Complete Identification, we have

1. **Dactylography:** Most absolute/precise method for identification. We can differentiate even identical twins
2. **DNA Fingerprinting**

IDENTIFICATION OF RACE

3 Types of races

1. Negroid
 2. Caucasoid
 3. Mongoloids
- Race can be determined from:
 - a. Bones
 - b. Teeth

Teeth

- Race from dentition
 - Mongoloid (Mnemonic - SET)
 - S : Shovel incisor
 - E : Enamel pearl
 - T : Taurodontism (bull tooth) - Increased pulp cavity, bigger cusp
 - Caucasoid tooth
 - Carabelli's cusp - Additional nodule in the molar 1.
 - Negroid tooth
 - They have a greater number of cusps in molars and premolars

Bones

- Mainly from "SKULL"

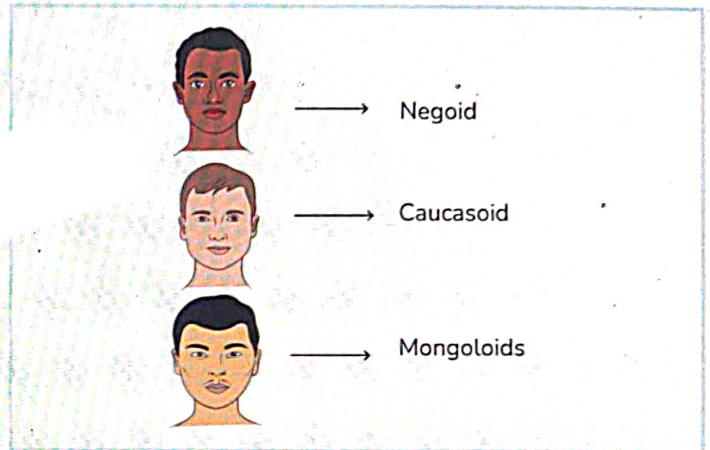
Indices for race determination:

- Cephalic index
- Crural index
- Brachial index
- Intermembral index
- Humerofemoral index

CEPHALIC INDEX

• **Cephalic Index (CI)** = $\frac{\text{Maximum breadth of skull}}{\text{Maximum length of skull}} \times 100$

- 70 - 75: Dolichol - Cephalic (Long Headed)
 - **Negroid** (Africans, Aryans)
- 75 - 80: Mesaticephalic (Medium Headed)
 - **Caucasoid** (Europeans and Chinese), **Indians**
- 80 - 85: Brachycephalic (Short Headed)
 - **Mongoloids** (Japanese)



AGE ESTIMATION

Rule of Hasse	Rule of Morrison
<ul style="list-style-type: none"> ○ Gestational age of fetus in the first 5 months ○ Gestational age = $\sqrt{\text{CHL}}$ (CHL = Crown to heel length) CRL = 2/3 CHL 	<ul style="list-style-type: none"> ○ Gestational age of fetus in the second 5 months (6-10 months) ○ Gestational age = $\frac{\text{CHL}}{5}$

By Ossification Center

- 5 month IUL = Calcaneum appears
- 7 month IUL = Talus
- 36th week = Lower end of femur
- 38th week = Upper end of tibia
- Birth = Cuboid appears

Sacrum

- All 5 center fuses to form the single bone at age of 25 years

Sternum

MANUBRIUM	5 months	
Body	5 months 7 months 7 months 10 months	} 60 yrs } fuse at 25 yrs
1		
2		
3		
4		
Xiphoid process	3 yrs	} 40 yrs

Elbow Joint

Mnemonic - CRITOE

- Capitulum - 1 yr
- Radial head - 5yr
- Inner epicondyle - 6yr
- Trochlea - 9yr
- Olecranon - 9yr
- Ext. epicondyle - 11yr

All of them fuse to form elbow joint at 16 yr

Carpal Bones

- Capitate - 2month
- Hamate - 3 m - 1 year
- Triquetral - 3 yr
- Lunate - 4 years
- Scaphoid - 5 years
- Trapezium, Trapezoid - 6 years
- Pisiform - 9-12 yr

Skull Sutures

- Posterior fontanelle (lambda) - 3 m - 6m
- Anterior fontanelle (Bregma) - 18 m
- Metopic suture - 9m - 2yr
- Basisphenoid and Basisphenoid junction fuses around 18-21-year

FOR AGE > 30 yr best bone to identify is Pubic symphyseal surface

Stature

- Femur : 27% of entire stature height is contributed by femur
- Tibia : 22%
- Humerus : 20%

AGE ESTIMATION BY DENTITION

- Primary/Temporary/ Deciduous = 20
 - M_2, M_1, C, I, C, I
 - Each quadrant = 5 teeth
- Secondary/Permanent = 32
 - $M_3, M_2, M_1, PM_2, PM_1, C, I, C, I$
 - Superadded teeth (are added extra) - 12
 - Successional teeth - 20
- All Permanent Molars = Superadded
- Each quadrant = 8 teeth

Sequence of eruption	
Temporary	Permanent
I - 6 months	M1 - 6 yrs.
M1 - 12 month	CI - 7 to 8 years
C - 18 month	LI - 8 to 9 years
M - 24 months	PM1 - 9 to 10 years
	PM2 - 10 to 11 years
	C - 11 to 12 years
	M2 - 12 to 14 years
	M3 - 17 to 25 years (Wisdom tooth)

Eruption	
Temporary	Permanent
○ First Tooth to erupt - Lower Central	○ First tooth to erupt - Molar 1 Incisor

- Period of mixed dentition - both permanent and temporary teeth can be seen together. Total number of teeth remains the same = 24.
- Total number of Permanent teeth = $(Age - 5) * 4$. During this period

Gustafson's Criteria

- Used in more than 25 years of Age
- 6 Criteria (APSRTC)
 - Attrition
 - Parodontosis
 - Secondary dentin: 2nd Best Criteria
 - Root resorption
 - Transparency of root: Best criteria
 - Cementum apposition

Boyde's Method

- Counting the number of incremental lines
- Used in dead infants
- 1st line: Neonatal line appears on 2nd - 3rd day of birth. seen by electron Microscope

Important Information

BEST BONE TO FIND RACE - SKULL
 BEST BONE TO FIND STATURE - FEMUR

Stack's Formulae

- Used in infancy and it based on height and weight of tooth.

Lamendin's Method

- Modification of Gustafson's Criteria
- Transparency of root & Parodontosis - Only uses these two criteria.

Dental Charting

Palmer notation

Permanent Teeth															
Upper right								Upper left							
8J	7J	6J	5J	4J	3J	2J	1J	L1	L2	L3	L4	L5	L6	L7	L8
8j	7j	6j	5j	4j	3j	2j	1j	r1	r2	r3	r4	r5	r6	r7	r8
Lower right								Lower left							
Deciduous teeth (baby teeth)															
Upper right								Upper left							
			EJ	DJ	CJ	BJ	AJ	LA	LB	LC	LD	LE			
			Ej	Dj	Cj	Bj	Aj	lA	lB	lC	lD	lE			
Lower right								Lower left							

Haderups system	
Permanent	
8+7+6+5+4+3+2+1+	+1+2+3+4+5+6+7+8
R ————— L	
8-7-6-5-4-3-2-1-	-1-2-3-4-5-6-7-8

FDI method / 2-digit system (MOST IMPORTANT)

PREFIX (CLOCKWISE)																	
1	2																
4	3																
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28		
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38		
PREFIX (CLOCKWISE)																	
5	6																
8	7	55	54	53	52	51	61	62	63	64	65						
		85	84	83	82	81	71	72	73	74	75						

IDENTIFICATION OF SEX

Refer Table 9.1

- **Sciatic Index = Best Index for Identification of Sex.**
- Pelvis Is the one bone with which we can find the sex even before the puberty

Ashley's Rule of 149

- Sex Differentiation from sternal length.
 - Measuring of Sternal length (Body + Manubrium)
 - If > 149 mm then - Male
 - If < 149 mm then - Female

KROGMAN'S Index

- Pelvis - 95% (single best),
 - Skull - 90%,
 - Long Bones - 80%
 - To increase Accuracy
 - Pelvis + Skull
 - Pelvis + Long bone
- } 98%

100% Accuracy is only possible with complete skeleton

DACTYLOGRAPHY

- Based on finger printing - **Best Method of identification**
- 12 - 24 weeks Intra Uterine Life
- Better than DNA fingerprinting because it is **different among twins also.**
- Permanent alterations of fingerprints is seen in
 - Leprosy
 - Electrocution
 - Radiation
 - Charring
- Different Type of Patterns
 - Loops: **Most common**
 - Whorls
 - Arch
 - Composite: **Least common**
- Loops (60-70%) Whorls (25-35 %) Arches (6-7 %) Composite (1-2%)



Table 9.1

Character	Male	Female	Exception
Skull Muscle markings, prominences and ridges	More prominent	Less prominent	Frontal Eminence and Parietal Eminence
Pelvis <ul style="list-style-type: none"> ○ All Prominence including muscle markings and ridges Shape of bone ○ Shape of Obturator Foramen ○ Ischial tuberosity ○ Grater sciatic notch (single best criteria) 	More prominent	Less prominent	Preauricular sulcus - more prominent in females
	Oval	Triangle	
	Inverted	Everted	
	Deep and narrow	Wide and shallow	
Angles of mandible	Less obtuse < 120	More obtuse >120	
Indices	Corpora Basal Index (more in male) Breadth of S ₁ vertebrae/ breadth of whole sacrum *100	<ul style="list-style-type: none"> ○ Sciatic Index (Single best index) ○ Ischiopubic Index ○ Sacral Index ○ Sternal index 	



Previous Year Questions

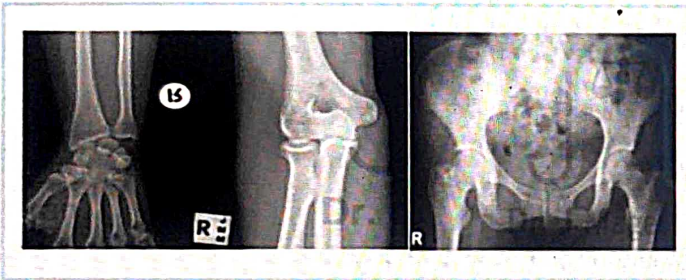
Q. Superimposition technique is used for?

(AIIMS May 2018)

- A. Skull
- B. Pelvis
- C. Femur
- D. Ribs

Q. A 14-year-old female was claimed to be kidnapped, on Interrogation she claims that she is not a minor and left home with the person on her own well. Count ordered for her age estimation. Given below are the X-ray of pelvis, wrist and bilateral elbow. What is her most probable age based as these?

(AIIMS May 2018)



- A. 14 yrs.
 - B. 16-17 yrs.
 - C. 17-19 yrs.
 - D. 21-22 yrs.
- D. Indicate defense by victim antemortem death

Q. Pure Aryans have which type of skull? (FMGE May 2018)

- A. Brachycephalic
- B. Mesocephalic
- C. Dolichocephalic
- D. All of the above

Q. Total number of teeth at the age of 12 years?

(FMGE May 2018)

- A. 12
- B. 20
- C. 28
- D. 30

Q. X-ray showing fusion of sternal body segments and fusion of medial end of clavicle. The approximate age is?

(INICET NOV 2020)

- A. More than 15 years
- B. More than 18 years
- C. More than 22 years
- D. More than 25 years

Q. Identical twins can be differentiated by?

(NEET Jan 2018)

- A. Fingerprint
- B. DNA fingerprinting
- C. Blood grouping
- D. Age

Q. Locard's principle is famous for?

(NEET Jan 2018)

- A. Theory of exchange
- B. Fingerprint study
- C. Formula for estimation of stature
- D. System of personal identification using the body measurement

Q. Fingerprint ridges appear by?

(INI CET 2022)

- A. 26 to 28 weeks of intrauterine life
- B. 12 to 16 weeks of intrauterine life
- C. 24 to 28 weeks intrauterine life
- D. 32 to 36 weeks of intrauterine life

10

SEXUAL JURISPRUDENCE



- **Impotency:** Inability of a person to achieve & maintain penile erection.
- Impotence towards one particular woman : Impotence QUADHAC
- **Frigidity:** Female sexual coldness
- **Sterility:** Inability to reproduce children
- **Fecundation ab extra:** Conception of a female without penile penetration
- **Satyriasis:** Increase sexual desire in males
- **Nymphomania:** Increase sexual desire in females

Hymen tear

- Penile penetration leads to posterolateral tear between 4 to 7 o'clock
- Digital penetration leads to anterior tear
- Can be examined by a Glaister keen rods

Intact hymen: Seen in

- False virgin - If hymen is intact even after sexual intercourse seen if hymen too thick / too loose / too elastic
- Child (deep seated hymen)

Legitimate status of child born out of ART = legitimate

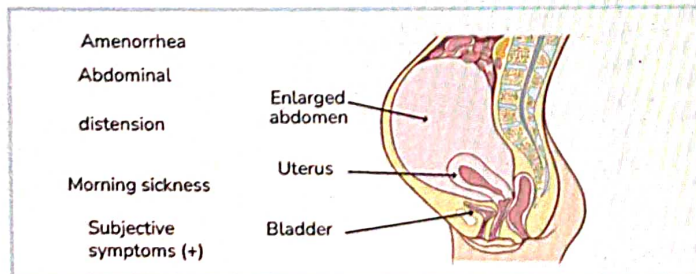
Positive signs of pregnancy

- Palpation of fetal movements
- Palpations of fetal parts
- Auscultation of fetal heart sounds
- Radiological signs

Spurious pregnancy / Phantom pregnancy/ Pseudocyesis

00:51:12

- Occur with woman intensely desiring a child
- Woman has all subjective symptoms due to hormonal imbalances but not pregnant



Fictitious child / Suppositious child / Fabricated child

- Female may feign pregnancy and after sometime she will bring the child and claims the child as her own child.
- Atavism:** Child resemble grand parents

Lochia

- Vaginal discharge for few weeks after delivery. Sign of Recent delivery.
 - Lochia Rubra 1-3 day
 - Lochia Serosa 4-10 day
 - Lochia Alba 11-14 day
 - Mnemonic: Republic of South Africa

IUD

- Intra uterine death
- **Signs**
 - Maceration: An example of aseptic autolysis
 - Earliest sign is skin slippage, reddening as early as 12 hrs
 - Radiological signs
 - **Robert sign** (gas in aorta) (12 hrs)
 - Overcrowding of ribs
 - **Ball's sign:** Hyperflexion of spine
 - **Spalding sign:** Overriding of cranial vault bones. Seen around 4-7 days

Tests of Live Births

Refer Table 10.1

- In Raygat's test, we use 'Liver' as control.
- False positive result: In putrefaction
- False negative result: Seen in Atelectasis / Pneumonia / Pulmonary edema

Type	Fertilisation of	Ovulatory cycle
Superfecundation	2 ova	Same
Superfetation	2 ova	Different

Table 10.1

Name	Mechanism / Principle	Unrespired Baby	Respired Baby
Level of diaphragm		3 - 4 th Rib	5 - 6 th Rib
Fodere's Test (Weight of Lungs)	↑↑ Vascularity	30 gm	60 gm
Plocquet's Test (Weight of Lungs / Wt. of Baby)		1: 70	1: 35
Wreden's test for Middle Ear		Gelatin	Air
Breslau's second life test (Stomach bowel test)		No air bubble (sink)	Air bubble +
Hydrostatic Test (Raygat's test) depends on residual air in the lung	Specific gravity of lung	Sink 1.040	Float 0.940



Previous Year Questions

Q. Grounds for divorce is?

(FMGE Jun 2019)

- A. Sterility
- B. Frigidity
- C. Impotence
- D. Poverty

Q. Posthumous child is?

(FMGE Dec 2019)

- A. Child born after the death of father
- B. Child born through artificial insemination
- C. Woman claim the child as her own
- D. Child born out of wedlock

Q. Maximum number of times a woman can become pregnant for surrogacy is?

(JIPMER 2017)

- A. 1
- B. 2
- C. 3
- D. 4

Q. A 14-year-old rape victim brought to the hospital with 22 weeks pregnancy. All of the following are correct statements regarding the case, except?

(AIIMS Nov 2017)

- A. Vaginal swab need to be taken
- B. The fetus can be aborted after her consent
- C. Examination can be done by a male doctor with a female attendant
- D. Urine pregnancy test is not necessary

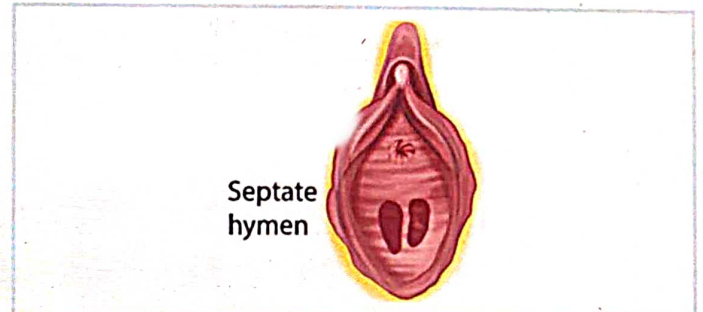
Q. IPC for causing abortion without women's consent?

(FMGE June 2019)

- A. 312
- B. 313
- C. 314
- D. 315

Q. This type of hymen is?

(NEET PG 2022)



A. Septate

- B. Fimbriate
- C. Annular
- D. Semilunar

Q. Opinion of 2 doctors needed for MTP, when the duration is?

(FMGE 2022)

- A. 12 to 20 weeks
- B. 20 to 24 weeks
- C. 24 to 28 weeks
- D. More than 28 weeks

11 SEXUAL OFFENCES



NATURAL SEXUAL OFFENCES

Adultery

- Extramarital affair

Incest

- Sex with blood relations

Rape

- Sec 375 IPC: Definition of rape
- If there is penetration of penis in vagina, anus, urethra, mouth
Or
Bodypart / foreign body into vagina, anus, urethra
Or
Application of mouth to vagina, anus, urethra
- Minimum age of consent of sex: 18 yrs.
- Statutory Rape: Sex with the girl < 18 yrs with / without consent

Examination: Can be done under police inquest which states

- For accused under section 53 (A) crpc
 - Consent is not mandatory
 - Reasonable force can be used
- For victim under section 164 (A) crpc
 - Consent is mandatory, obtain informed refusal if she is not consenting
- Lugol's iodine test - Done to detect vaginal epithelium cells on the accused

UNNATURAL SEXUAL OFFENCES

- Lesbianism / Tribadism
 - Active Partner: Dyke/Butch
 - Passive Partner: Femme
- Sodomy/ Greek love / Buggery: Penile - anal intercourse
- Pederasty: Adult Male (Pederast) is having habitual sodomy with Male Child (Catamite)
- Buccal Coitus: Oral Sex / Sin of Gomorrah
 - Fellatio - Oral stimulation of penis
 - Cunnilingus - Oral stimulation of vagina
- Bestiality: Sexual intercourse with animals

Non - consensual unnatural sexual offence is punishable under section 377 IPC

PERVERSIONS / PARAPHILIAS

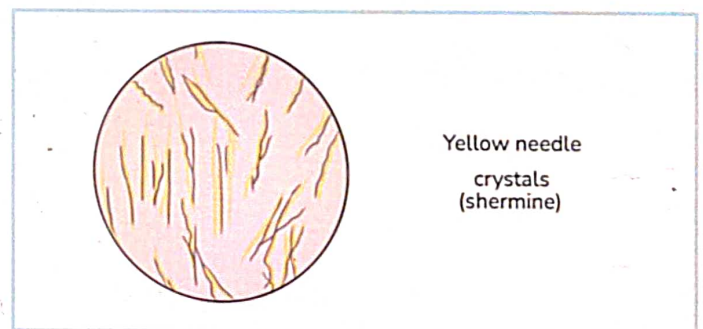
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- Sadism: Sexual gratification by inflicting pain in partner.
- Masochism: Sexual gratification by suffering pain.

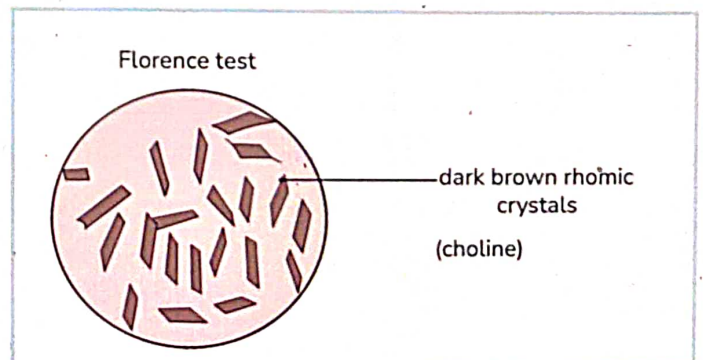
- Bondage: Sadism + Masochism
- Exhibitionism: Sexual gratification by showing private parts. (294 IPC)
- Voyeurism / Scotophilia (Peeping Tom): Sexual gratification by watching private acts of a female. (354 (C) IPC)
- Fetishism - Sexual gratification by inanimate objects
- Transvestism / eonism - Sexual gratification by wearing the dress of opposite sex.
- Frotteurism - Sexual gratification by touching or rubbing of female private parts. (punishable under 290 IPC and 354 (A) IPC)
- Scatalogia - Sexual gratification by talking obscenity
- Klismaphilia - Sexual gratification by enema
- Urophilia - Sexual gratification by sight or smell of urine
- Coprophilia - Sexual gratification by sight and smell of feces

TEST TO CHECK PRESENCE OF SEMEN

- Barberio test - Yellow needle crystal due to presence of spermine



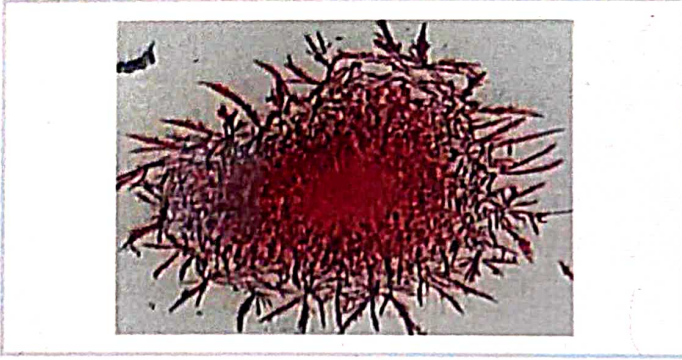
- Florence test - Dark brown rhombic crystal due to presence of choline



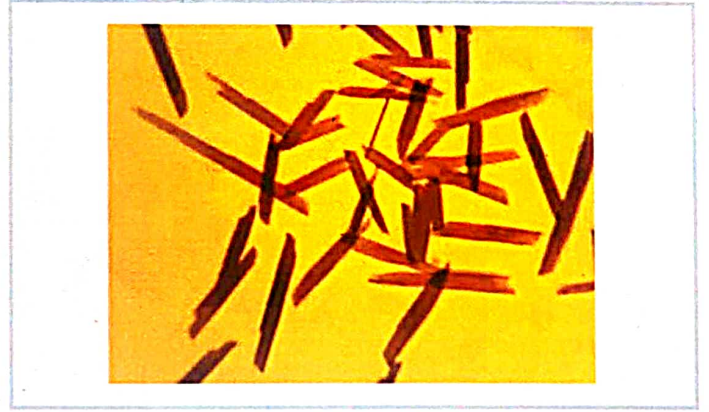
- Best test to detect - MICROSCOPY (presence of even 1 spermatozoa confirms the test)

TEST FOR BLOOD STAINS

- Takayama's test - Pink feathery crystals



- Teichman test - Brown rhombic crystals



- Absorption Spectrometry - Best test for blood stain.



Previous Year Questions

- Q. A 14-year-old rape victim was brought to the hospital with 22 weeks pregnancy. All of the following are correct statement regarding the case, except? (AIIMS Nov 2017)
- A. Vaginal swab need to be taken
 - B. The fetus can be aborted after her consent
 - C. Examination can be done by a male doctor with a female
 - D. Urine pregnancy test is not necessary
- Q. A man continues to call females, achieves sexual gratification by talking obscenity & sharing obscene picture. The condition is? (AIIMS Aug 2020)
- A. Scatologia
 - B. Stalking
 - C. Scopophilia
 - D. Voyeurism
- Q. Following is used to identify the vaginal cells on glans penis during the examination of accused of rape? (INI CET 2022)
- A. Precipitin test
 - B. Florence test
 - C. Lugols iodine
 - D. Toluidine blue
- Q. Getting Sexual gratification by giving pain to partner is known as? (FMGE 2022)
- A. Masochism
 - B. Sadism
 - C. Lesbianism
 - D. Urolagnia

12 LEGAL SECTIONS



LEGAL SECTIONS

- 44 IPC - Definition of injury
- 82 IPC - Crime done by child <7 yr = not liable
- 83 IPC - Crime done by child between 7 - 12 yrs, liability depends on maturity of the child
- 84 IPC - Criminal responsibility of insane person → non liable, Rules related to Insanity
 - Irresistible Impulse Act
 - Curren's Rule
 - American law Institute Test
 - MC Naughten's Rule
- 85 IPC - Crime done in involuntary drunkenness → person is not liable
- 86 IPC - Crime done in voluntary drunkenness → person is liable
- 90 IPC - Consent given under following situation are INVALID - Child <12, Insane, under influence, Intoxicated
- 92 IPC - No need of consent in emergency situation
- 191 IPC - Definition of perjury
- 193 IPC - Punishment of perjury
- 300 IPC - Definition of culpable homicide amounting to murder
- 302 IPC - Punishment of murder
- 304 (A) IPC - (P) Death due to medical negligence
- 304 (B) IPC - Punishment for dowry death
- 312 - (P) Criminal abortion (Illegal abortion) with consent of female
- 313 - (P) Criminal abortion without consent of female
- 314 - Criminal abortion resulting in death of female
- 319 IPC - Definition of Hurt
- 320 IPC - Definition of grievous hurt

320 IPC: Grievous hurt sequence

1. Emasculation
2. Permanent loss of vision
3. Permanent loss of hearing
4. Permanent loss of member or joint
5. Permanent loss of power of member or joint
6. Permanent disfiguration of face or head
7. Fracture or dislocation of bone or tooth
8. Any hurt which endangers life or which causes the sufferer to be in severe bodily pain or unable to follow his ordinary pursuits for 20 days.

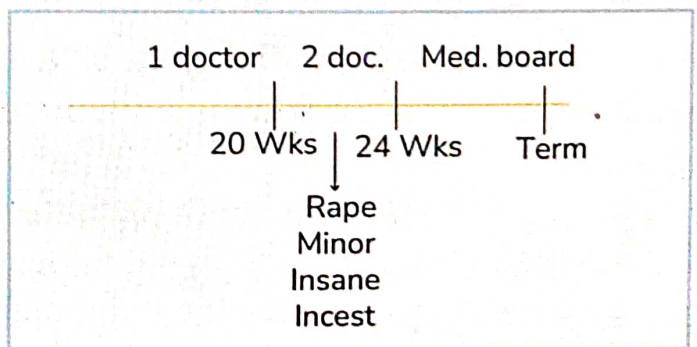
- 326 (A) IPC - Punishment of Vitriolage
- 326 (B) IPC - Punishment of attempt of acid attack.
- 354 IPC
 - A - Define and punishment of sexual harassment
 - B - Forcibly disrobing a female
 - C - Voyeurism
 - D - Stalking
- 375 IPC - Definition of rape
- 376 IPC - Punishment of rape
- 376 (1) IPC - 10 yr - life imprisonment
- 376 (2) IPC - Punishment for Custodial rape
- 377 IPC - Punishment for unnatural sexual offences
- 39 CrPC - Police intimation in case of crime, if not it is punishable
- 357 (C) CrPC - All hospitals, public, private, shall immediately provide the first aid or medical treatment, free of cost and shall immediately inform the police of such incident. Violation of this is punishable under 166 (B) IPC.

MTP ACT

01:26:27

MTP AMENDMENT ACT 2021

- Indication
 - Eugenic
 - Humanitarian: Pregnancy due to rape
 - Therapeutic
 - Social: Failure of contraception
- Husband's consent not necessary
- Min age of consent for MTP is 18 yrs
 - If < 18 yrs. consent of guardian required
- Confidentiality should be maintained
- If Age of gestation: <12 weeks



- Emergency - ANYTIME

CONSUMER PROTECTION ACT (COPRA) (CPA)

- National commission
 - More than 10 crore
- State commission
 - 1-10 crore
- District consumer redressal forum
 - <1 crore
- If person is not satisfied with decision of any court then he can go to higher court up to Supreme Court.

DECLARATIONS

- Helsinki: Human Experimentation
- Geneva: Medical ethics
- Tokyo: Guidelines for Doctor concerning Torture
- Oslo: Therapeutic abortion
- Lisbon: Rights of the patient
- Malta: Hunger strikes
- Sydney: Death and Organ transplantation
- Venice: Terminal illness
- Washington: Biological weapon

13 TOXICOLOGY



- Study of Poisons - Toxicology
- Study of toxin - Toxinology
- Study of venom - Venomics

01:32:55

Cardiac

MNEMONIC: Car DONA

DIGITALIS (Foxglove)

OLEANDER (Kaner)

NICOTINE

ACONITE (Monk hood, Mitha zaher)

01:33:40

Asphyxiants

- CO, H₂S, HCN

Miscellaneous

- Agricultural poison
- Food poisoning

Poisons / Conditions and colour of Hypostasis

- CO - Cherry red
- Cyanide - Bright red
- Hypothermia - Pink
- Phosphorus - Dark brown
- Hydrogen sulphide - Bluish green
- Aniline - Deep blue / brown
- Nitrites - Reddish brown
- Opiates - Black

Poisons and Smell

- HYDROGEN CYANIDE - Bitter almonds
- Arsenic and phosphorus - Garlic, (OPC)
- Alcohol - Fruity, acetone
- Hydrogen sulphide - Rotten egg (disulfiram, mercaptans)
- OPC - Kerosene smell
- Zinc phosphide - Fishy
- Marijuana - Burnt rope
- Hemlock - Mousy odour

Poisons and Stomach Mucosa

Stomach Mucosa Appearance	Poisons
• Red velvety stomach	• Arsenic
• Black necrotic	• H ₂ SO ₄
• Yellowish skin, teeth and stomach mucosa (Due to picric acid XANTHOPROTEICRXN)	• HNO ₃

CLASSIFICATION OF POISONS

- C - Corrosives
- I - Irritants
- N - Neurotoxic
- C - Cardiotoxic
- A - Asphyxiants
- M - Miscellaneous

Corrosives

Acids	Alkali
<ul style="list-style-type: none"> • Damage by Coagulative Necrosis <ul style="list-style-type: none"> ○ Except hydrofluoric acid 	<ul style="list-style-type: none"> • Liquefactive necrosis (More Dangerous)

Irritants

Non metallic	Metals	Plant	Animal
Phosphorus	Mercury, Lead, Arsenic	Ricin Abrus Semecarpus Croton Calotropis	Snake Scorpion

Neurotoxic

- Cerebral
 - Delirium. Eg - Datura, Cocaine, Cannabis
 - Inebriant - Alcohol, Chloral hydrate (Mickey Finn)
 - Somniferous - Opiates
- SPINAL
 - Strychnos nux vomica
 - Gelsimium
- Peripheral nerve - Conium maculatum (hemlock) causes ascending paralysis

<ul style="list-style-type: none"> • BUFF/WHITE COLOR • Thickening (Leathery) (Rest all acids cause thinning of mucosa) 	<ul style="list-style-type: none"> • Carbolic Acid
<ul style="list-style-type: none"> • Slate grey mucosa 	<ul style="list-style-type: none"> • Mercury
<ul style="list-style-type: none"> • Blue 	<ul style="list-style-type: none"> • CuSO₄, Sodium amytal

VISCERA PRESERVATION

- Routinely these organs are preserved
 - Stomach
 - Small intestine (proximal)
 - Liver
 - Kidney
 - Blood (most reliable)
- In cases of known poisoning preserve
 - Spinal cord - Strychnos nuxvomica, Gelsimium
 - Heart - Aconite
 - Brain - Alcohol (Cerebral poisons)
 - Fatty tissues - Insecticides
 - Bone, hair, nail - Heavy metal poison
 - Lungs - Volatile poison.

Preservatives

- Saturated solution of NaCl (most commonly used)
 - Avoid in aconite and corrosive poisoning except carbolic acid
- Rectified spirit (95% alcohol) (Best)
 - Avoid in alcohol, formalin, phosphorus, phenol poisoning.
- For Blood - NaF, Potassium Oxalate
- For Urine - NaF, Thymol, Toluene
- No preservative needed in
 - Lung
 - Hair
 - Bone
 - Nail
- Formalin cannot be used for toxicological analysis, chemical analysis, viscera preservation. It is used only for histopathological examination

LEGAL DUTIES OF A DOCTOR

- 39 CrPC : Intimation to police
- 176 IPC: Punishable for not informing
- 177 IPC: Punishable for false information
- Suicidal and alive: No need to inform
- Suicidal and dead: Inform
- Preserve the evidences
 - Disappearance of evidence is punishable under 201 IPC

DECONTAMINATION

01:53:40

- **Gastric lavage:** Effective if done within 1 - 3 hrs.
 - Done by Lavacuator (ideal) or Ewalds tube or Ryle's tube
 - Contraindication
 - C - Corrosives (Except phenol)
 - C - Comatose condition
 - S - Convulsant poisoning (Strychnos nuxvomica)
 - K - Volatile (Kerosene). Due to risk of aspiration.
- **Activated Charcoal** - Physical antidote



Activated charcoal

- Powder mixed with water and then ingested
- Poison bind to surface of charcoal - This property is known as **adsorption**
- Avoid in CHIM
 - C - Corrosives
 - H - Hydrocarbon
 - I - Insecticide
 - M - Metal
- **Antidotes**
 - Arsenic - BAL, DMSA
 - Copper - Pencillamine, DMSA
 - Iron - Desferrioxamine
 - Lead - EDTA, DMSA
 - Mercury - DMSA, BAL except - Organic mercury
 - Cocaine - AMYL NITRITE
 - Beta blocker - Glucagon
 - Carbon Monoxide - High flow oxygen
 - Cyanide - Hydroxocobalamin, Nitrites, Amyl nitrite, Sodium nitrite
 - Digitalis - Digibind also in oleander
 - Morphine - Naloxone sodium
 - Methanol - Ethanol and Fomepizole
 - OPC - Atropine, Oximes
 - Carbamates - Atropine
 - Organochlorine - Symptomatic treatment
 - Pyretheroids - Also symptomatic treatment



Previous Year Questions

Q. Gastric lavage is allowed in which corrosive poisoning?

(JIPMER 2017)

- A. Paint thinner ingestion
- B. Lysol ingestion
- C. Crude toilet disinfectant ingestion
- D. Battery acid ingestion

Q. A 3 year old child brought to hospital with history of consumption of iron tablets. History of abdominal pain, diarrhoea & vomiting. The child is in comatose condition. The treatment is?

(NEET PG 2022)

- A. Desferrioxamine
- B. BAL
- C. Activated charcoal
- D. Penicillamine

Q. The antidote in opioid poisoning is?

(NEET PG 2022)

- A. Methadone
- B. Naloxone
- C. Flumazenil
- D. Oximes

Q. A girl had been brought with history of paracetamol tablets from a medicine bottle. The treatment to be given is?

(NEET PG 2022)

- A. Nacetyl cysteine
- B. Naloxone
- C. Flumazenil
- D. Atropine

Q. In a case of lead poisoning the enzymes inhibited are?

(NEET PG.2022)

- A. ALA synthase
- B. Uroporphyrinogen III synthetase
- C. ALA dehydratase & ferrochelatase
- D. Coproporphyrinogen reductase

Q. Lead poisoning 60 mcg / 100 ml. The treatment is?

(FMGE 2022)

- A. EDTA
- B. DMSA
- C. EDTA + DMSA
- D. Penicillamine

Q. Identify the poisonous plant having yellow flowers and seeds are contained in prickly capsules? (INICET-May-2022)



- A. Argemone mexicana
- B. Nerium odorum
- C. Papaver somniferum
- D. Calotropis procera

Q. All the following are muscarinic manifestations of organophosphorus poisoning, except? (INICET 2022)

- A. Urinary incontinence and diuresis
- B. Bradycardia
- C. Mydriasis
- D. Bronchoconstriction

Q. Most characteristic feature of muscarinic symptoms in OPC poisoning among the following? (INICET 2022)

- A. Respiratory symptoms like salivation, rhinorrhea, bronchorrhea and bronchospasm
- B. Mydriatic pupil
- C. Tachycardia
- D. Skeletal muscle contraction

Q. A 27 year old patient comes to emergency with salivation, diarrhoea, watery eyes, dysuria. What will be first line of management? (INICET 2022)

- A. IV calcium gluconate
- B. Atropine
- C. Pralidoxime
- D. Glucagon

14 CORROSIVES



- Maximum Tissue destruction

(02:00:45)

Acids	Alkali
<ul style="list-style-type: none"> • Damage by Coagulative Necrosis <ul style="list-style-type: none"> ○ Except hydrofluoric acid e.g. <ul style="list-style-type: none"> ○ INORGANIC (produces local action) <ul style="list-style-type: none"> → Sulphuric acid → Nitric acid → Hydrochloric acid → Hydrofluoric acid ○ ORGANIC (produces systemic action) <ul style="list-style-type: none"> → Carbolic → Oxalic → Acetic 	<ul style="list-style-type: none"> • Liquefactive necrosis (More Dangerous) e.g. <ul style="list-style-type: none"> ○ Sodium hydroxide ○ Potassium hydroxide ○ Potassium carbonate ○ Sodium carbonate

Carbolism

MNEMONIC

- P - Pyrocatechol
- H - Hydroquinone
- E - hEmolysis
- N - Nephrotoxic
- O - Ochronosis (black discoloration)
- L - Leathery gastric mucosa
- It produces thickening of stomach mucosa (Leathery appearance). Gastric lavage can be done
- In liver in gets metabolized to Pyrocatechol, Hydroquinone. When excreted from kidney produces **Carboluria (Green Coloured Urine)**

Carboluria

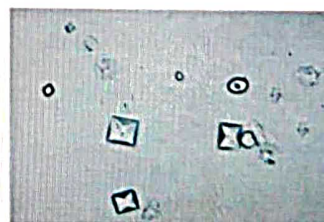


- C - Constricted pupil
- C - Convulsions
- In Carbolism, PCT damage leads to renal damage

Oxalic Acid

- Get into system → Binds Ca^{++} → Ca oxalate crystalluria - Oxaluria (casts in urine)
- Serum Ca^{++} levels ↓↓ → Hypocalcaemia results in Tetany
- PCT necrosis and renal failure
- Oxalic acid is found in tomato, spinach and cabbage.

Oxalic acid crystals in urine



Hypocalcemia is seen with

1. Oxalic acid
2. HFA also causes hypomagnesemia, hyperkalemia
3. Ethylene glycol poisoning

ACIDS

H_2SO_4 (oil of vitriol)

- Black Necrotic Stomach mucosa, Tongue, Skin and Gastric perforation
- Wet blotting paper stomach
- Chalky white teeth as it has hygroscopic property
- Vitriolage punishable under 326 (A) IPC, attempt to throw acid is punishable under 326 (B) IPC.

HNO_3

- Everything yellow due to "Picric Acid"
- Yellow color skin, teeth.
- Brown/Yellow stomach mucosa
- Xanthoproteic RXN

Carbolic Acid / Phenol

- Acute poisoning: Carbolism
- Chronic poisoning: Phenolic Marasmus
- Phenol can be absorbed almost through all routes even through skin



Previous Year Questions

Q. In corrosive acid case, stomach is opened along?

(FMGE Jun 2019)

- A. Lesser curvature
- B. Greater curvature
- C. Vertical,
- D. Pylorus

Q. Gastric lavage is allowed in which corrosive poisoning?

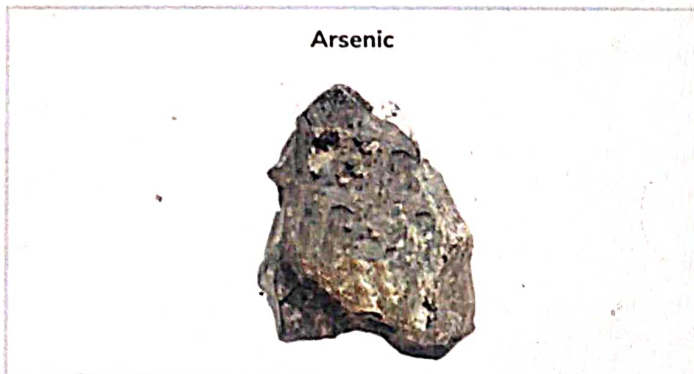
(JIPMER 2017)

- A. Paint thinner ingestion
- B. Lysol ingestion
- C. Crude toilet disinfectant ingestion
- D. Battery acid ingestion

15 METALLIC POISONING



ARSENIC POISONING



Arsenic

- Most toxic form - Arsine
- Most toxic salt - Arsenic trioxide (colorless, tasteless, odourless power)
- Acute Poisoning: Gastroenteritis, resembles cholera
- Chronic Poisoning: Arsenicosis
- If due to contaminated water. It is known as Hydroarsenicism



Important Information

- Most common acute metallic poisoning - Arsenic
- Most common Chronic Metallic poisoning - Lead Poisoning - Plumbism

Features of Chronic Poisoning

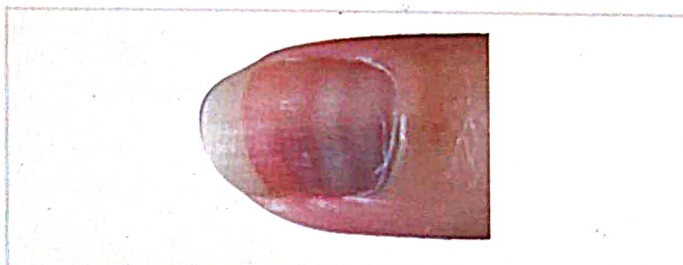
02:13:03

- Skin
 - Hyperpigmentation - Rain drop pigmentation (Brownish)



- Hypopigmentation
- Hyperkeratosis of palms & soles
- Can cause Basal Cell Carcinoma, Squamous Cell Carcinoma.

- Nail
 - Aldrich Mees lines - Transverse white line (Seen with thallium as well)



- Peripheral Neuropathy (Sensory > Motor)
 - Sensorimotor neuropathy: peripheral symmetrical - Glove and stocking type
- Vessels
 - Peripheral thrombosis → Gangrene → "Black foot disease"

Tests

- Marsh, Reinsch (old test)
- New tests
 - NAA (Neutron Activation Analysis)
 - AAS (Atomic Absorption Spectrometry)

Arsenic can be detected in

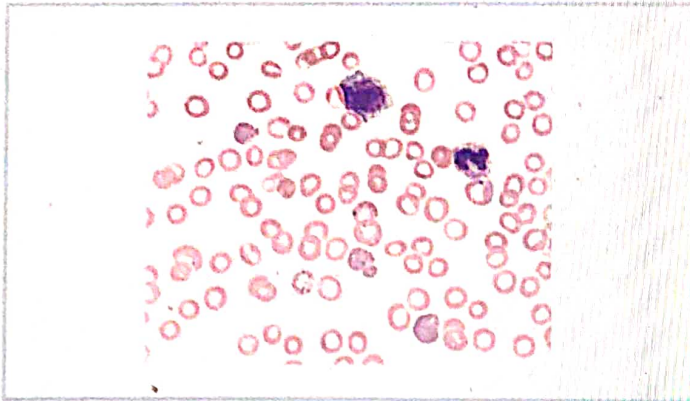
- Decomposed bodies
- Skeletal remains
- Burnt remains

LEAD POISONING

- Most common route in occupational exposure - Inhalational

Toxic compounds	
Organic Lead	Inorganic Lead
<ul style="list-style-type: none"> • Tetraethyl Lead 	<ul style="list-style-type: none"> • Lead Tetroxide (most toxic) • Lead Sulphide (least toxic)

- Chronic lead poisoning - Plumbism / Saturnism
 - A - Anemia - Microcytic hypochromic
 - B - Basophilic stippling in RBC due to 5 - Pyrimidine nucleotidase



→ Blue line in gums (lead sulphide) → **Burtonian line**



→ **Bone line** (lead line) Radiopaque band in Metaphyseal region



- **C** - Colic, Constipation, Cabot's ring
- **D** - Drop (Wrist drop and foot drop)
- **E** - Encephalopathy common in children (particularly tetraethyl lead)
- **F** - Facial pallor (Due to vasospasm) Earlier Sign of Plumbism, **Specific sign of plumbism**
- **G** - Gout (**Saturnine Gout**)

MERCURY POISONING - AKA HYDRARGYRISM / QUICKSILVER

- Seen in Hatters, Glassblowers

Toxic compounds	
Organic Mercury	Inorganic Mercury
<ul style="list-style-type: none"> • Methyl Mercury 	<ul style="list-style-type: none"> • Mercury salt (more toxic) • Mercurous salt

MNEMONIC

- M** - Minimata disease (due to fish consumption containing organic hg)
- E** - Erethism (mad hatters)
- T** - Tremors (Hatters shakes / Glass blowers shakes)
- A** - Acrodynia: Painful pink peripheries / Pink disease / Swift fever disease / Calomel disease (Children affected due to exposure of mercurous chloride)
- L** - Mercuria Lentis (**Deposited in Anterior Lens Capsule**).
- S** - Slit lamp examination - Brown reflex. Vision is normal

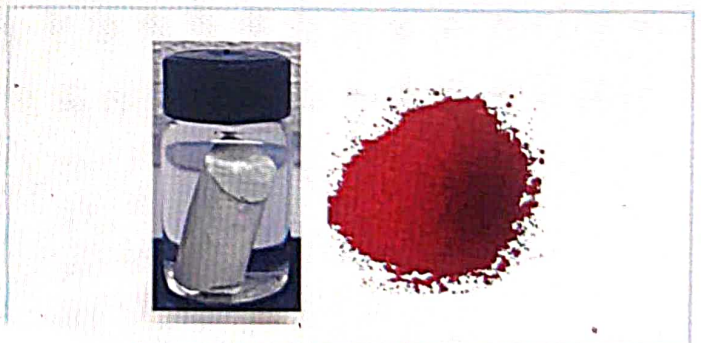
WHITE PHOSPHORUS

ACUTE POISONING

- Toxic
- Luminous vomitus / stools
- Emits fumes
- Smoky stool syndrome

CHRONIC

- Phossy jaw / glass jaw / lucifers jaw
- Osteonecrosis of mandible





Previous Year Questions

Q. Which metal results in "Saturation gout" formation?

(FMGE Jan 2018)

- A. Cadmium
- B. Lead
- C. Beryline
- D. Mercury

Q. Hairs are preserved in which poisoning?

(FMGE Dec 2019)

- A. Arsenic
- B. Manganese
- C. Phosphorous
- D. Alcohol

Q. Which metal results in "Saturation gout" formation?

(FMGE Jan 2018)

- A. Cadmium
- B. Lead
- C. Beryline
- D. Mercury

Q. A 45 year old male came with acute loss of hair in head & madarosis. The wife had given history of behavioral changes. The doctor examined the nails and made the diagnosis. The condition is?

(NEET PG 2022)

- A. Arsenic poisoning
- B. Thallium poisoning
- C. Mercury poisoning
- D. Lead poisoning

16 PLANT IRRITANTS



Ricinus Communis

- Common name - Arandi, Castor



- Active principle: Ricin
- Intact seed - Not toxic, Crushed seed - toxic
- Inhibits protein synthesis

Abrus Precatorius

- Common name - Lunchi, Rati seeds, Crabs eyes
- Active Principle: **Abrin** (Most potent), Abrine, Abraline
- Rati Seeds used to produce **Sui needles**
 - Ideal Cattle Poison
 - Resembles snake bite (Viper)



Semecarpus Anacardium (Marking Nuts / Bhilawa Seeds)



- Active principle
 - Bhilawanol
 - Semicarpol
- Seeds are called as Marking Nuts
- Seeds are used to **produce artificial bruise** with it.

CROTON

- Common name Jamalgota
- Active principle - **Crotin**, Crotonoside, Crotonic acid.



Calotropis



- Common name (AKDO, MADAR)
- Active principal - Calotropin, Calotoxin, Calactin
- Each and every part is toxic

Capsicum Annum

- Active principle - **Capsicin**, Capsaicin.
- Hunan's Hand - Contact dermatitis to chilly powder.





Previous Year Questions

Q. A 32-year-old woman presents to ER with history of ingestion of crushed plant seen (picture). She was treated with stomach wash and active charcoal. She is at risk of developing which of the following electrolyte substance?

(JIPMER May 2019)



- A. Hypocalcemia
- B. Hypercalcemia
- C. Hypokalemia
- D. Hyperkalemia

Q. In a remote village in West Bengal, patients with different gender and age were admitted in the local hospital with complaints of vomiting and diarrhea. On investigation all these people had bought mustard seeds from the same store. Which condition is most likely to be occurred here?

(FMGE 2022)

- A. Epidemic dropsy
- B. Endemic ascites
- C. Aflatoxicosis
- D. Lathyrism

17 ANIMAL IRRITANTS

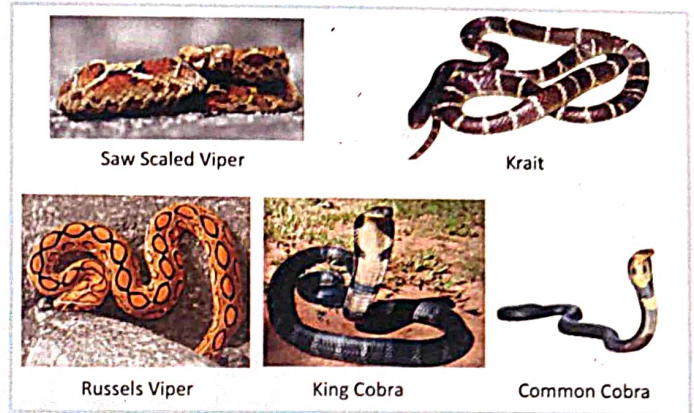


02:36:00

• Study of Snakes: Ophiology

Differentiating points between Venomous and Non-Venomous SNAKES

Features	Venomous	Non - Venomous
Head scales	Usually small except in cobras, kraits and pit viper large Cobra: 3 rd supra labial scale largest Krait: 4 th infra labial scale largest Pit viper - pit	Usually large
Belly scales	Large & cover the entire breadth of the belly.	Small & never cover the entire breadth of the belly.
Tail	Compressed	Not markedly compressed.
Bite	2 fang marks	Multiple small teeth



Symptoms

- M/c symptom - Fright
- Ophitoxemia - Systemic toxicity
- ↑↑ Local symptoms are common with viper, and no local symptoms present with krait bite.
- Neurotoxic symptoms more with elapids
Earliest neurotoxic symptoms - Drooping of eyelids then descending paralysis followed by death.
- Vasculotoxic with vipers
 - Patient has DIC
- Myotoxicity with Sea snakes
 - Muscle tenderness, Necrosis, Renal failure
- Dry bite: No symptoms. More seen with cobra

Treatment

- RIGHT approach (1st AID)
 - Reassurance
 - pressure Immobilization of limb by bandage also known as Sutherland's wrap
 - Get to hospital
 - Tell the toxic symptoms to doctor
- ASV (Anti Snake Venom) Produced from the horse serum.
 - Dose 8 - 10 vials (IV) are usually required at beginning of treatment.
 - IV Neostigmine + atropine: Reversing neurological symptom. Only for cobra bite not for krait bite.
 - ASV is effective in Common Cobra, Krait, Russell's Viper. Saw Scaled Viper.
 - 20 minutes whole blood clotting test
 - Take the blood sample in a vial and check after 20 minutes for the clotting
 - If clotting happens - It is Normal or EIAPID BITE
 - If clotting doesn't happen - Bitten by viper, should be given ASV

VENOMOUS SNAKE FAMILY

Elapidae	Viperidae	Hydrophidae
<ul style="list-style-type: none"> • Neurotoxic <ul style="list-style-type: none"> ○ King cobra (Ophiophagus Hannah) ○ Common cobra (naja naja) ○ Krait (Bungarus Caruleus) ↓ • Neuroparalysis 	<ul style="list-style-type: none"> • Vasculotoxic <ul style="list-style-type: none"> ○ Russel's viper ○ Saw scale viper ↓ • DIC 	<ul style="list-style-type: none"> • Myotoxic <ul style="list-style-type: none"> ↓ • Renal failure • Sea snakes • Resembles Crush syndrome

- BIG 4- Common cobra, Krait, Russels viper (Daboia Russeli) , Saw scaled viper (Echnis carinate) ,
- Anti-snake venom will be effective against them



Previous Year Questions

Q. A man was admitted in the casualty with the following sign. His friends saw laying on the ground. They also saw a snake passing in the area and took a photo of it. The patient died during the course of the treatment. The probable cause of death is? (FMGE Dec 2019)



- A. Shock
- B. Respiratory paralysis
- C. Renal failure
- D. Coagulopathy

Q. A patient with history of cobra bite presents with drooping of eyelids, respiratory difficulty & difficulty in swallowing. 10 vials of ASV already administered. ICU not available. What is the next best thing to be done? (FMGE 2022)

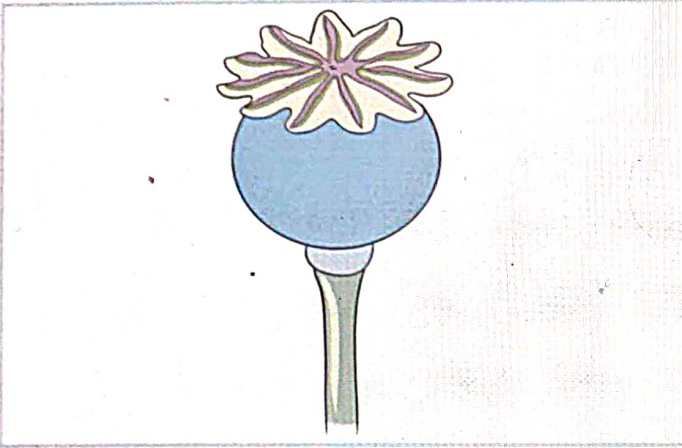
- A. Nebulizer with salbutamol
- B. Atropine with neostigmine
- C. Antihistamines
- D. IV hydrocortisone

18 NEUROTOXIC POISON



CEREBRAL POISON

Opium (Afim, Chandu)



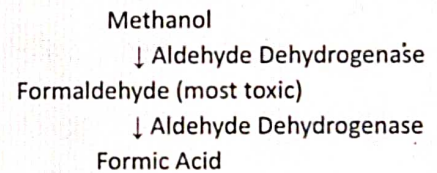
- Derived from plant "**Papaver Somniferum**", after making slits in the unripe capsule and collecting the white milky exudate.
- Poppy seeds - non toxic
- Crude Opium contains all alkaloids

HEROIN

- It is diacetyl morphine
- Other names Smack, Dope, Junk, Tar, Brown sugar
- Main lining: Injection iv
- Skin popping: Injection into skin
- Chasing the Dragon: Inhaling the vapour
- HEROIN + COCAINE: **SPEED BALL**
- HEROIN + STRYCHNINE: **HOT SHOT**

Alcohol

- Ethyl alcohol < Methyl alcohol < Isopropyl alcohol
- Ethanol
 - If blood alcohol contains = 1, then Urine = 1.3, CSF = 1.1, Vitreous = 1.2, Alveolar air = 0.0021 (used for breath analyser by using **Henry's Law**)
 - If blood alcohol is more than **30 mg%** (legal limit) among drivers, it is punishable under 185 MVA (Motor Vehicle Act).
 - Qualitative Tests
 - Kozelka & Hine test
 - Cavett test
 - Quantitative tests
 - Gas liquid chromatography
 - Breath analyser
- **Methanol**: Illicit liquor/ Hooch tragedy



- It is toxic
- Metabolic acidosis due to Formic acid
- OPTIC neuritis - Blurring of vision, Snow Field vision

Treatment

- Ethanol IV
- DOC: Fomepizole
- IV bicarbonate



Previous Year Questions

Q. A chronic alcoholic started experiencing visual hallucinations, talking irrelevant, disoriented, tremors after 48 hrs. of stopping alcohol. The probable condition is?

(FMGE Aug 2020)

- A. Wernicke's encephalopathy
- B. Delirium tremors
- C. Alcoholic hallucinations
- D. Automatism

Q. Inhaling the cloth soaked in drug is?

(FMGE June 2019)

- A. Bagging
- B. Spraying
- C. Huffing
- D. Sniffing

Q. A patient with history of substance abuse has been brought to casualty. The patient had RR 8/ min, pulse 52/min, BP 90/60 mmHg. Pinpoint pupil were noted. Identify the type of poisoning?

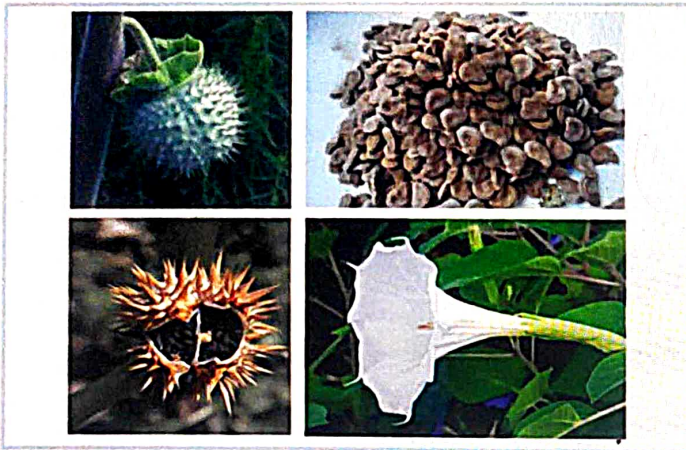
(FMGE 2022)

- A. Morphine
- B. Cocaine
- C. Alcohol
- D. Methanol

19 DELIRIANTS

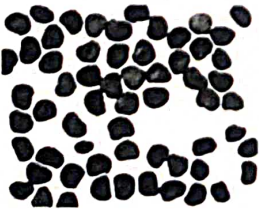



DATURA



- aka Thorn Apple, railway poison and roadside poison
- Commonly used for robbery
- All parts are toxic, seeds are more toxic
- Active principle: Hyoscine (primary), Atropine
- Anticholinergic effects
 - Dry skin
 - Dry mouth
 - Dilatation of pupil (Mc)
 - Delirium
 - Drunken gait
 - Death
 - Retention of urine
- Treatment: Physostigmine

Difference between datura and chilli seeds

DATURA SEEDS	CAPSICUM SEEDS
	
Large and stout Kidney & bean shaped Brown or yellowish brown Numerous depressions on the surface Odourless and bitter	Small & Thin Round Pale Yellow Smooth Pungent and burning taste

CANNABIS

02:58:12

- Hash / Grass / Rope / Pot / Weed



- Active principle: THC (Tetra Hydro Cannabinol)
 - Preparations: Bhang Ganja Charas / Hashish
- ↓ ↓ ↓
 Dried leaves Dried flowers **Most potent**
 Reefers/ Resinous
 joint exudate



- HASH OIL = Most potent form of the cannabis.

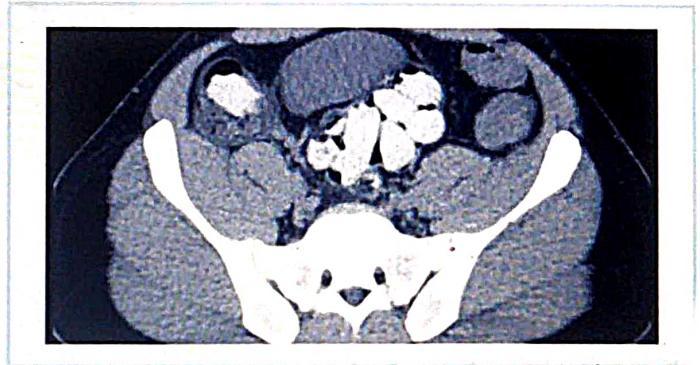
Chronic Cannabis abuse

1. Hemp Insanity/ Hashish insanity - Mania / Psychosis develops to the user
 - RUN AMOK - Person also develops Homicidal impulse, stabbing spree (person will keep on stabbing / killing other people).
 - Person is not responsible for his crime under this influence
2. Amotivational syndrome - Person has no motivation to the work.

COCAINE (ERYTHROXYLUM COCA)

03:03:53

- Aka White lady, Snow, Crack (smokable form)
- Sympathomimetic (↑HR, Sweating, Pupils dilated)
- SNORTING (Sniffing Powder Directly)



Chronic cocaine abuse

- Results in septal ulceration / palatal ulceration
- Black colour tongue / teeth, these are suggestive of chronic abuse.
- Peripheral gangrene

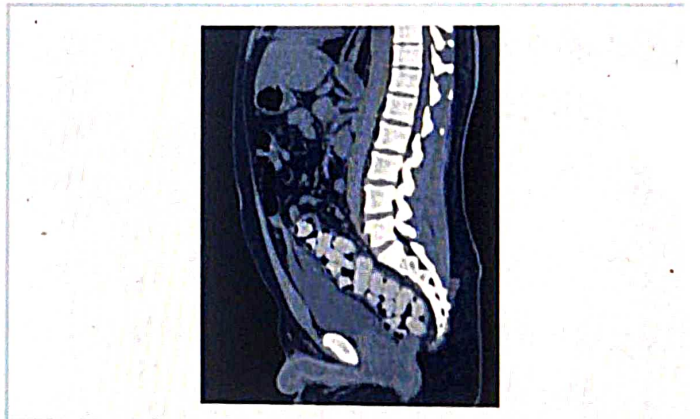
Cocaine bugs/ Magnan's symptoms/Formication

- Tactile hallucination and person feels like multiple insects are crawling on skin.

Body Packer Syndrome

- A mule who swallows drug/packets of cocaine which are used to smuggle, if anyhow ruptures inside the body, leading to rapid absorption of drug into the body and increased symptoms.

- **Diagnosis** - Xray to see the packets
- **Treatment** - Amyl nitrite





Previous Year Questions

Q. Magnan's symptom is seen in?

(NEET JAN 2020)

- A. Datura
- B. Cocaine
- C. Opium
- D. Cannabis

Q. Which of the following causes hypertension?

(INI CET 2022)

- A. Cocaine
- B. Acute alcoholism
- C. OP poisoning
- D. Acute arsenic poisoning

Q. Not a feature of cocaine intoxication?

(INI CET 2022)

- A. Tingling and numbness of hands and feet
- B. Hypertension
- C. Hyperthermia
- D. Constricted pupil & bradycardia

20 SPINAL POISONS



STRYCHNOS NUX VOMICA

03:10:38

- Most Important spinal poison.
- Kuchila seeds / dog's buttons / Quacker's buttons
- 1 crushed seed can be fatal.

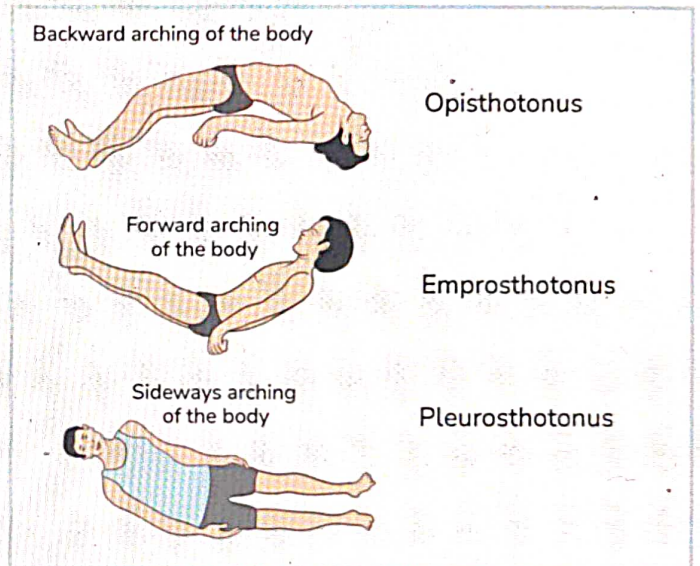


Autopsy

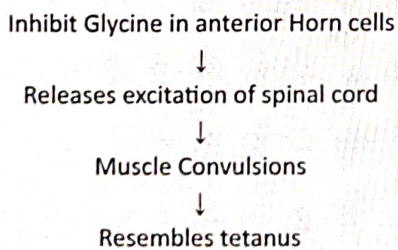
- PM Caloricity is seen.
- Rigor mortis start early, Disappears early

Spinal Postures

- **Opisthotonos** / Hyperextension of spine → M/C posture (Backward)
- **Emprosthotonus** / Hyperflexion
- **Pleurothotonus** / Lateral bending of spine



- Active principle: **Strychnine / brucine / loganin**
- MOA:



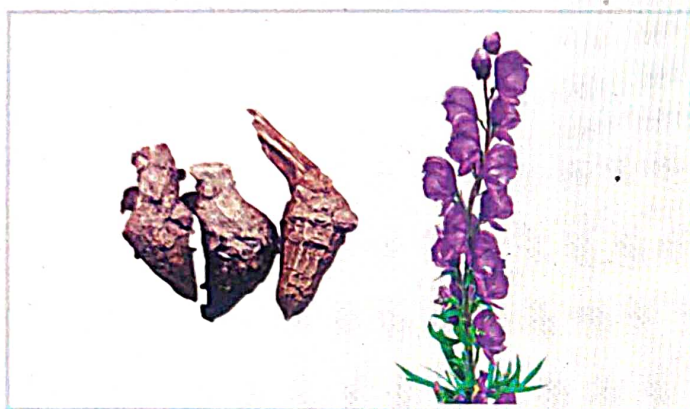
21 CARDIOTOXIC POISONS

- **CAR-DONA**

- D - Digitalis (foxglove)
- O - Oleander: Pink / yellow (Cerbera thevetia)
- N - Nicotine
- A - Aconite

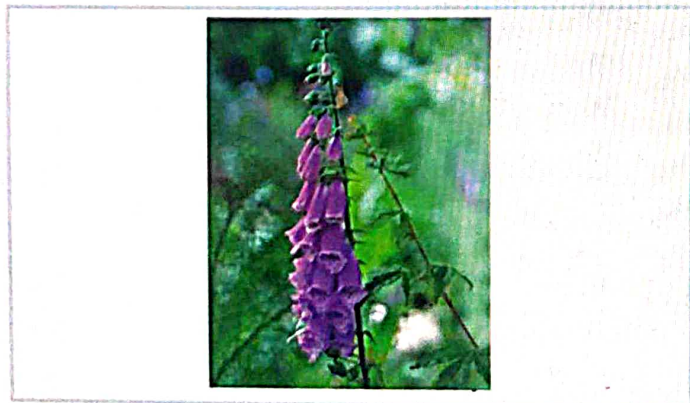
Aconite / blue rocket / monk's hood / Mitha Zaher/devil's helmet

- Root is the most toxic



- Active principle: Aconitine
- MOA: Blocks voltage sensitive Na⁺ channels
- Side effect
 - Paraesthesia over fingers, mouth and face
 - Hippus - Alternate dilatation & constriction of pupil
 - Cardiac arrhythmias: Both bradyarrhythmia & tachyarrhythmias
 - If bradyarrhythmia, Atropine to be given
 - If tachyarrhythmias, Give Amiodarone / or Flecainide for VF
 - Hyperkalemia is seen

Digitalis (Foxglove)



- Active principle - Cardiac glycosides

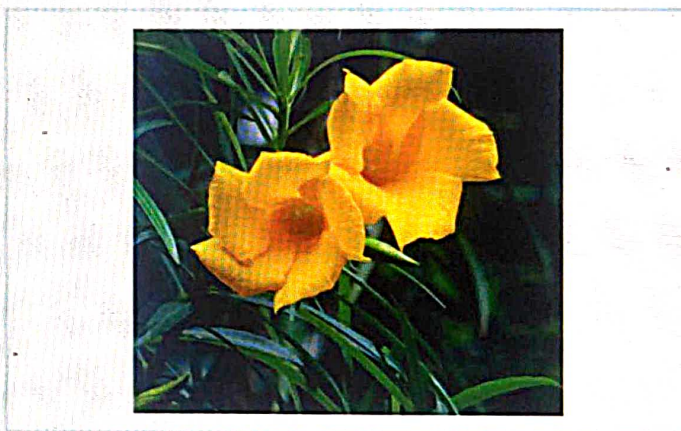
Nerium odorum also known as pink oleander / Kaner

- AP - Folinerin, Oleandrin



Cerbera thevetia / yellow oleander / Pila kaner

- Causes hypokalaemia / hyperkalaemia (cause of death)
- AP - Cerberin, Thevetin, Thevetoxin, Ruvoside, Peruvoside, Nerifolin.



Important Information

- All of them act through Na⁺ K⁺ ATPase pump
- So DIGIBIND is effective for all three of the above.



Previous Year Questions

Q. Choose the incorrect statement regarding the given image?

(AIIMS May 2018)



- A. Causes AV block
- B. Atropine is the antidote
- C. Only root is poisonous
- D. Sweet taste

22 ASPHYXIANTS



03:19:41

	CO	CYANIDE
FORM	gas	Hydrogen cyanide Hydrocyanic acid NaCN and KCN
Odour	Odourless	Bitter almond
Toxicity	210 times more affinity towards Hb	(-) Cytochrome enzyme (ETC)
Anoxia	Anemic anoxia	Histotoxic anoxia
Rx	High flow oxygen	Hydroxocobalamin Lilly's antidote It contains <ul style="list-style-type: none"> • Amyl nitrite • Na⁺ nitrite • Na⁺ thiosulphate Nitrites induces methhemoglobin
Test	Spectrometry Kunkel's test Hoppe- Seyler's test	Lee - Jones test
Hypostasis	Cherry red	Brick red



Previous Year Questions

Q. Among the following which has highest affinity for haemoglobin?
(FMGE 2022)

- A. Carbon monoxide
- B. Oxygen
- C. Nitrogen
- D. Carbon dioxide

23 MISCELLANEOUS



OPC	CARBAMATES	ORGANOCHLORINE	PYRETHROIDS
Irreversible inhibition of AchE	Reversible inhibition	Inhibits nerve transmission	Inhibits Na ⁺ channels
RX= Atropine & Oximes	Atropine	Symptomatic Rx	Symptomatic Rx
		e.g = DDT, ENDRIN	

24 FORENSIC PSYCHIATRY



Lucid Interval

- It is period of normalcy in between periods of symptoms of mental illness
- During this period symptoms of mental illness may be completely absent.
- **Medicolegal importance**
 - Enjoy all civil rights
 - Criminally responsible for unlawful acts.

TESTAMENTARY CAPACITY

- Refers to capacity of a person to make a Valid will.

HOLOGRAPHIC WILL

- Handwritten will written by the person itself.

INSANITY AND CRIMINAL RESPONSIBILITY

Discussed under section 84 IPC

- "Nothing is an offence, which is done by a person, who at the time of doing it, by unsoundness of mind. Incapable of knowing the nature of the act or that, what he is doing is either wrong or contrary to the law"

Durham's rule

- An accused person is not criminally responsible, if his unlawful is the product of mental disease or mental defect.

Curren's rule (1961)

- ✦ Not responsible if he did not have the capacity to regulate his conduct to the requirement of the law.

The Irresistible Impulse Act (New Hamshire Doctrine)

- An accused person is criminally not responsible even he knows the nature and quality of his act and knows that it is wrong.
- If he is incapable of restraining himself from committing the Act.
- Because the free agency of his will has been destroyed by the mental illness

The American Law Institute Test (ALI) 1972

- Appreciate the criminality of his conduct, or to adjust his conduct to the requirements of the law.

Criminal Responsibility in other situation

- Somnambulism - Not liable
- Somnolentia - Not liable
- Delirium Tremens - Not liable
- Run Amok - Not liable
- Kleptomania - Liable
- Hypnosis - Liable

ASSISTIVE REPRODUCTIVE TECHNOLOGY (ART)(2021)

- Government notified on 18th December 2021
- The act seeks to provide for
 - Regulation of ART clinics / banks
 - Prevention of misuse / sale and ethical practice of ART
 - ART research & development.

Definition

- 'Include all techniques that seek to obtain a pregnancy.
- By handling the sperm/ oocyte outside the human body. Transferring the gamete or the embryo into the reproductive system of a women

Authorities

- National ART and surrogacy board
- State ART and surrogacy board
- National ART and surrogacy registry
- Appropriate ART and surrogacy authority

Registration of ART clinics and banks

- Every ART clinics and bank must be registered under the National Registry of Banks and clinics of India.
- Clinics and banks will be registered only if they adhere to certain standards.
- Registration valid for 5 years

Conditions for gamete donation

- Screening of gamete donors
- Semen from males 21-55 years
- Oocytes from females 23-35 years
- She should be married with a living child
- She can donate **only once** in her life time
- Not more than 7 shall be retrieved
- Posthumous collection of gametes
- Only with prior consent of commissioning couple

Conditions for gamete supply

- No mixing of semen from 2 individual
- No cryopreservation without consent
- Prohibition of usage for any other purposes
- No export of gametes / embryos outside India for research

Conditions for offering ART services

- Commissioning couple.
 - Male : 21-55
 - Female : 21-50
- Written informed consent of both the parties
- No sex selection.
- Checking for genetic diseases before the embryo implantation
- Not more than 3 oocytes placed in uterus

Rights of a child born through ART

- Deemed to be a biological child of the couple
- Entitled to the rights and privileges available to a natural child of the commissioning couple.
- A donor will not have any parental rights over the child.

Offences and Penalties

- Sex selection 5-10 years imprisonment, 10-20L fine
- Abandoning the children born through ART
- Trading or importing human embryos or gametes
- Exploiting commissioning couple, woman, or the donors
- Transferring embryo into a male or animal.
- First offence: 5-10L fine
- Repeat offence: 10-20L fine, 3-8 year imprisonment