

FORENSIC MEDICINE MADE EASY

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Salient Features

Covered Topics in Concise Way

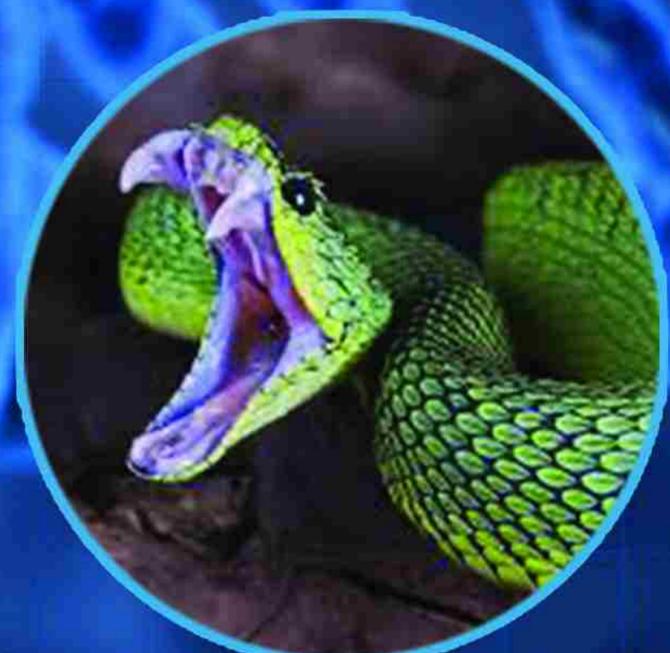
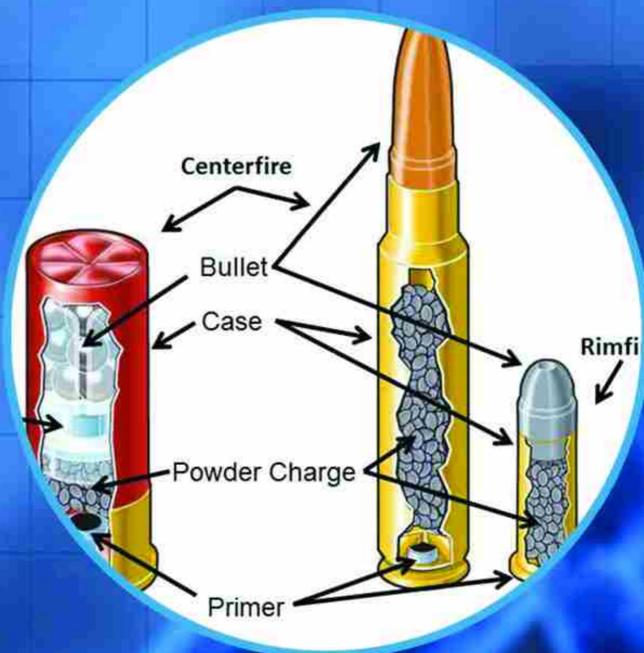
Easy Mnemonics to Remember

Imp. IPCs & Crpc Explained

1200+ Questions with AIIMS & NBE

Tables for Quick Revision

Image Based Questions



ALTIS VORTEX
Books & Publications

Type Of Injuries

▷Abrasions (Gravel Rash) ^Q

- An abrasion is destruction of the skin, which involves superficial layers of epidermis only.
- The exposed raw surface is covered by exudation of lymph and blood, which produce protective covering known as **scab or crust**. ^Q

▷Types of abrasion:

1. **Scratches:** These are caused by a sharp object such as finger Nails, pins or thorn.
2. **Grazed:** They are most common type of abrasion. An abrasion caused by violent lateral rubbing by friction forces. Also known as **brush burn**. ^Q
3. **Pressure Abrasion:** They are caused by impact vertical to skin surface. It is imprint of impacting object. Fingernail abrasion in throttling and ligature mark in Hanging. Bite mark
4. Nails can form **crescentric** abrasion in **throttling**.
5. **Imprint:** They are caused by force applied at or around right angle to the surface of skin. Example: Tyre mark by motor vehicle. (Rough object)
6. **Impact Abrasion and Pressure abrasions are types of Patterned Abrasions** Age of Abrasion ^Q:

Fresh	Bright red
12 to 24 hours	Lymph and blood dries up leaving a bright red scab. ^Q
2 to 3 days	Reddish brown scab.
4 to 7 days	Epithelium grows and covers defect under the scab.
After 7 days	Scab dries shrinks and falls out.

Contusions (Bruises) A contusion is effusion of blood into the tissue, due to the rupture of the subcutaneous vessels, caused due to violence.

- If the part is vascular and loose, such as face, vulva, scrotum, a slight degree of violence may cause a large bruise.
- If the tissue are strongly supported and covered by thick dermis, such as abdomen, back, scalp, palm and soles, moderate violence may produce a small bruise.
- Bruising is more marked on tissues overlying bone.
- Children and old people bruise more easily.
- Stomping - kicking and jumping is known as stomping.
- **In large bruise colour changes from periphery.**

Six penny Bruise - Multiple small bruise on trunk and limbs caused by adult fingertips.

▷Age of Bruise-

At first (1-2 hours)	Red
Few hours to 3 days	Blue
4 th Day	Bluish-black to brown (haemosiderin) ^Q
5 to 6 days	Greenish (haematoidin) ^Q
7 to 12 days	Yellow (bilirubin) ^Q
2 weeks	Normal/original colour

Ectopic bruise (migratory bruise): Site of bruise and site of injury may be different.

Battle sign: fracture of middle cranial fossa causes bruise at mastoid process. ^Q

Raccoon sign (Black eye or Spectacle hemorrhage): Fracture of anterior cranial fossa causes periorcular bruising. ^Q

▷Artificial bruising ^Q is caused by: (PSM)

- P : plumbago
- S : semicarpus anacardium- (marking nut)
- M : mader juice- Calotropis
- **Patterned bruise** are important from a medicolegal point of view, because they can give a fairly good idea of the striking surface. Among the most commonly

encountered patterned injuries are **patterned abrasions**, **patterned bruises** and patterned lacerations. These are so called because these injuries reflect the pattern of the striking surface. Beating with whips having patterned thongs and kicking with boots may leave **patterned bruises** on the body. Whip with patterned thongs may even cause superficial **patterned lacerations**.

Difference between bruise and PM hypostasis:

Bruise	PM Hypostasis
Ill defined margins	Margins well defined
Present over the affected area	Present over dependent area of body
(Whether dependent or not)	
Colour changes with time	No such change
Skin area may be elevated	No elevation of skin
Present even in pressure areas	Absent at pressure areas

Incision test is done to differentiate between hypostasis and bruise. In bruise blood cannot be washed away

Incised wounds Which is longer than it is deep (Sharp weapon)

- Incised wound appears lacerated at loose tissues like scrotum, axilla. (**Incised looking laceration**)^Q
- Incised wounds are deeper at their beginning. Towards the end of the cut, the wound becomes shallow, called **tailing** of the wound, which indicates direction.^Q
- Cut tissue and cut Hair Follicle (by Magnifying Lens)
- A clean incised wound heals **by primary intention**.
- When loss of tissue and bacterial contamination is there it is by **secondary intention**

▷Age of Incised wound:

Fresh	Hematoma formation
12 hours	Edges are red, swollen, and adherent with blood and lymph
24 hours	A continuous layer of endothelial cells cover the surface and edges are formed. ^Q
36 hours	The capillary network is complete. ^Q
48 to 72 hours	The wound is filled with fibroblasts ^Q
3 to 5 days	Definite fibrils running parallel to the vessels are seen, vessels Show thickening and obliteration. (Collagen Fibrils)
1 to 2 weeks	Scars tissue is formed.

Hesitation marks or tentative cuts or trial wounds: They are cuts which are multiple, small and superficial, often involving the skin and seen at the beginning of the incised wound. They are **seen in suicidal wounds**.

Incised wound on genitalia suggestive of homicidal wound. ^Q

▷Stab or Puncture wounds ^Q

- Most important dimension in stab wound in **depth**
- Punctured wound is deeper than its width and length on skin.
- **Fish Tailing:** if a single edged weapons is used, the surface, triangular or wedge shaped one angle of the wound will be sharp, the other blunt or torn. ^Q
- **Double edged weapons** produce **spindle shaped** wound ^Q
- **Line of lancers** are important lines for shape of stab injury.
- Cavity deep stab- **penetrating wound**
- Through and through – **perforating stab wound**
- **Hilt bruise or abrasion** can be seen if **knife has been fully plunged** in the victim with great force.

Wound of Entry

The wound of entry is generally bigger than the wound exit because the stabbing weapon so often has a tapering tip. Clothes may be pushed into the wound entry.

- **Shape:** It may sometimes correspond to the blade of the weapon used. Thus, it can be of following types:

1. Tear drop shaped

2. Wedge shaped

3. Spindle shaped



The occurrence of stab wounds in a paired pattern suggests the use of a two pronged sharp weapon such as a fork, pair of scissors etc.

- **Harakiri:** ^Q
 - A. Traditionally practiced in Japan
 - B. Unusual type of suicide
 - C. Victim inflicts a stab wound on his abdomen, pulls out intestine
 - D. Cause of death is sudden cardiac collapse due to fall in intra-abdominal pressure (Syncope)
 - E. It is also known as seppuku.

▷Lacerations or Tear (By Heavy Blunt Force)

Lacerations are tears of skin, mucous membrane muscle or internal organ produced by application of blunt force to the broad area of the body

- **Tear:** The most common and frequently encountered is the tear. This is the most general kind of laceration. It has ragged and bruised margins and is caused by a heavy blunt weapon such as a cricket bat, a hockey stick or a lathi acting upon an

area of a body where there is sufficient amount of underlying fat and muscle, as on a thigh Margins are Irregular but in

Split Laceration: Incised Like or incised looking Wounds. The skin are the scalp, eyebrows, cheekbones, lower jaw, iliac crest, perineum and skin ^Q

Difference between incised looking (lacerated) and Incised wound (Magnifying Glass* is used)

1. In lacerated wound, there are characteristic Tissue Bridges (crushed tissues) present, when the margin are separated due to crushing of hair bulbs, blood vessels etc.
2. The margins are irregular as compared to incised wound.

▷Type of Lacerations

1. **Split Laceration: Incised Like or incised looking Wounds.** The skin are the scalp, eyebrows, cheekbones, lower jaw, iliac crest, perineum and shin ^Q

2. **Stretch laceration- Tangential Blunt Force**

3. **Cut laceration:** This type of laceration is produced by heavy cutting weapons such as a chopper, Axe, hatchet or meat cleaver. This wound may be visualized as a "cross" between a true laceration and a true incised wound. The edges of the weapon do cut the skin, but since the edges are heavy, they crush and bruise the margins of the wounds too. The underlying bones are frequently found fractured. This indicates that a heavy weapon was used. These wounds are often known as **chop wounds**.

Chop wound has features of Both laceration and Cut wounds but because of heavy base gapping is more.

5. **Avulsion- Separation of Tissue**

6. **Tear**

7. **Cut laceration**

- **Explanation -Avulsion** is a type of laceration in which a large area of skin may be separated from underlying attachment and lost (large laceration devoid of any skin)
- If attached with any point - **flaying**
- Superficial laceration on the back by whipping with a cycle chain is a example of **patterned laceration**

Direction of Force: Laceration usually curved and the **convexity points** towards the direction

▷Defence Wounds

Immediate and instinctive reaction of the victim to save himself, either by raising the arm to prevent the attack or by grasping the weapons. (Knuckle, wrist)

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

Self-suffered wound are those, which may be produced by a person on his own body or by another with his consent.

Fabricated wounds are fictitious, forged or invented wounds

Sequence of enzyme/ biochemical markers rising after injury: ^Q

Tissue cathepsin	T	5- 10 min
Serotonin	S	10 min
Histamines	H	20-30 min
Esterase and ATPase	A	within 1 hours
Aminopeptidase	A	2 hours
Acidphosphatase	A	4 hours
Alakaline phosphatase	A	6 hours

Raekilo conducted the study to find out histochemical changes in wounds.

► **FEW IMPORTANT POINTS:**

1. Type of torture

A.	Dry submarino - covering the face of victim with a plastic bag
B.	Planton - forced standing
C.	Picana - electrical torture
D.	Falanga/Bestinado - beating of soles
E.	Telefono -repeated slapping of the sides of the head of the victim (ears)
F.	Black Slave -Insertion of hot metal rod in anus
G.	Quirafano -hitting on the adbomen
H.	Parrot Perch -Suspending from a pole placed under the knees, with the wrists bound to the ankles
I.	Bellary -A stick smeared with red or green chilly paste is thrust into the anus
J.	Plestinian hanging/crucifixion -Binding the prisoner's hands behind his or her back. As fatigue sets in the person falls forward, putting full body weight on the shoulders, this impairs breathing, leading to death.

2. **Ewing's Postulates** ^Q: These postulates should be satisfied before a relationship between Trauma and new growth is accepted

3. The minimum amount of air to **cause fatal air embolism** in adult is **100 ml**

4. The minimum amount of fat necessary to **cause fat embolism** is **12-120 ml**.
5. Mortality rate in fat embolism- **10-20%**
6. **Felony** term is not used in India it is a term for serious crime. (U.K.)
7. **Test for air embolism - water test, pyrogallol test**

▷ **FIREARM INJURIES (BALLISTICS)--- Father of Ballistic- Calvin Goddard**

- **External forensic ballistics** – study of the motion of projectiles ^Q
- **Internal ballistics-** study of interaction of projectile until the bullet exits from the barrel. ^Q

▷ **The effect on the target: Terminal ballistic**

Rifled	Smooth Bore
In rifled fire arm there are groove and land presents in the bore	The bore of shot gun is smooth.
L---L= caliber is the distance between two diagonally opposite lands	Bore
The projectile in the cartridge of rifled weapon is Bullet	Projectiles in the cartridge of short gun are short Pellets.

Number of balls/pellets of equal size and weight as can be made from 454 gms. (1pound) of lead ^Q

Example: A 12 bore gun technically means 1/12th pound of lead will exactly fit the bore of gun.

▷ **Rifling provides:**

• Spin and rotation to bullet	Increase accuracy and range
• Checks wobbling	Gyroscopic stability
• Enhance wound power	

Different ranges of fire-arm:

TYPE	Range
Shot gun (Smooth Bore)	50 yards ^Q
Rifle	1000-3000 yards ^Q
Pistol	400 yards ^Q
Revolver	200 yards ^Q
Air gun	40 yards

▷ **Cartridge of shot gun has** ^Q **(FDC)**

A. Percussion Cap/ Detonator cap

B. Propellant(Gun Powder)

C. Cardboard disc

D. Felt wad (helps in lubrication, separate projectile from propellant)

E. Lead shot

F **Musket** is a smooth bored long-barreled old type military gun. ^Q

G. **Carbine** is a short barrel rifle

H. **Paradox Gun**-When the muzzle end of the shot gun is rifled it is called Paradox Gun. ^Q

I **Revolver**

J. **Related fact:** Revolvers never eject cartridge cases. The remaining 3 categories (pistols, shotguns and rifles) all include semi-automatic or automatic versions which eject on firing. But it is useful to remember that all these 3 categories also include versions which are not automatic and thus do not eject on firing.

- Revolver is the only weapon which never ejects cartridge.
- **Air rifle and Air pistol**
- In these, compressed air is used to fire lead slugs.
- Empty cartridges are ejected out from automatic pistol

Primer-

Primer (BLAST)

B - Barium nitrate

L - Lead Styphnate

A - Antimony

S - Sulphide

T - Tetrazine

Antimony Sulphide, Barium Nitrate & Lead Styphnate are used as primers. ^Q

- Primer on pressure detonates and ignites gun powder

Black gun powder consists of

P- Potassium nitrate (75%)

C- Charcoal (15%)

S- Sulphur (10%)

Potassium nitrate-Oxidizing agent

[**Dermal Nitrate Test/Paraffin Wax test/Diphenyl Amine Test** is done to detect presence of gun Powder on hands of the persons who has fired the Gun] ^Q

- **Sulphur**- Increase density by acting as binding agent
- **Charcoal-fuel**
 - The principle residues formed after burning the black powder are potassium sulfate and potassium carbonate.

[NB: FG "Fine Grain" denotes the fineness of Gun Powder particles, more F's quicker it will burn] ^Q

Smokeless Powder ^Q

- Nitrocellulose (**single base**)
- Nitroglycerine and nitrocellulose (**double base**)
- Nitroglycerine, nitrocellulose & Nitro guanidine (**triple base**) ^Q

It produces much less flame and smoke and are more completely burnt than black powder

- **Detection of gun powder residues are done by** ^Q
- **Mn- HAND**

- **H - Harrison Gillroy tesy**
- **A - Absorption Spectrometry**
- **N - Neutron activation analysis**
- **D - Dermal Nitrate test**

A. **Paraffin test** (dermal nitrate test) =

B. **Harrison and Gilroy test** ----ANTIMONY, BARIUM, LEAD

C. **Neutron activation analysis (NAA)** -----ANTIMONY AND COPPER

D. **Atomic absorption spectroscopy (AAS)** -ANTIMONY BARIUM AND COPPER

E. Flame-less Atomic absorption spectroscopy(FAAS)

F. Scanning electron microscope- energy dispersive x-ray analysis (SEM-EDXA)

►Bullets

- Bullet is made up of **lead**.
- The extent of muscles damage by a bullet depends primarily on the velocity Kinetic energy = $\frac{1}{2} MV^2$

So destruction caused by bullet is more dependent on velocity than mass.

- Large round bullet causes greater damage to the body
- A bullet is picked up with **hands** ^Q

▷Types of Bullets

- A **dum dum bullet**, tip is chiseled out, which fragments extensively upon striking. ^Q
- **Express bullet** -Bullet in which a hole is present. ^Q
- **Tracer bullet** Powder in the base so that it burns brightly and leaves a visible track^Q
- **Incendiary bullets: it is a type of tracer bullet which** contain white phosphorus.
- **Souvenir bullet**-when the bullet remains in body for a long period. It causes chronic lead poisoning.
- **Glancing of bullet** causes gutter fracture. ^Q
- **Frangible Bullet** – Fragments on hitting the target
- **Piggyback bullet**- This bullet is pushed by another bullet (piggy back bullet. In Tandem cartridge 2 bullets are present in same cartridge which enters the target at different points. ^Q

K. Wounds from shot-gun (Suggesting Range):

Shape of wound:	Distance:
Cruciate or Stellate shape	Contact over bone
Oval Shape	Upto 30 cm
Rat hole wound	30-100 cm
Satellite wound	More than 2 meters
Individual pellets	Over 4 meters

} → ORS

Firearm Injury (Ranges)	Caused by
Tattooing of intermediate Range Firearm injury. ^Q	Unburnt gun powder (Not wiped)
Blackening	Smoke/ Soot (Wiped away)
Burning/ Singeing of hairs (Scroching)	Flame

Useful mnemonic to remember commonly accepted ranges of burning, blackening and tattooing in various firearms: ^Q

Type	Burning and singeing	Blackening (×2)	Tattooing (×2-×3)
Pistol and revolver	3"	6"	12"-18"
Rifles	6"	12"	24"-36"
Shotguns	12"	24"	48"-72"

▷Bullet is picked up with hands because fired bullet has

1. **Primary Marking** manufacturing specification. It helps in identification of gun.

4. The puppe's rule is used to determine

- A. The gun from which the shot was fired
- B. The distance from which the shot was fired
- C. The sequence in which the shots were fired
- D. Whether the shots were accidental, homicidal or suicidal in nature

5. Gunpowder and/or soot on blood stained garments can be visualized by (F)

- A. Magnifying lens
- B. UV rays
- C. Infrared rays
- D. Xrays

6. Kennedy phenomenon deals with:

- A. Evaluation of exit and entry wound
- B. Evaluation of burn wounds
- C. Effects of poisoning on stomach mucosa
- D. Estimation of fetal age