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AimExcellence Series

FORENSIC MEDICINE & TOXICOLOGY

State PG 2016 + AIIMS + PGI + JIPMER (Recall) Questions 2016

Highlights

NRMT TEST (50 Q no-repeat MCQ tests)
==> Recent Pattern Questions
==> Pictorial Questions
==> Recent AIIMS and JIPMER Q/A
Useful in ==> NEET/NEXT (proposed examination by GOI), AIIMS, DNB, JIPMER, PGI, FCPS, Nepal Medical Council Examination, 2nd MB MBBS
—Color plates for the students' better understanding



SnarayanM

Editor
M Saha

JAYPEE

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Color Plates

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3

Mechanical Injuries

MECHANICAL INJURIES → ABRASION
• Synonym → GRAVEL RASH • Affect → superficial layer of skin
• **TYPES** → [**!! PIGS**] • SCRATCH → linear • GRAZE → **MC++;** Gravel rash; RTA • IMPACT • PRESSURE
• [PRESSURE + IMPACT] → PATTTERNED ABRASION
• Point abrasion → variant of SCRTCH
• ANT bite marks → D/d of antemortem abrasion**

COLOR CHANGES (ABRASION)	
• FRESH → red • 12–24 hours → reddish scab • 2–3 d → reddish brown scab • 4–7 d → abrasion starts healing (from PERIPHERY)++ • 7–10 d → scab dries, falls off • 10–12 d → healing complete, skin back to normal color	
ANTEMORTEM	**POSTMORTEM**
• Vital reaction, inflammation, enzyme → +nt • Anywhere in body	• -nt • Over bony prominences

CONTUSION (BRUISE)
• TRAUMA due to BLUNT subject • Extravasation of blood • At and around area of injury • Superficial bruise → develop immediately • Deep bruise → 1–3 days

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CONTUSION (BRUISE)

COLOR CHANGES

- Bruise turn <u>smaller with time</u>
- Become small from <u>periphery to center</u>

- First → RED (oxyHb)
- Few hours–3 days → blue (reduced Hb)
- 4th day → Bluish black to brown (haemosiderin)**
- 5–6 d → greenish (hematoidin)
- 7–12 d → yellow (bilirubin)
- 2 weeks → normal (absorption of pigment)

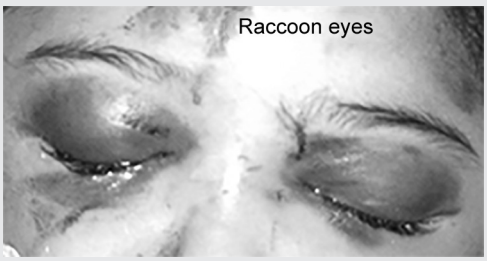
SPILSBURY PHENOMENON++
→ appearance of deep-seated contusion on surface
→ After DEATH++

- ECTOPIC BRUISE
- SITE of injury and bruise are different

- **RACCOON EYES** → fracture anterior cranial fossa**
- **Battle sign** → Behind EARS → fracture middle cranial fossa



(For color version, see Plate 4)



(For color version, see Plate 4)

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ARTIFICIAL BRUISE
• → Caused by [**!! CAPS**]
• Calotropis
• Semecarpus anacardium
• Plumbago
• BRUISE + ABRASION → **Contused abrasion++**
• BRUISE + LACERATION → **Contused lacerated wound++**

AM bruise	PM bruise
• Swelling, inflammation, vital reaction, color changes → +ve	• → -ve
• Color → **nonuniform**, pale at center	• → uniform
Contusion	**PM lividity**
• Subepidermal++ • Rupture of capillaries, due to rupture of blood vessels++ • Anywhere in body++ • Incision → bloody area → due to extravasated blood++ • **Color changes** → seen** • Blood → <u>can not be</u> washed away++ • AM/PM**	• Epidermal++ • Stagnation of blood in toneless dilated capillaries++ • Only in <u>dependent body parts</u>++ • Incising → oozing point → due to cutting of capillaries++ • No <u>color change</u>** • Easily washed away • Only PM
• Medicolegal importance • To know <u>nature and age</u> of injury • Type of weapon used	• **<u>Time</u>** since death • Position of dead body/whether shifted or not

Features	Artificial Bruise	True Bruise
Cause++	Calotropis, semicarpus anacardium, plumbago** [**!! CAP**]	Trauma
Appearance++	Irregular shape with regular margin	Round shape, irregular margin
Content++	**Acrid serum**	Blood

Laceration
• Split of skin/mucous membrane and underneath tissues
• Hair, nerve, blood vessels are crushed**
• Site of injury = site of impact
• Size of injury not correspond to impacting surface

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Types

- Split/stretch/cut/avulsion/tears **[!! SS–CAT]**
- Flaying → type of avulsion**
- Split laceration → incised looking/like wound**



(For color version, see Plate 4)

Incised wound

- **LENGTH** → greatest dimension
- **WIDTH > thickness of blade** → due to gaping of wound
- Langer's line → determine gaping
- Gaping → more—when across Langer's line
- Margins → everted, clean cut, clear
- Clean incised wound → heals by → primary intention**
- **Hesitation cuts** → characteristic → SUICIDAL ATTEMPT**
- Nose, ear, genitals → incised wound → HOMICIDAL**

Split laceration [@*]	**Incised wound**
• Heavy, hard, blunt object • Common cause of death → injury to internal viscera • Site of injury → overlying BONES** • Size of injury → not correspond to impacting object	• Sharp-edged object • Hemorrhage from cuts of blood vessels • Anywhere • Corresponds
• Muscles, blood vessels, nerves, hair bulb → **crushed**	• Cut

Chop wound = slash wound

- Different type of incised wound
- By heavy sharp cutting object → Axe, Sword

STAB WOUND

- By sharp-pointed object
- **DEPTH** → greatest dimension**

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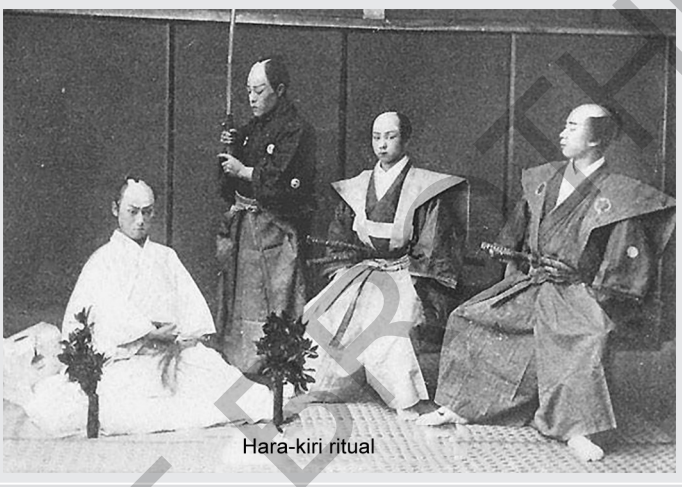
- **Puncture**
- **Penetrated** → pierce in to body cavity
- **Perforated** → wound of entry and exit → both presents
- **Concealed puncture wound** → puncture by pin++

- Suicidal stab wound of thorax → exclusively over **heart++**

- **HARA-KIRI/SEPPUKU++** → abdomen punctured in sitting position
- → **JAPANESE ritualistic suicide++**
- → Sudden fall of intra-abdominal pressure → collapse → death



Hara-kiri ritual

STAB WOUND → **BACK** → homicidal++

Features	AM (Antemortem) wound	PM wound
Hemorrhage	• Arterial • Copious • Staining of edges can't washed away	• Venous • Slight • Easily washed away
Clot	Have PLATELETS	PLATELETS → -ve
Blood clot	Laminated Firm, rubbery and variegated Firmly adherent to lining of **endothelium**	• Nonlaminated • Soft friable • CHICKEN FAT (yellow)** • **CURRENT JELLY** (red)** • Easily washed away
Wound edge	Everted, swollen	Apposed, not swollen
Vital reaction, inflammation, enzyme, serotonin, histamine	+nt/raised	-nt/not raised

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FIREARM

- FORENSIC BALLISTIC → study of firearm and their investigation
- FIREARM → 4 parts → [**!! BAGuM**]
- BARREL → proximal (BARREL END) and distal (MUZZLE END)
- ACTION →[**!! FTb**]
- → FIRING PIN
- →TRIGGER
- →BREECH BOLT
- GRIP
- MAGAZINE

Types

- SMOOTH BORE → [**!! MMS**]
- Muzzle loaders
- Masket
- Shot gun
- RIFLED (longitudinal twisted groove)
- Pistol
- Revolver
- Rifle

Pistol and revolver → Hand guns

CARTRIDGE

4 PARTS

- Wads
- Projectile
  - → SHOTGUN → lead shots and pellets
  - → RIFLE → bullets

[Tip of bullet → **NOSE++**]

- Propellant (gun powder)
- Cartridge case

CARTRIDGE CASE

- SHOTGUN → cylindrical
- RIFLED WEAPON → tapering
- Made of BRASS/STEEL
- PERCUSSION/DETONATOR CAP → center of base**
- **PRIMER** → made of potassium chlorate, Hg fulminate, Ba nitrate, tetrazene++

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PROPELLANT (GUN POWDER)

- **CLASSICAL** → [**!! KCS**]
- KNO_3 (75%) + CHARCOAL (15%) + SULPHUR (10%)**
- Called BLACK GUN POWDER**
- Depending on fineness → FG; FFG; FFFG (F= fineness; more F → more finer)**
- Pyrodex → Gunpowder with same component, albeit, different ratio++
- SMOKE producing

SMOKELESS GUN POWDER**

- Black powder + nitrocellulose [single base]
- Black powder + nitrocellulose + nitroglycerine [double base]
- Black powder + nitrocellulose + nitroglycerine + nitroguanidine [triple base]

PROPELLANT

- SHOTGUN → lead shots and pellets
- RIFLED WEAPON → bullets

WADS

- In cartridge of shotgun
- **FELT WADS**
  - → Wad made of felt
  - → Lubricates the bore

WADS → function

- Separates PROJECTILE from PROPELLANT
- Seal BORE effectively
- Prevent gas from escaping
- Allow optimum pressure to develop

CHOCKING of SHOTGUN

- Constriction of barrel near muzzle (distal) end
- Commonly amounting no more than 1 mm++
- Full choke (1 mm); ¾ th; ½; ¼th CHOKE++
- TRUE CYLINDER → Unchoked shot gun

FIREARM WEAPON

- LOADING → loaded in **BREECH** END; MUZZLE LOADING → obsolete now
- COCKING
- FIRING

TISSUE DAMAGE → depend on Ek = ½ Mv2 → dependent on velocity of bullet**

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	SHOT GUN	MUSKETS	AIR GUN	RIFLE	REVOLVER	PISTOL
MUZZLE VELOCITY**	1000-1200 ft/s	1700 ft/s	400-700 ft/s	2500 ft/s	600-800 ft/s	1200 ft/s
EFFECTIVE RANGE	60-70 yards	150 yards	30 yards	600 yards	100 yards (90 m)	100 yards
PROJEC-TILES**	Multiple pellets	Single large pel-lets	Lead slug	Single bullet	Single	Single

- **Destructive power of bullet = ½ Mv^2 (= dependent on Velocity)****

Firearm wounds

- Due to
  - PROJECTILE (bullets/pellets)
  - Association of projectiles
- Projectiles
  - Entry and exit wound
  - Abrasion/contusion collar
- Association of Projectiles [**!! FWGS**] [**][++]
  - Fire and → burning of hair/cloth
  - Heat → scorching/charring of skin
  - Wads (only shotgun) → impact abrasion/contusion
  - Gunpowder (burnt and unburnt) → Tattooing
  - Smoke and carbon particle → blackening
- PLUS

BLAST EFFECT → formation of gas under pressure**
Cherry red color → CO - Hb**

RANGE of firing [!! 2CML]

- CONTACT (/near contact) SHOT
- CLOSE SHOT → up to 6 inch
- MID (/near) RANGE SHOT → 6 inch–6 ft/2yards
- LONG RANGE SHOT → > 2 yards
- **POINT BLANK** → within 8 cm++
- **Within 2 yards** → entry wound characteristics similar for RIFLED and SHOT GUN++
- SHOT GUN—only ENTRY WOUND (generally)**
- RIFLED WEAPON—BOTH ENTRY and EXIT**

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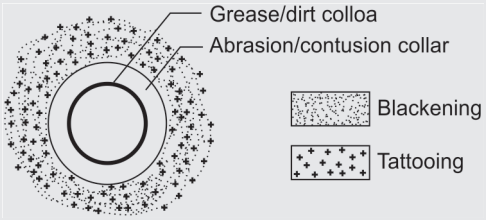
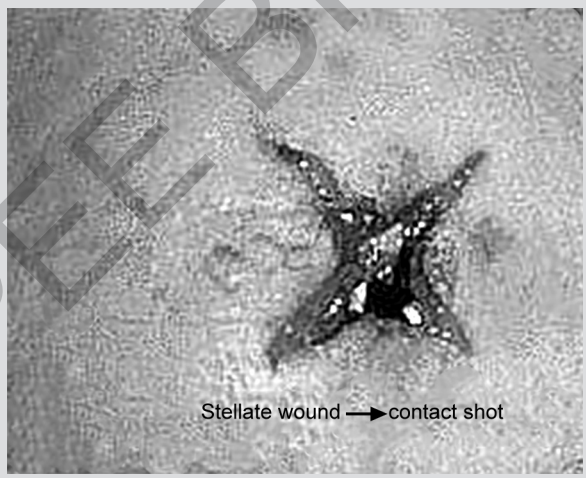
Grease collar/Dirt collar

- Carried lubricant from the barrel of firearm on the projectile



CONTACT SHOT

- All discharge in **one track** (if pure CONTACT SHOT)**
- Some discharge around ENTRY WOUND → if GUN recoiled/near CONTACT SHOT
- Characteristic of ENTRY WOUND (<u>absolutely dissimilar</u> than other 3 types)
  - ENTRY WOUND
  - → everted
    → Larger than EXIT wound
    Larger than size of PROJECTILE
- ENTRY WOUND → STELLATE/CRUCIATE**



(For color version, see Plate 4)

- While deciphering the characteristic of any kind of wound, things one should keep in mind, the [cause → effect] relationship, it will enable one to understand the wound characteristic easily

TRUE CONTACT SHOT

- Burning
- Scorching

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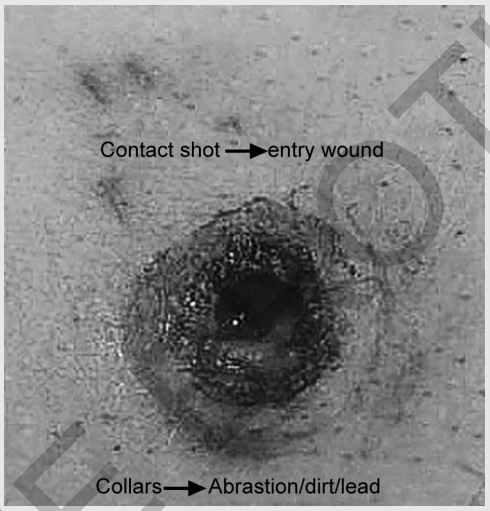
- Abrasion collar
- Red track (CO-Hb)**
- Blackening/smudging
- Tattooing
- → All will be inside the track

- Additional findings

- SKULL

- Outer table → CLEAN CUT hole**
- INNER table → BEVELLED opening**



(For color version, see Plate 4)

GAS

- **Blast effect****
- Laceration of deeper tissue
- Burst opening of skull**
- Fragmentation of bone

NEGATIVE PRESSURE at MUZZLE END

- **BACK SPATTER** → hair, tissue, blood → enter MUZZLE END**

MUZZLE END imprint abrasion

WADS → present inside the wound

CLOSE CONTACT SHOT

→ Up to 6 inch (= 15 cm)

→ Range of FLAME (++) more specific

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- SINGLE wound
- INVERTED margin**

- Burning
- Scorching
- Tattooing
- Soiling
- Abrasion (around wound)

- CHERRY RED COLOR → wound track and adjoining tissues

3 COLLARS [!! AGLy]
→ (yes, know it's UGLY → but a mnemonic, not spelling mistake ☺]

- **ABRASION/CONTUSION** → due to PROJECTILE → OUTER MOST
- **DIRT/GREASE** → DUST (atmospheric) + OIL (barrel)
- **LEAD** ➔only in NAKED bullet → lead particle internal to dirt collar
  [encircling around ENTRY WOUND → OUTSIDE → INSIDE]

NEAR/MID RANGE SHOT (6 inch → 6 ft)
• Outside range of HEAT and FLAME → **no** BURNING and SCORCHING
• BLACKENING and SMUDGING/FOULING → till 30 cm++ • TATTOOING → till 90 cm++
• **SHOT GUN** – → Pellet holes → increases with distance – → EDGE of WOUND → **RAT HOLE++**

LONG RANGE (Beyond 6 ft)
• RIFLED WEAPON • Bullet wound → 1** • 3 collar (**!! ADiL**) – Abrasion – Dirt – Lead
SHOT GUN
→ WADDING injury → till 5 yards++

ENTRY	EXIT
• Smaller • Inverted (except **CONTACT SHOT**) • Abrasion/grease/lead collar → +nt • Burning/scorching/tattooing/smudging/pink coloration (CO-Hb) → +nt	• Larger • Everted • -nt (abrasion +nt in certain scenarios) • → -nt

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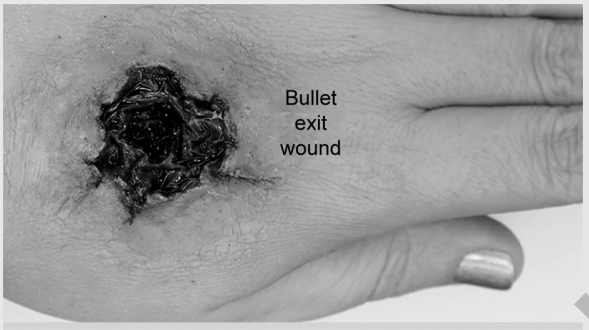

(For color version, see Plate 5)

SHORED (SUPPORTED) EXIT WOUND

- When EXIT WOUND is SUPPORTED → appears as CIRCULAR/nearly CIRCULAR defect surrounded by ABRASION (usually BROADER) → mimicking ABRASION COLLAR at ENTRY WOUND

GUTTER WOUND [SKULL]

BULLET → striking → but not entering the skull

FISSURED FRACTURE → radiating from DEFECT

IRREGULAR LACERATION → involves **LEPTOMENINGES++**

IDENTIFICATION of WEAPON

By

- SSC (size, shape, composition) + primary and secondary marking on bullet
- Appearance of wound
- PRIMARY MARKING
  - → identify **make and model** (M&m) of weapon**
- SECONDARY MARKING
- → BULLET fingerprint
  - Specific for particular weapon
  - MC in LEAD and JACKETED bullets

#EXTRA

- Found in CRIME SCENE → **EXHIBIT bullet++**
- Compared with TEST BULLET (shot in **BULLET TRAPS /RECOVERY TANK**)

#EXTRA POINTS

- **Ricocheting bullets****
  - **External ricocheting** → deviated before entering the body
  - **Internal ricocheting** → bullet hitting BONES inside body
- **KENNEDY PHENOMENON****
  - → Sx and suturing → make it difficult to identify it's EXIT/ENTRY WOUND

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SIGN	SIGNALS
[**]	Past questions asked in exams
[++]	Imp NEW points/potential future questions
Underlines/bold	Must notice
[^^]	Other subject info
[!!]	Mnemonics
[@*]	Important for MBBS exams (written + practicals)[FSM]

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