Fire arms-II

Medico legal aspects

DR. SHARAD PORTE

MD (Agat-Tantra & VHA)

- Wounds produced by rifled weapon:

Type of Firearm Wound

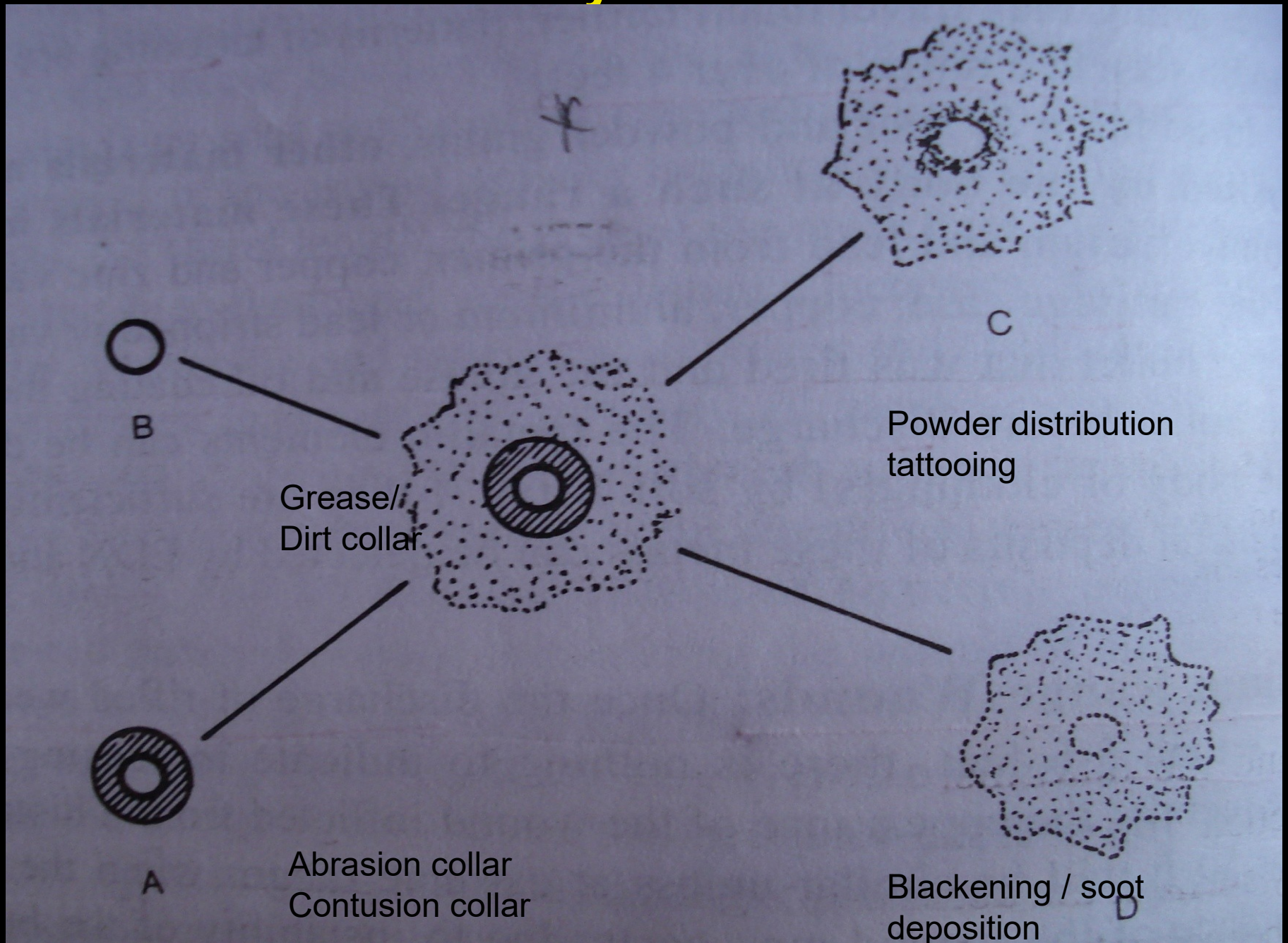
- Entry wounds:

- Exit wounds:

Entry wound:

1. Contact wound:-
2. Loose Contact wound
3. Close range wound:-
4. Intermediate/short range wound:-
5. Distant range wound:-

Entry wound


C
B
Powder distribution
tattooing
Grease/
Dirt collar
A
Abrasion collar
Contusion collar
Blackening / soot
deposition
D

Contact wounds:

- 1: Hard/Firm contact with the skin-
  - Over the shallowly situated bone:
  - Not over the shallowly situated bone:
- 2: Loose contact:
- 3: Angled contact wound:-
- 4: Incomplete contact wound- on uneven surface

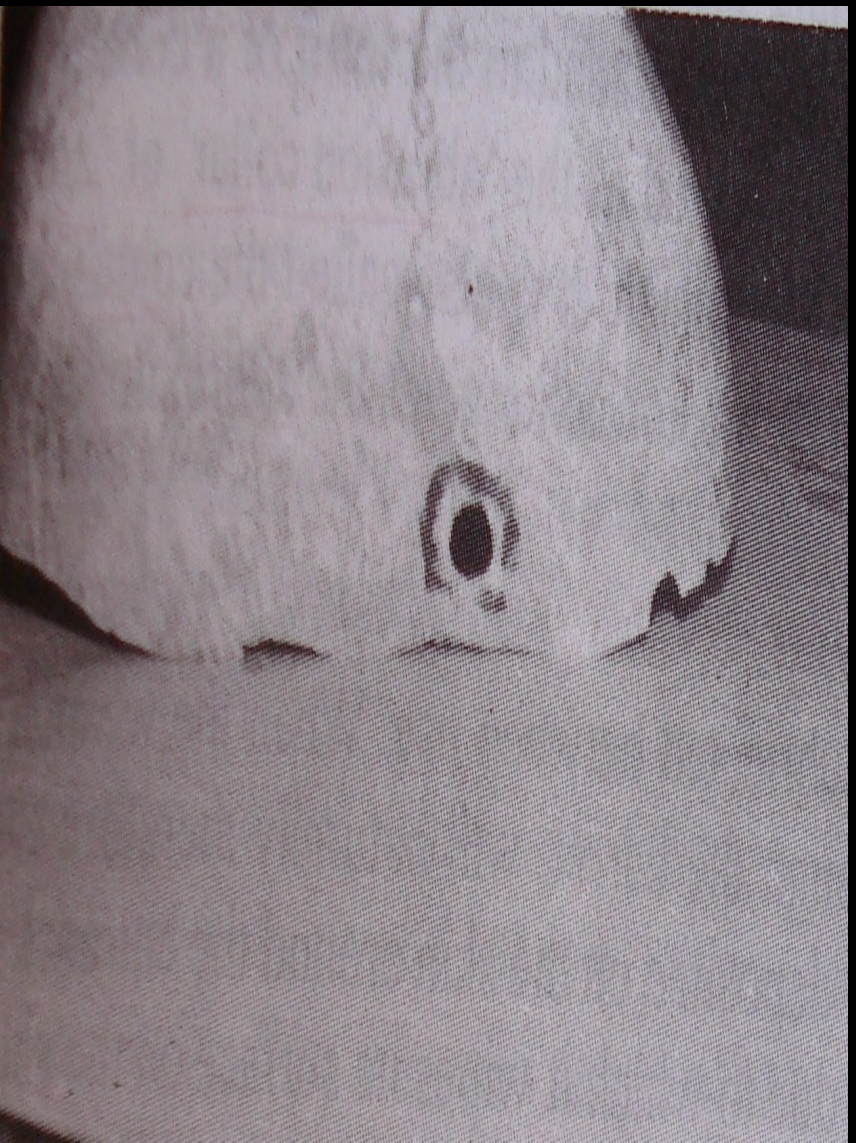
Firm Contact over shallowly situated bone (Head)

1. Lacerated (Split) – Cruciate, Stellate ,Triradiate
2. Soot, Burnt, Semi-burnt powder in wound tract
3. Skull – Punched in hole (Fracture)
4. Back Spatter
5. Muzzle Imprint.

6. Burning, Singeing,Blackening & Tattooing → Absent

(due to prevents much escape of gases,soot & powder)

Skull – Punched in hole (Fracture)



Riffled firearm exit wound - Skull

Hard Contact over shallowly situated bone (Head)

Back Spatter:

- Sucking of blood, hair, fragments of tissues & cloth fibers several cm back inside the barrel
- **Due to:-** The muzzle blast & the negative pressure in the barrel after discharge
- **High MLI:-**

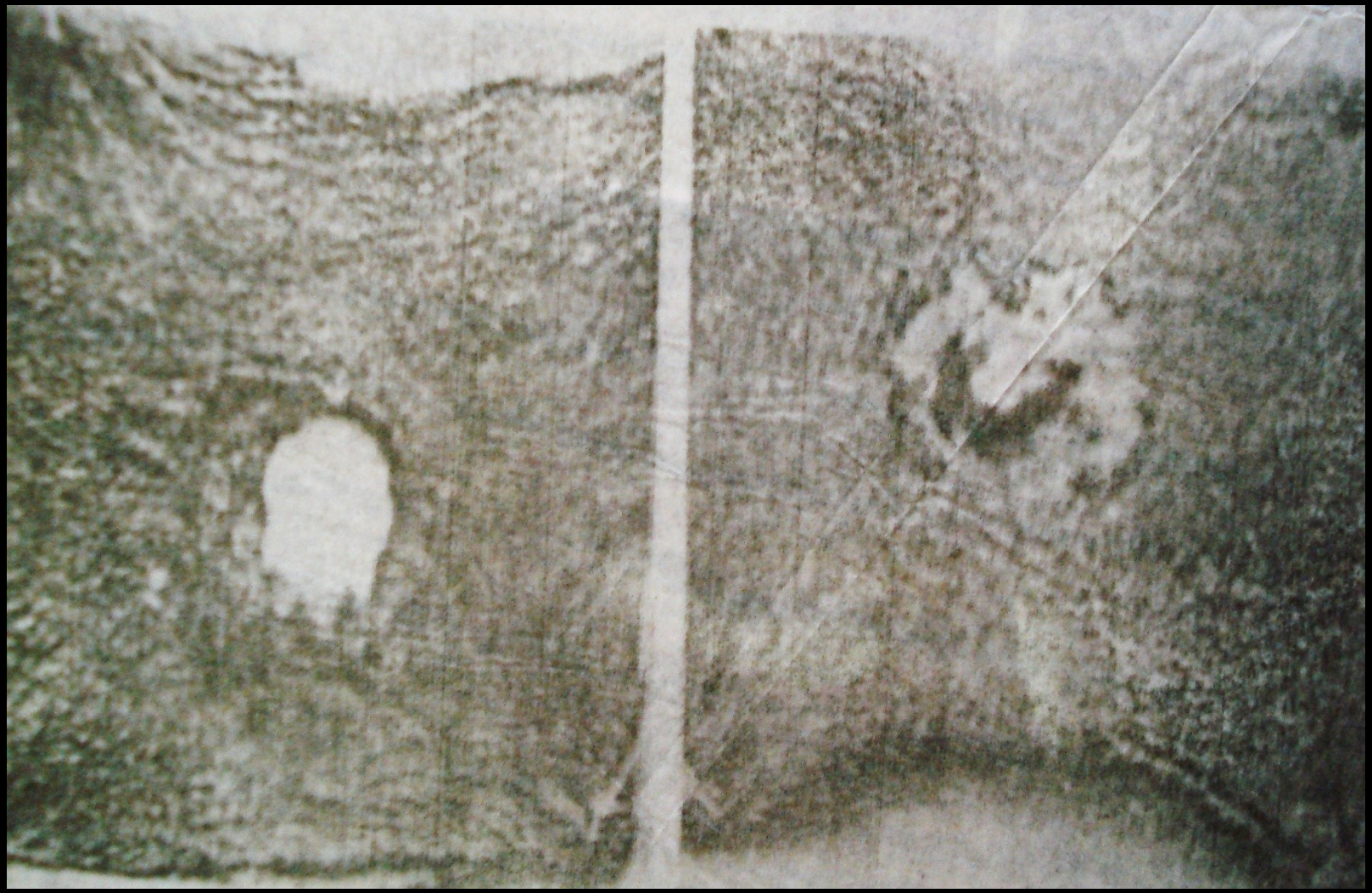
Firm Contact not over shallowly situated bone (Abdomen & Thorax)

1. Punctured Wound – Circular or Oval
2. Muzzle Imprint
3. Soot, Burnt & Semi-Burnt powder in wound tract

4. Burning, Singeing, Blackening & Tattooing Absent

(due to prevents much escape of gases, soot & powder)

Punctured Wound – Circular or Oval



Direction

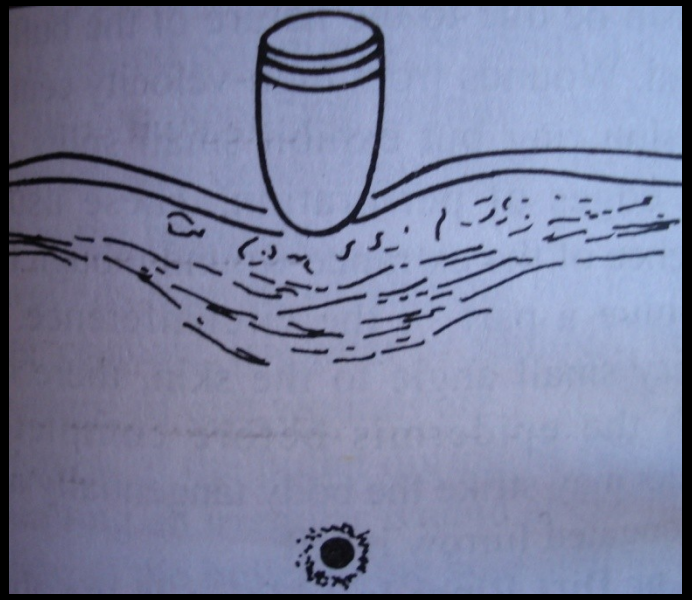
- **Right angle :**

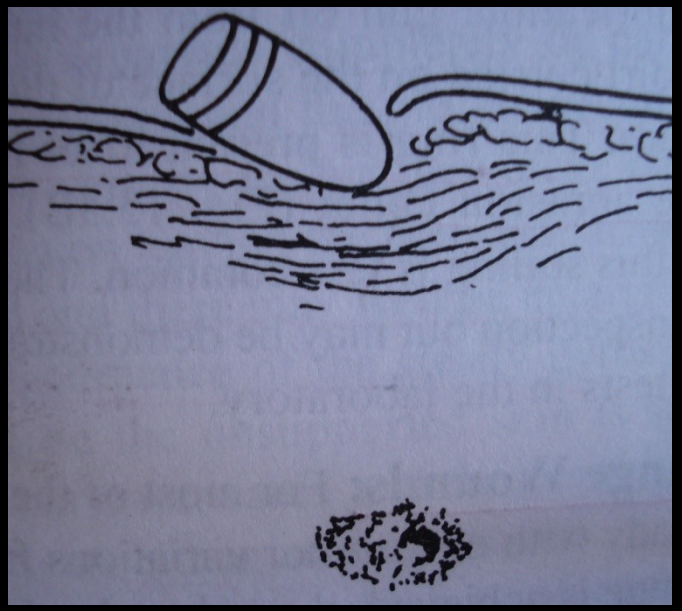
wound circular

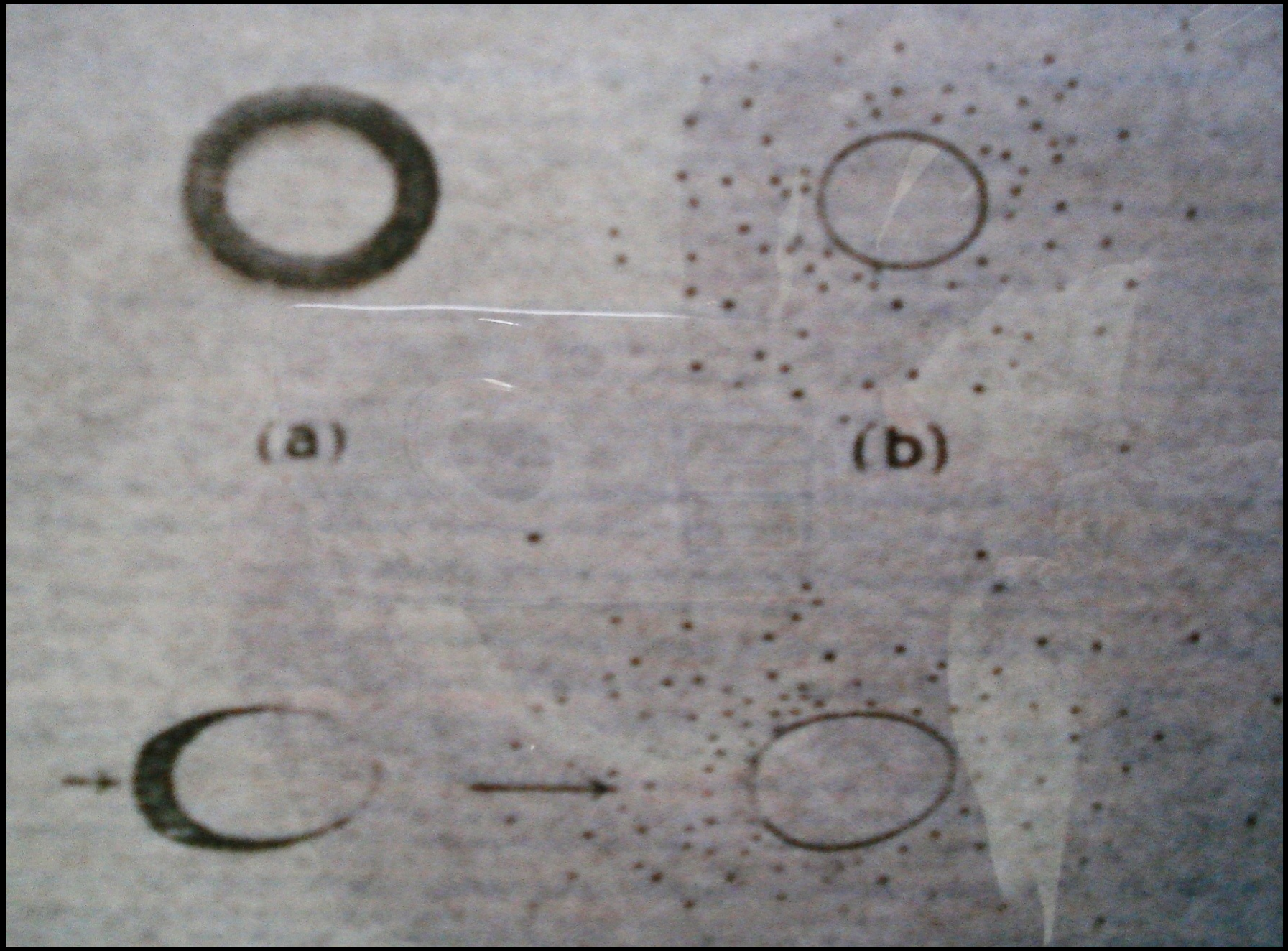
- **Along surface :**

elongated oval / gutter

- **Tangential / oblique : oval**






(a)
(b)

Loose contact wound:

- **Corona:-** due to scattering of Muzzle blast & Soot.
- **Pinkish Colouration:-** interior of wound tract (COHb)
- **Singeing of hair:-** may be
- **Back Spatter:-** Absent
- **Muzzle imprint:** Absent
- **Absence of significant tattooing:**
- **Spitting of the wound margins:** usually not

Close range wounds:

- Within the range of flame, Smoke, muzzle blast & Powder

- (Rifles- 12 inch; pistol/revolver- 6 inch)

Close range/near contact wounds:

1. Entrance wound – Circular or Oval
2. Burning of the Skin
3. Singeing of Hair
4. Blackening (Soot or Smoke Soiling)
5. Powder Tattooing
6. Fouling

1. Muzzle Imprint, Back Spatter & Corona Absent

Close range wound: Caution:

- **Clothing** may prevent blackening of the skin
- Hence: clothes must be examined carefully

intermediate/short range wounds:

- Within the range of powder deposition & smoke but outside the range of flame, Smoke & muzzle blast.

- (rifles: 24-36 inch; pistol, revolver: 12-18 inch)

intermediate/short range wounds:

1. Entrance Wound – Circular or Oval
2. Abraded-bruised marzine minimal
3. Blackening
4. Tattooing
5. Other Material – Antimony+Barium+Lead from primer & Copper+Zinc from catridge case & Copper+Aluminum+Lead from Bullet

1. Burning Skin & Singeing of Hair - Absent

Powder Tattooing/Stippling/peppering:

- **Produced by:** Semi-burnt/un-burnt powder
- **More common-** with black powder
- **Factors affecting its size & density:**
  - Caliber of the weapon
  - The barrel length
  - Type of powder
  - Distance

Powder Tattooing/Stippling/peppering:

Medico-legal Importance:

- Like soot cannot be wiped away (by hemorrhage or intentional wiping)
- To determine the range: size & density (test firing)
- AM v PM tattooing: AM- Reddish-brown to orange-red; PM- moist grey/yellow appearance

Medium Range

(Out of range of Powder, Smoke, Flame & Muzzle Blast)

1. Entrance Wound – Circular or Oval
2. Abrasion Collar - Marginal Abrasion
3. Dirt / Grease Ring

4. Burning, Singeing, Blackening & Tattooing Absent

Abrasion Collar/rim (Marginal Abrasion):

Definition:

- Abrasion on the skin immediately around the central aperture

Mechanism of Formation:

- Rubbing of the skin by the rotating bullet

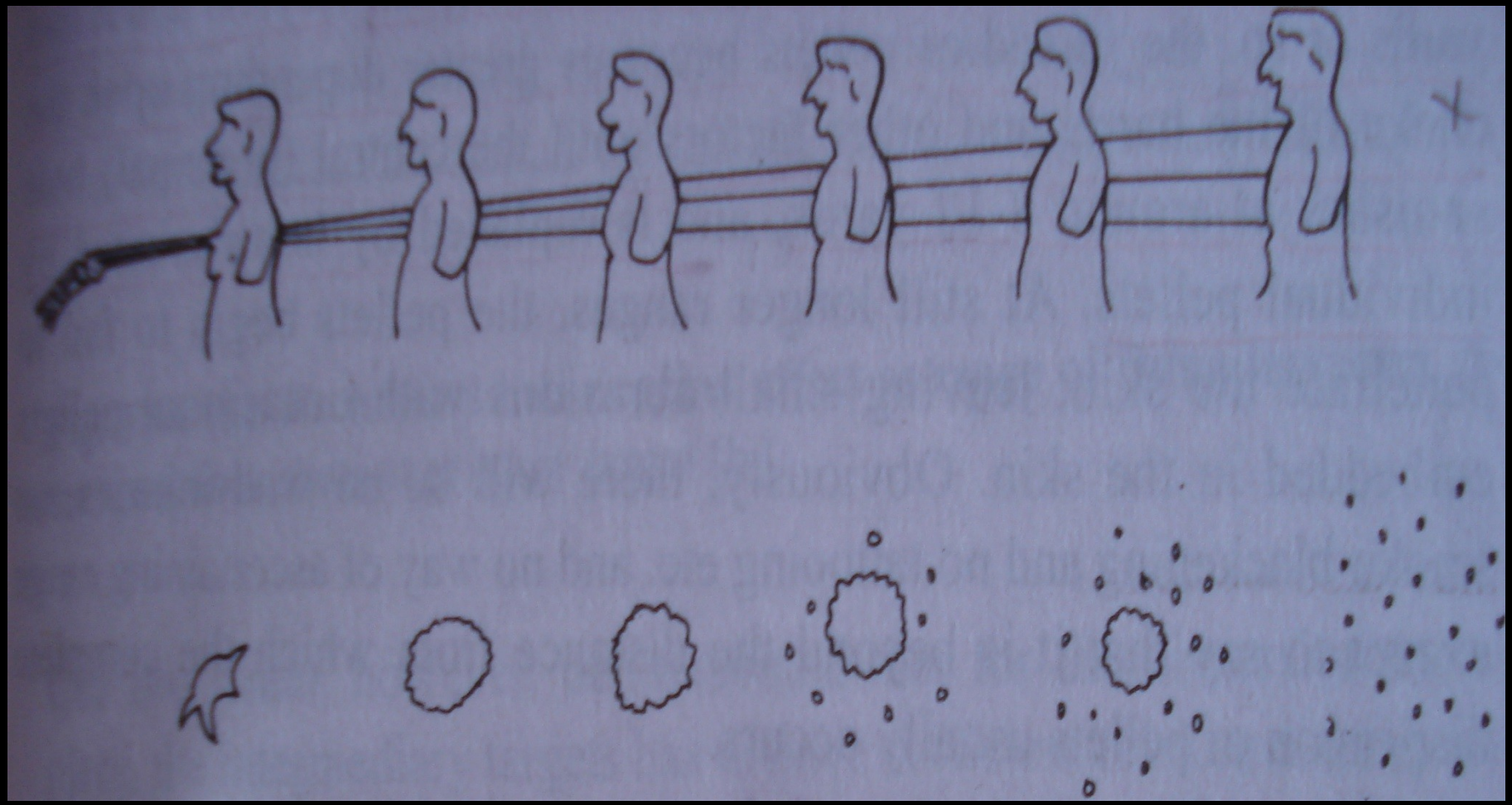
Also shows bruising: hence **Abraded- contused collar**

DIFFERENCE BETWEEN ENTRY WOUND AND EXIT WOUND

	Entry wound	Exit wound
1. Size	Smaller than the diameter of the bullet	Larger than the diameter of the bullet
2. Edges	Inverted.	Everted.
3. Abrasion collar	Present.	Absent.
4. Evidence	Evidence of blast effect suggests singeing, smugging and tattooing.	Not present.
5. Bleeding	Less.	More.
6. Fouling	Present.	Absent
7. Carbon monoxide	Present in the blood and tissues	Absent.
8. Ecchymosis	A circular zone of ecchymosis seen around entrance wound.	Absent.
9. Radiology examination	Radiological examination or neutron activation analysis reveals the presence of a lead ring or metal ring around the entrance wound.	Absent.

- **Wounds produced By Smooth-Bored Weapons**

Smooth bored gun – Entry Wound



- Normally no exit wound

- **Firm contact & Loose Contact wounds: Same as Rifled weapons**

- **Close range wounds:- Like Rifled except Wad in wound present in Smooth-Bore**

- **Intermediate/Short range wounds:**

  1. Entrance Wound - Satellite Pellet hole appearing around the central hole.

  2. Wad present in Wound.

- **Medium range wounds:**

  1. Spread of satellite pallet holes increases & central hole diminishes.

Medium range wound: between 1-5 yards

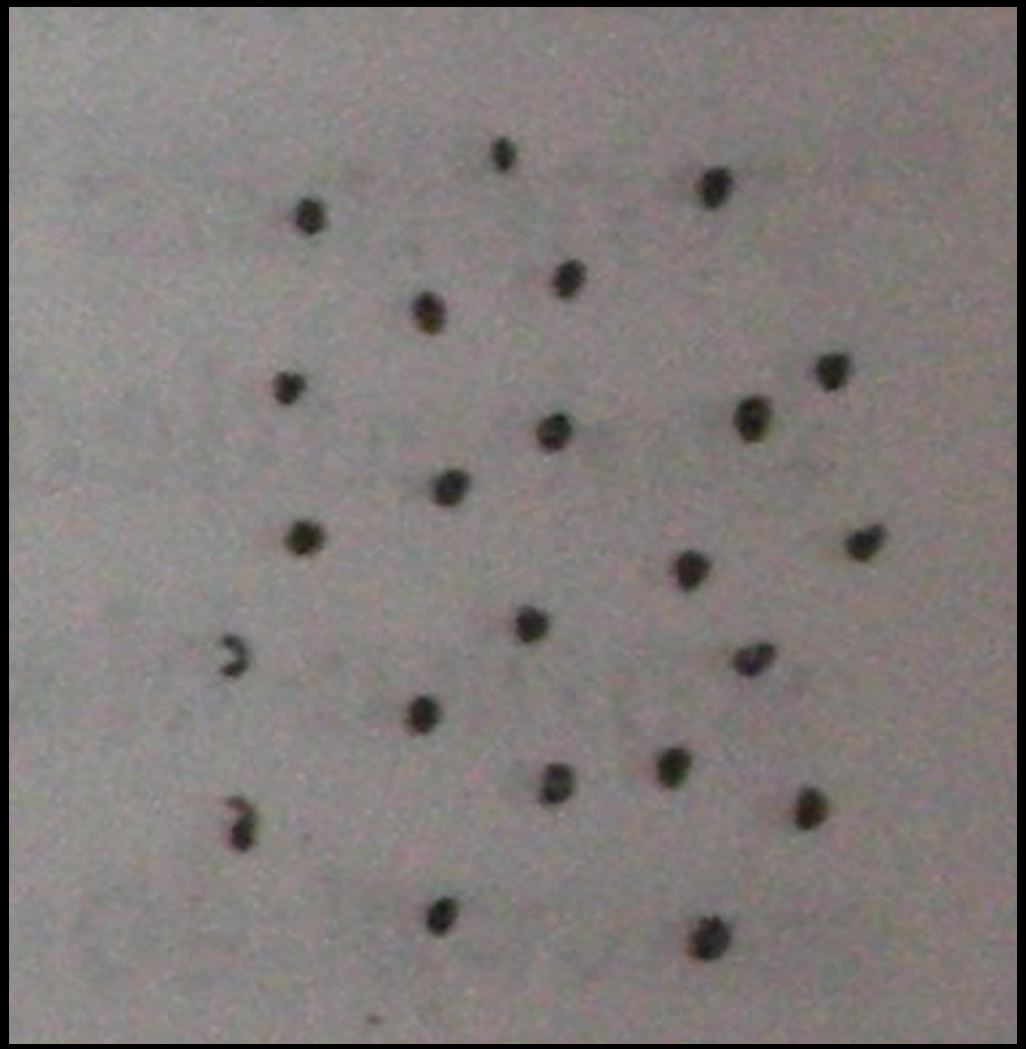
Formula: For estimation of range

- **Total diameter of spread in inches is roughly equal to the range in yards**

- **Distant range wounds:**

Distant range wound: beyond 5 yards

- No Central hole: at around 8-12 yards
- Holes created by individual pellets: present



DISPERSAL OF PELLETS FROM A DISTANCE

Distant range wound: beyond 5 yards

- **As range increases:** Pellets fails to penetrate the skin & leaves small abrasions
- **Occasional pellets** may be embedded in the skin

Forensic Evidence preservation:

- Living patients by treating doctor:
- At the time of post-mortem examination:

Examination & Forensic Evidence preservation:

1. Clothing
2. X-ray Examination
3. Firearm Injury
4. Collection, Preservation & Dispatch of Exhibit
5. Cause of Death

Examination & Forensic Evidence preservation:- 1.Clothing

Examination-

a) Condition of cloth

b) Missile/Missiles missing in cloth

c) Deposition of firearm residue

d) Blood Stain

Medico-legal Aspect

a) determine range of firearm

b) determine Entry & Exit wound

c) Locate Bullet & Missile

Examination & Forensic Evidence preservation:- 2.X-ray

Medico-legal Aspect

a) Locate Missile / Pellet

b) Determine tract of wound

c) Determine effect of bone

d) Determine Air Embolism or Bullet Embolism

Examination & Forensic Evidence preservation:- 3.Firearm Injury

1. **Entry Wound:-**

   A] External

   B] Internal

2. **Exit Wound :-**

   A] External

   B] Internal

Examination & Forensic Evidence :
4. Collection, Preservation & Dispatch

1. Prior radiography should be conducted
2. Double heavy-duty gloves should be worn
3. Rubber-tipped extractor should be used
4. Projectile should be examine for any traces like- fiber, glass pieces, paint & then it may be dried in open air
5. Before packing bullet / pellet should be marked for Identification
6. Pack the bullet / pellet /Fragment in hard plastic container
7. Write ‘Biohazard’ on container

Cause of Death in Firearm

1. Hemorrhage :- most common
2. Air Embolism :- Rare
3. Bullet / Pellet Embolism :- Rare
4. Secondary Complication

Track taken by the projectile through the body

- To be dissected in OT/ mortuary after X-RAY
- Not to be probed
- Variation may be due to
  - Tissue variation
  - Velocity of bullet : high → no deviation
    low → deviation

BULLET TRACK

Direction of fire

- Heel to wound distance gives height of the wound & inclination of bullet tract

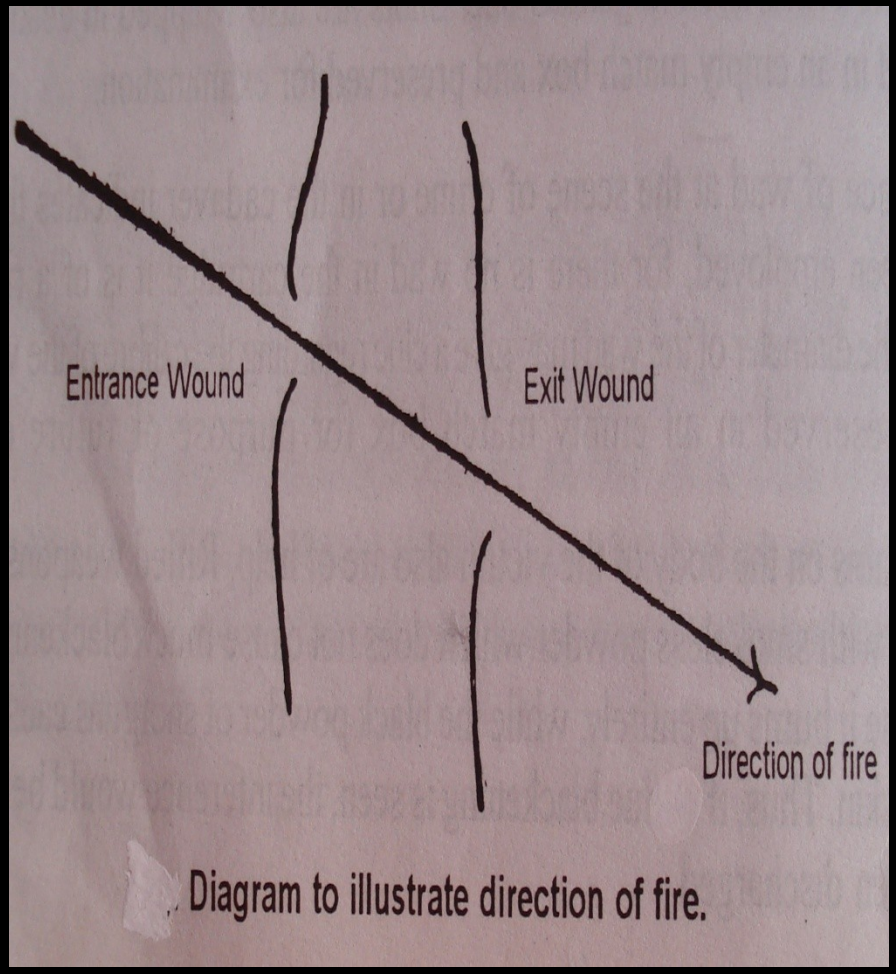


Diagram to illustrate direction of fire.

Medico legal aspects of wounds

- Nature
  - Suicidal
  - Homicidal
  - Accidental
- Antemortem / postmortem

Features	Suicidal	Accidental	Homicidal
Site	Accessible	Any	Any
Distance	Contact	Close-distant	Any
Direction	Upward/ downward/ backward	Any	Usually upward / any
No. of wounds	One		Many
Residue over hand	Present		Absent
Weapon	Found at scene		Not found
Scene of crime	House / workplace	Indoor-outdoor / marriage parties / travelling	Anywhere
Signs of struggle	No		Yes
Victim	Usually male		Any
Cadaveric spasm	Present	Absent	Absent

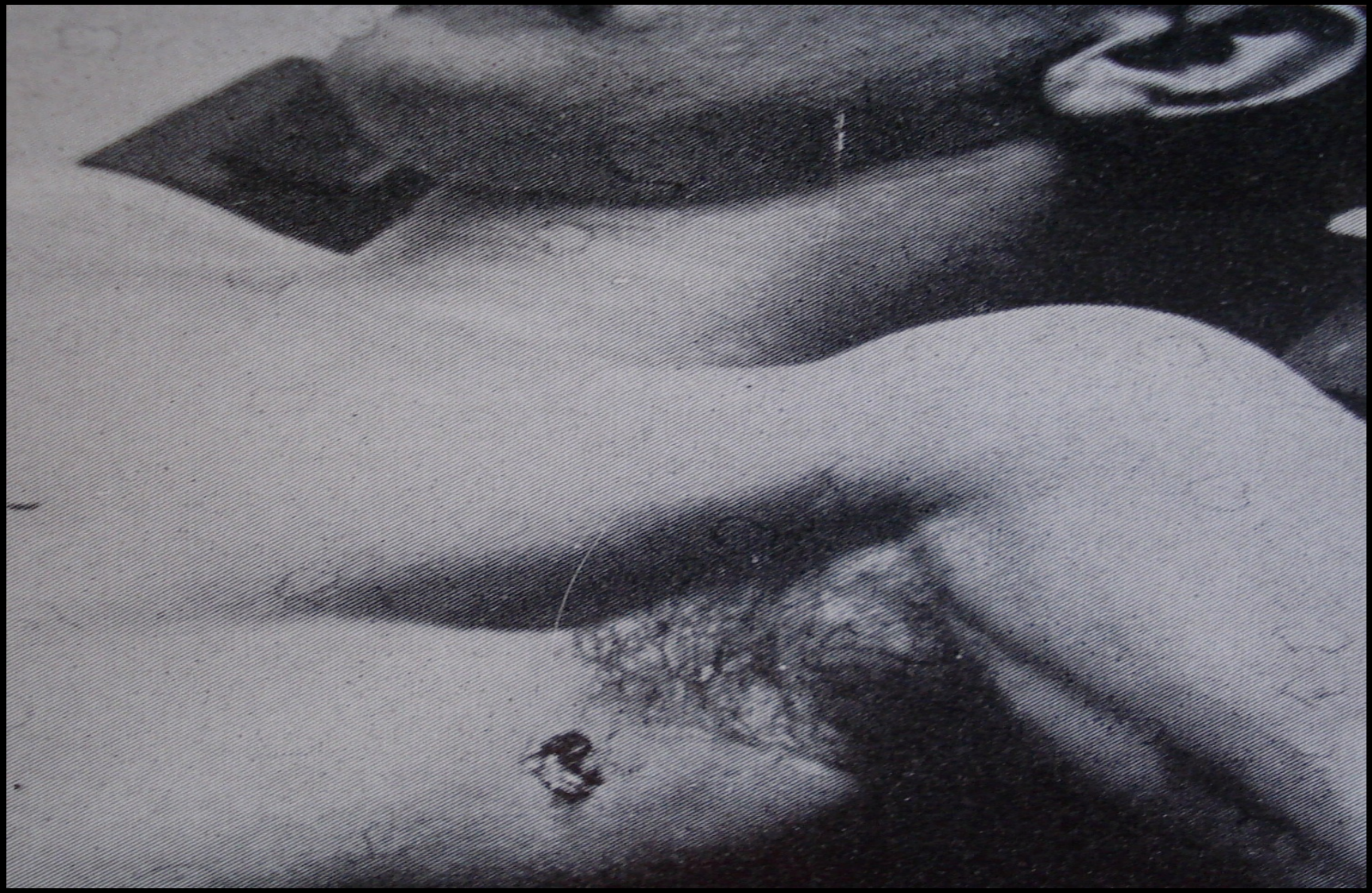
SUICIDAL

HOMICIDAL

Peculiar / atypical effects of firearm

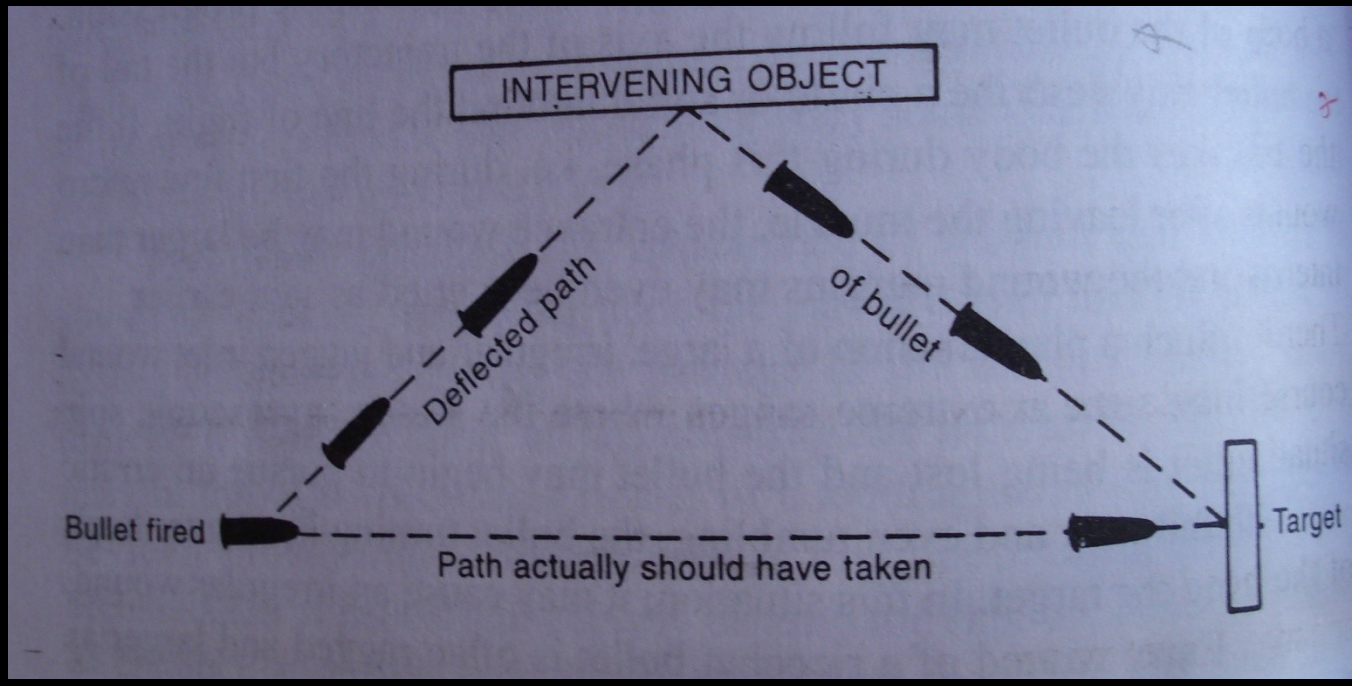
- Large atypical wound of entry
  - Spinning / wobbling / tumbling
- ‘Graze effect’
- Single entrance & multiple exit wounds
- Multiple entrance & exit wounds from a single shot
- Concealed wound

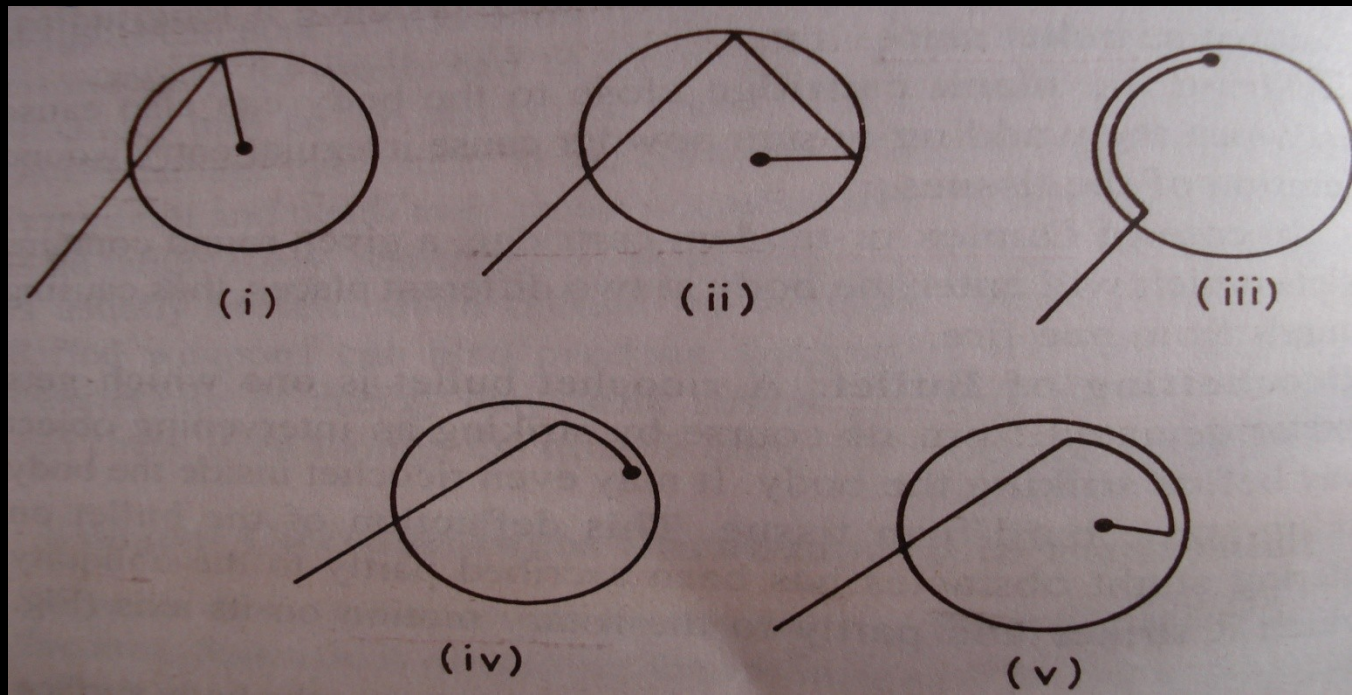
CONCEALED WOUND



- Bullet striking skull & not entering
- Entrance wound seen, exit wound not seen, bullet not found in body
- Unexplained bullet in body: **tandem bullet**
- Blank cartridge & fatalities
- Defective firearm
- **Kennedy phenomenon**
- **Rayalseema phenomenon**

- Ricocheting of bullet
  - EXTERNAL
  - INTERNAL

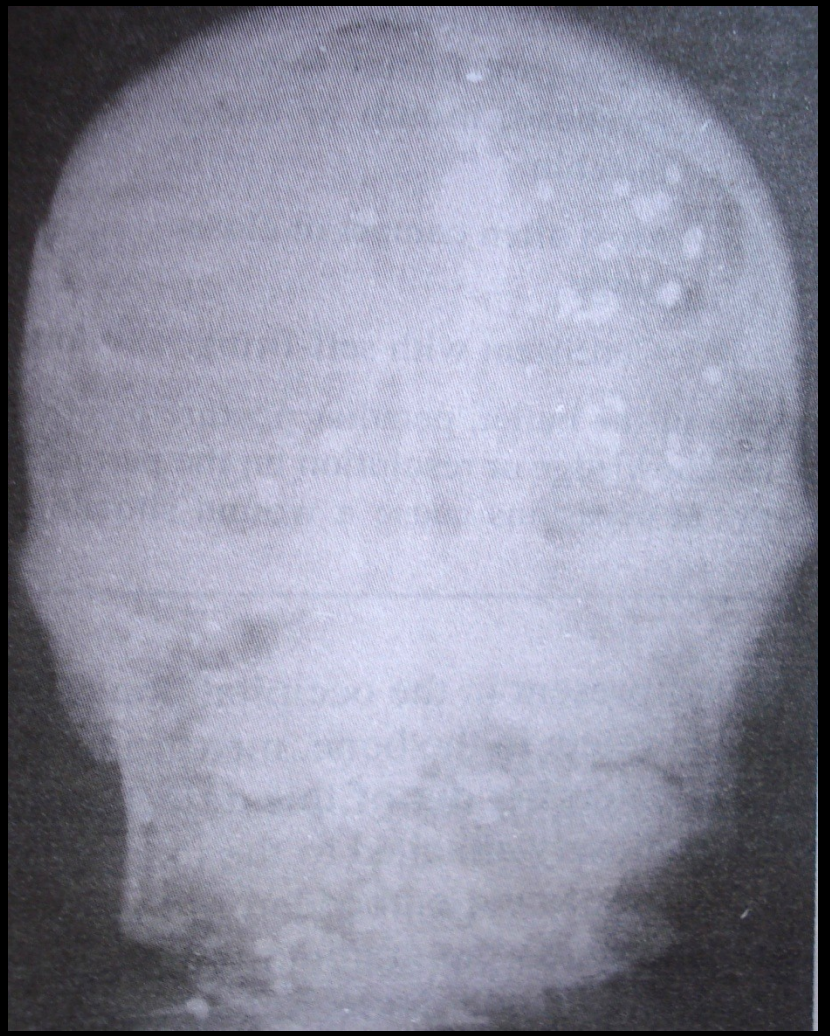




- Is it a firearm injury?
- What kind of weapon used?
- From what distance & direction was the weapon fired?
- When was the firearm discharged?

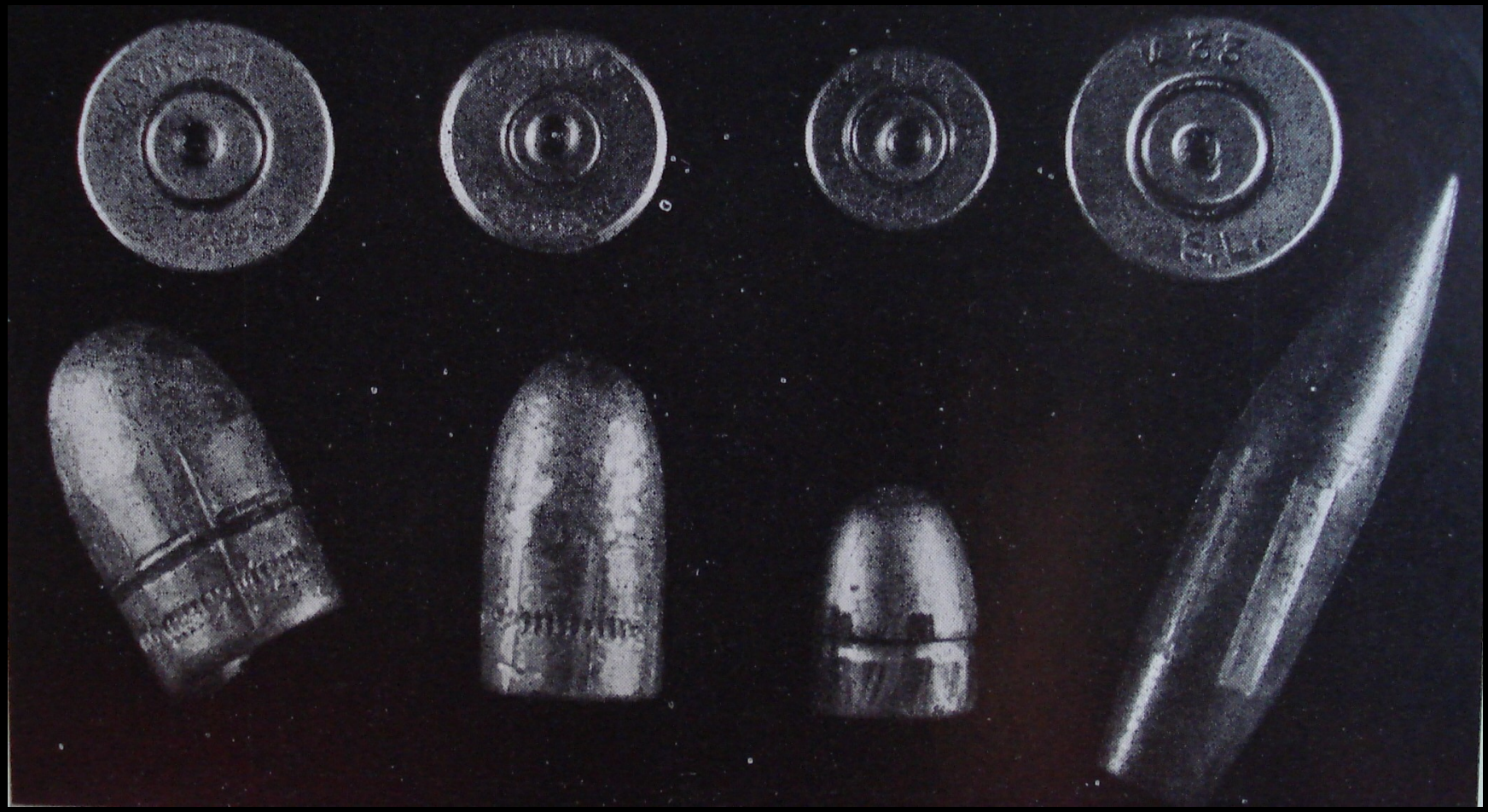
Medico legal autopsy

- To be examined in mortuary
- Photographs to be taken
- Clothings to be preserved
  - Blackenning
  - Tattooing
  - Bullet / pellet
- Wound to be scaled
- Cut section of skin 1/4th inch around wound
- Preserve, pack, label & send to forensic science lab
- X ray to be taken for locating bullet / pellet



- No probing of tract by pencil, finger or probe
- All exhibits to be preserved, labelled
- Avoid defacing the wound
- Do not remove bullet with forceps – only by fingers or padded forceps
- To be dried – not to be washed

- Preserved in cotton after marking base of bullet for future identification



Tests

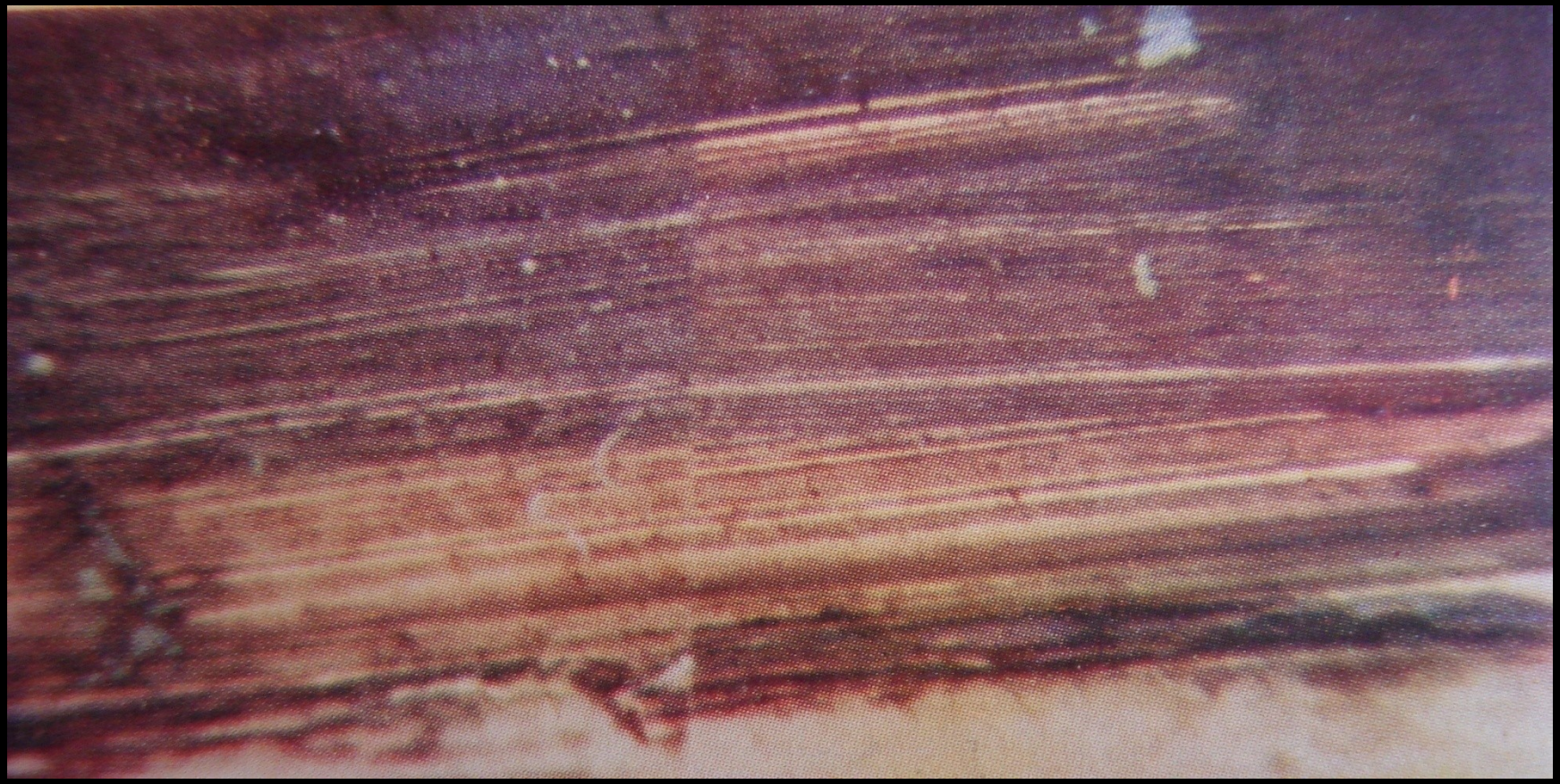
- Paraffin test / dermal nitrate test
- Neutrone activation test
- Flameless atomic absorption spectrometry
- Scanning electron microscope-energy dispersive x-ray spectrometry

Paraffin test / dermal nitrate test

1. Hands were coated with a layer of paraffin
2. After cooling the cast were removed with paraffin & treated with Diphenylamine (a reagent to detect Nitrate / Nitrite)
3. Blue flecks in paraffin indicate :- Positive

- **CAUTION**

  Above observations should be confirmed by test shots or test firing with the particular firearm using the same type of ammunition as used in crime



Conclusion

“ A cartridge case at a scene of offence could prove as incriminating as if the murderer had left his visiting card”

- Sir Sydney Smith


THANK
YOU