



## FIREARM INJURIES -2

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# Earlier session

- Introduction, Definitions
- Parts of a firearm weapon
- Classification(Types) of firearms
- Smooth bore firearms
- Rifled barrel firearms
- Cartridge – smooth bore gun, rifled gun
- Self study topics

# In this session

- Characteristics of gunshot wounds
- Gunshot wounds at different ranges
  - A. Shotgun wounds
  - B. Rifled gun wounds
    - Entry wound V/s Exit wound
- Scientific tests to detect Gunpowder Residue
- Management in gunshot injuries
- Bullet fingerprinting
- Bomb explosion injuries
- Self study topics

# Videos of pistol fire and shotgun fire



pistol fire in slow motion [720p].mp4



slow motion shotgun shot.mp4



Shotgun fire in slow motion [360p].webm

<https://www.youtube.com/watch?v=7y9apnbl6GA>

<https://www.youtube.com/watch?v=SqfyysHejxk>

<https://www.youtube.com/watch?v=kMac29qi49w>

# Gun shot wounds

- Bullet, Pellets(shots) -> entry wounds  
destructive power  $KE = \frac{1}{2} mv^2$
- Flame -> burning
- Smoke -> blackening
- Unburned gunpowder -> tattooing
- Wad -> contusion
- Over edge – abrasion collar, grease collar

# Rifled firearm wound V/s Shotgun wound

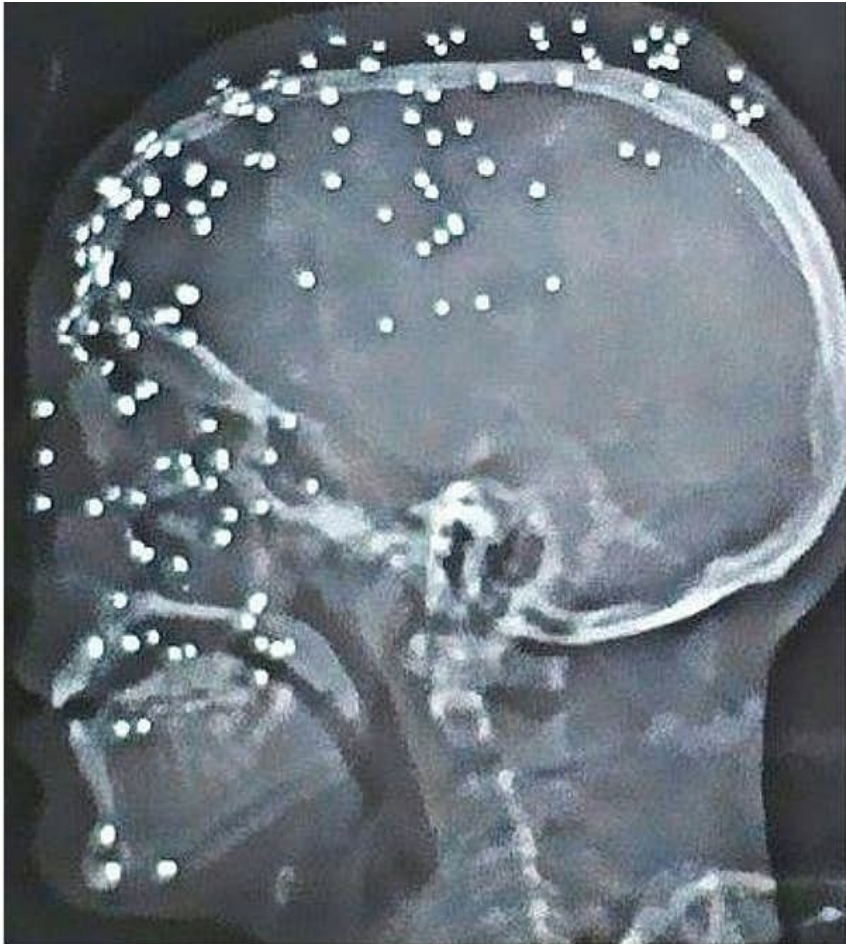


# Shotgun wound V/s Rifled gun wound

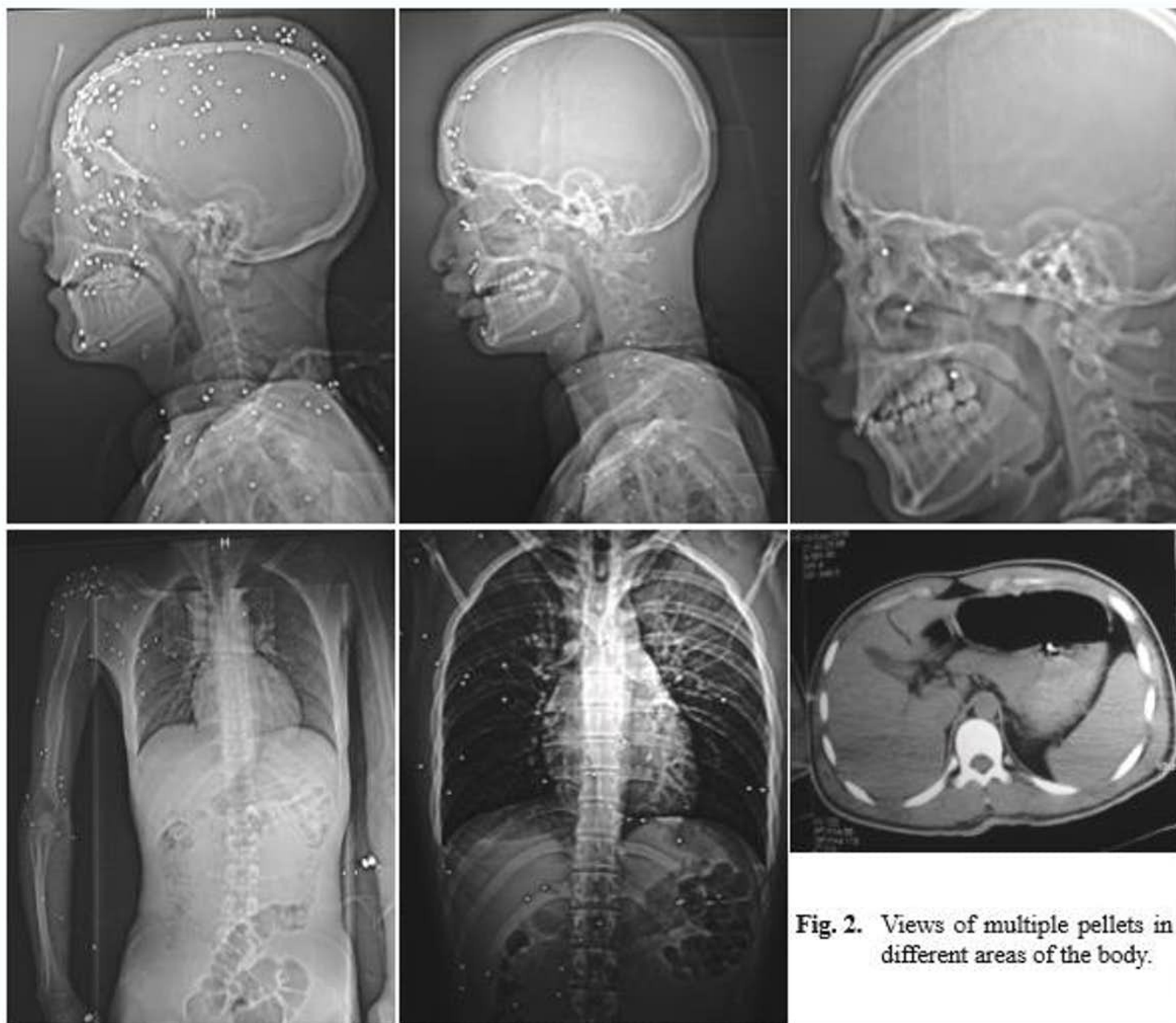
Feature	Shotgun wound	Rifled gun wound
<b>Number of Wounds</b>	Single or Multiple - only Entry wounds No exit wounds	Single- only Entry wound or Two – Entry & Exit wounds
<b>Wound characteristics</b>	Wad contusion, Satellite wounds in intermediate range  Multiple pellets embedded in body tissues & organs	Characteristic Entry & Exit wounds of bullet  More penetrative injury, Bullet may be found in body at end of bullet injury track



## Pellet wounds in shotgun injury







**Fig. 2.** Views of multiple pellets in different areas of the body.



Contact range wound  
of shotgun injury



Near contact range wound  
in shotgun injury

Wad contusion in  
shotgun injury





## Satellite wounds in shotgun injury





Distant range wounds in  
shotgun injury



Gun powder residue  
over firing hand





# Entry wounds in rifled gun injury



# Entry wounds in rifled gun injury





# Exit wound in rifled gun injury

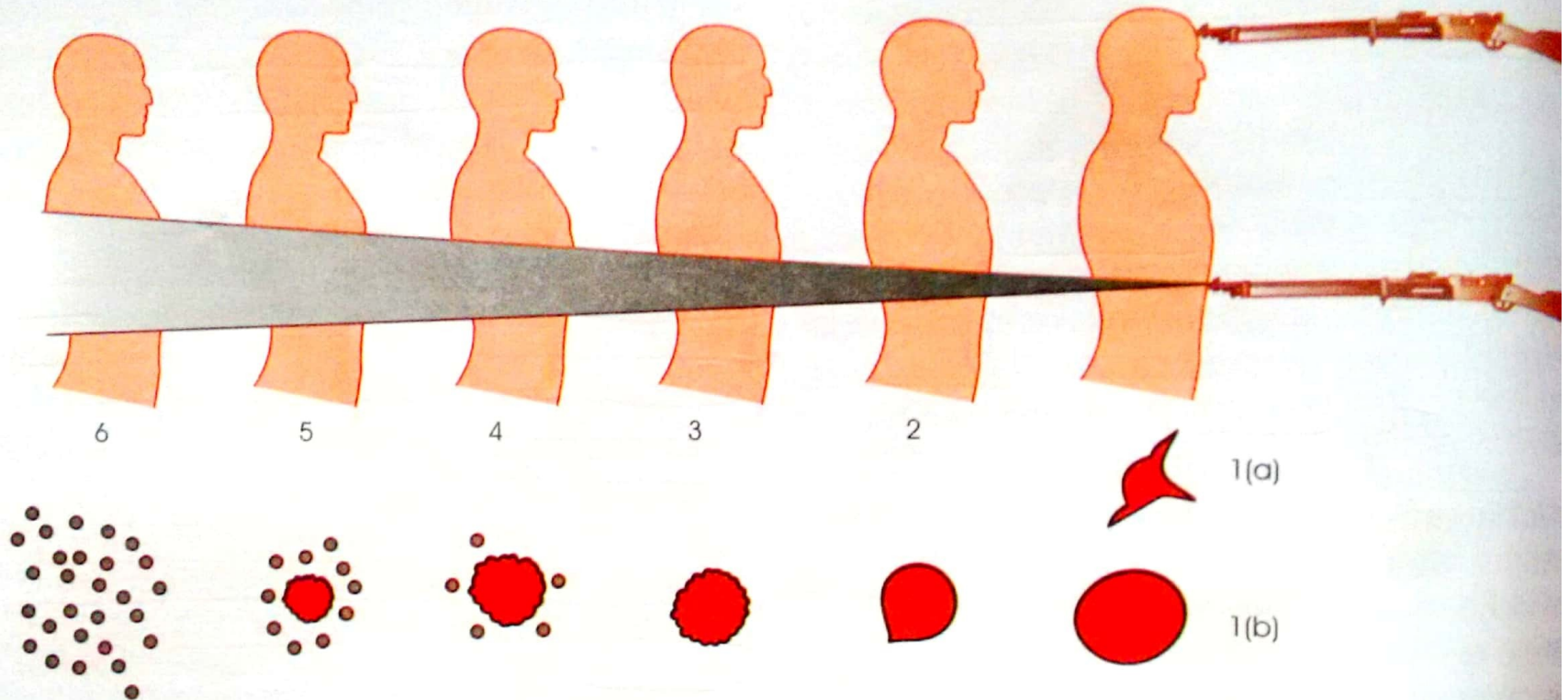


**Figure 14.16:** Firearm exit wound over the right temple

# Gun shot wounds

	Flame (Burning)	Smoke (Blackening)	Gun Powder particles (Tattooing)	Wad (Contusion)	Characteristic features
<b>Shot Gun (Smooth bore guns)</b>	Up to 15cms	Up to 30cm	Up to 60-90cm	Up to 2-5 mt	Pellet wounds
<b>Rivolver/ Pistol</b>	Up to 7cms	Up to 15cm	Up to 40-50cm	-	Bullet wound
<b>Rifles</b>	Up to 15cms	Up to 30cm	Up to 60-100cm	-	Bullet wound

# Shotgun wound from various range



**Figure 14.13:** Appearance of shot gun wounds with increasing range: (1a) Split wound from contact over bone (1b) Round contact wound (2) Wound at closed range upto 30 cm (3) Rat hole wound from 30 cm 1meter (4) Satellite pellet holes above 1 meter (5) Diminishing central hole with increasing shot spreading (6) No central hole above 10 meters with uniform spread of shot

# Wound of shotgun

	Shape of wound	Flame (Burning) (UP to 15cms)	Smoke (Blackening) (UP to 30cm)	Gun Powder particles (Tattooing) (UP to 60-90cm)	Wad (Contusion) (UP to 2-5 mt)	Additional features
Contact Range ( 0 cm)	Irregular / round	+	+	+	+	Muzzle imprint, Back Spatter
Close Range (0 to 1 mt)	Round	+/-	+/-	+/-	+	Burst head, Corona
Short Range (1 to 2 mt)	Corrugated	-	-	-	+	
Intermediate Range ( 2 to 4 mt)	Corrugated	-	-	-	+/-	Satellite wounds
Long/Distant Range ( > 4-5 mt)	Discrete small wounds	-	-	-	-	Scattered shot wounds

# Wound of revolver/ pistol

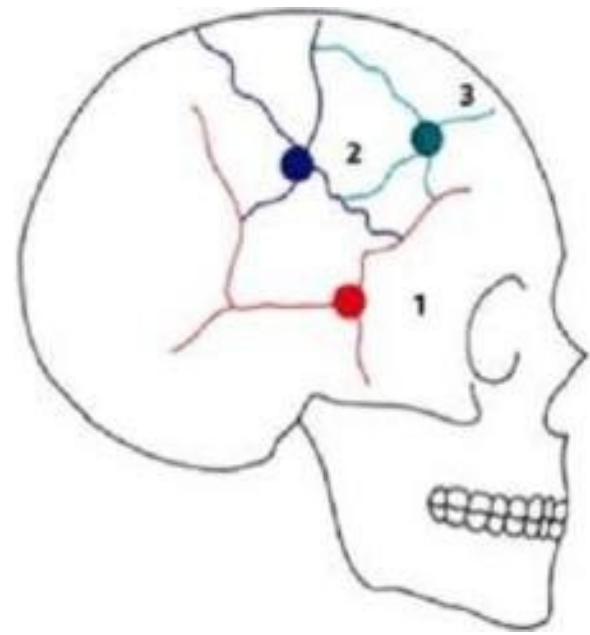
	Shape of wound	Flame (Burning) (UP to 8cms)	Smoke (Blackening) (UP to 15cm)	Gun Powder particles (Tattooing) (UP to 40-50cm)	Additional features
Contact Range ( 0 cm)	Round/ irregular	+	+	+	Muzzle imprint Back Spatter
Near contact Range (1 to 10 cm)	Round	+	+	+	Burst head Corona
Short Range (10 to 50cm)	Round	-	+/-	+/-	Abrasion collar Grease collar
Long/Distant Range ( > 50cms)	Round	-	-	-	Abrasion collar



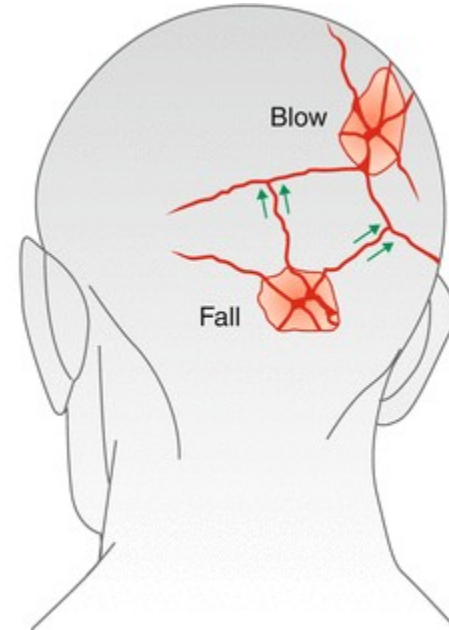
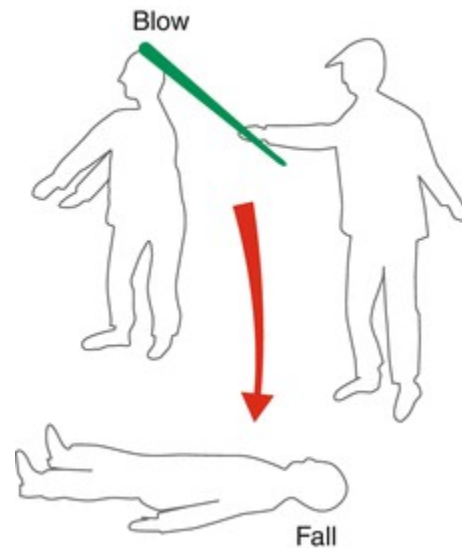
# Entry wound V/s Exit wound

- Size
- Blackening, burning, tattooing
- Edges
- Collar
- Bleeding
- Cloths over
- Tissue beneath
- Lead ring





- **Puppe's Rule**





# Scientific Tests to detect Gun Powder Residue

Sample : a) NS soaked cotton swabs  
b) paraffin wax samples

- 1) Paraffin test/ Dermal nitrate test
- 2) Harrison & Gilroy Test
- 3) Neutron Activation Analysis
- 4) Atomic absorption spectroscopy(AAS/FAAS)
- 5) Scanning Electron Microscopy-Energy Dispersive Xray Analysis (SEM-EDXA)



# Management of gunshot wound

- Primary resuscitation – ABC, stop bleeding
- No. of wounds, type, entry- exit wounds
- Swabs from hands, wounds
- X-ray, USG, CT – no., site, track, damages
- Emergency OT:

Beware of explosion fire during OT –

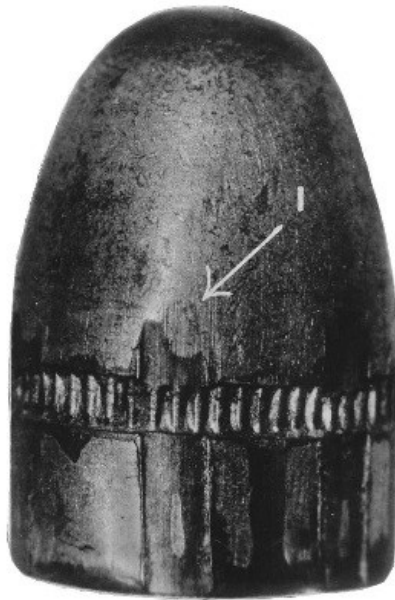
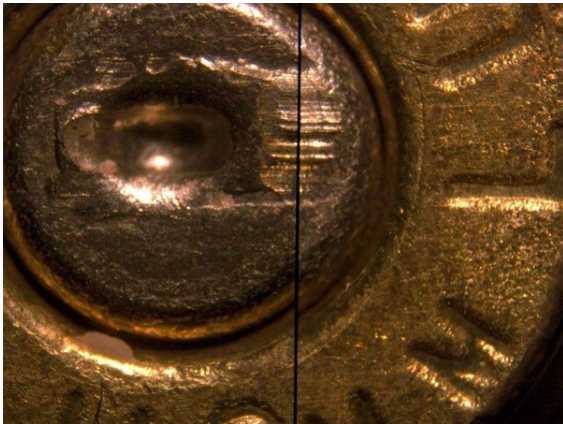
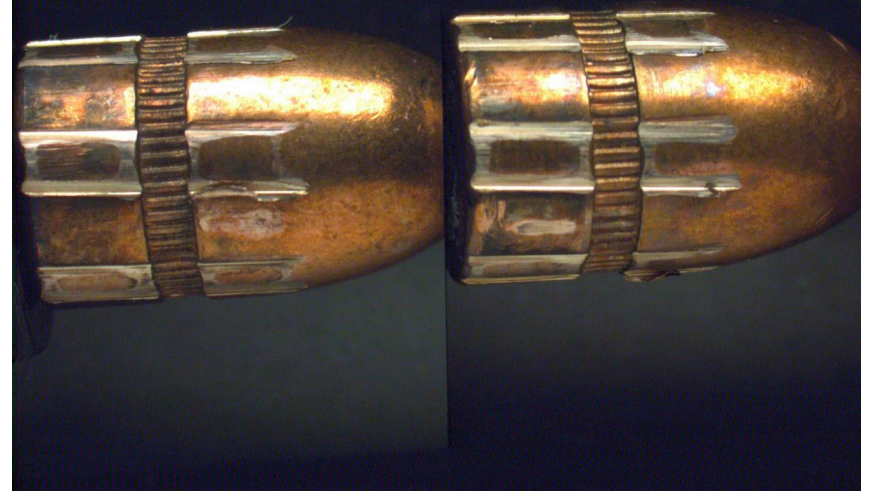
Careful removal & preservation of  
bullets/shots/fragments – no., size, shape, site

- MLC case, hand over the evidences to police

- Bullet fingerprinting

- Primary markings
- Secondary markings

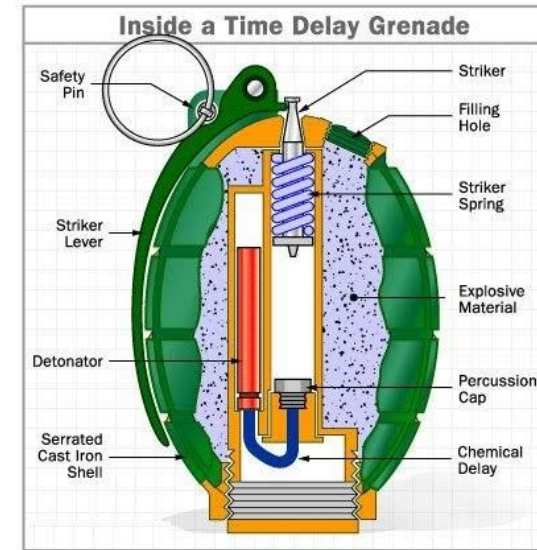
side by side at 4x magnification



# Bomb explosion injuries

- Bomb

- 1) Disruptive effect
  - 2) Flame - Burns
  - 3) 1<sup>st</sup> Blast wave – TM, blast lung, hollow viscera
  - 4) Flying missiles – **bruises, abrasions, puncture lacerations**
  - 5) Falling buildings – secondary injuries
  - 6) Fumes
- 
- LPG Gas explosion – blow off injuries, burns, building fall



# Self study

- 1) Tandem bullet  
(Piggyback)
- 2) Yawning of bullet
- 3) Tumbling of bullet
- 4) wobbling of bullet
- 5) Ricocheted bullet

- 1) Souvenir bullet
- 2) Gutter fracture
- 3) Bullet slap/Bullet  
graze

## **Reference books**

1. The Essentials of FMT by Dr KSN Reddy
2. Forensic Medicine by Dr BK Bastiya
3. Essentials of FMT by Dr A Aggrawal
4. Review of FMT by Dr G Biswas
5. Textbook of FMT by Dr PC Dikshit
6. Textbook of MJFMT by Dr CK Parikh
7. Textbook of FMT by Dr VV Pillay

Any questions

MCQs



# MCQ 1

- In firearm wound, what causes the 'blackening around entry wound'?
- a) Flame
  - b) Hot gases
  - c) Unburned gunpowder
  - d) Smoke

# MCQ 2

- What is 'Back spattering' in firearm injuries?
  - a) 'Suck in' of blood & tissues into barrel of firearm due to negative pressure
  - b) Gradual narrowing of gauge of barrel towards muzzle end
  - c) Gushing of blood from exit wound
  - d) Cherry red blood & tissue over entry wound

## MCQ 3

- Gun powder residue over hands or cloths can be detected by which test?
  - a) Phenolphthelin test
  - b) Hydrostatic test
  - c) Dermal nitrate test
  - d) Superimposition technique

# MCQ 4

- A case of murder with multiple gunshot injuries is brought for autopsy. Two metal bullets recovered from deadbody in autopsy. Study of primary and secondary markings over bullets can help to detect what?
  - a) Range of firing weapon
  - b) Identification of crime weapon
  - c) Time since firing incident
  - d) Type of firearm weapon

# MCQ 5

- Puppe's rule helps to detect what?
  - a) Sequence order in multiple bullet wounds
  - b) Direction of bullet travel track
  - c) Power and tissue damage by a bullet injury
  - d) Time since injury in rifled gunshot injury