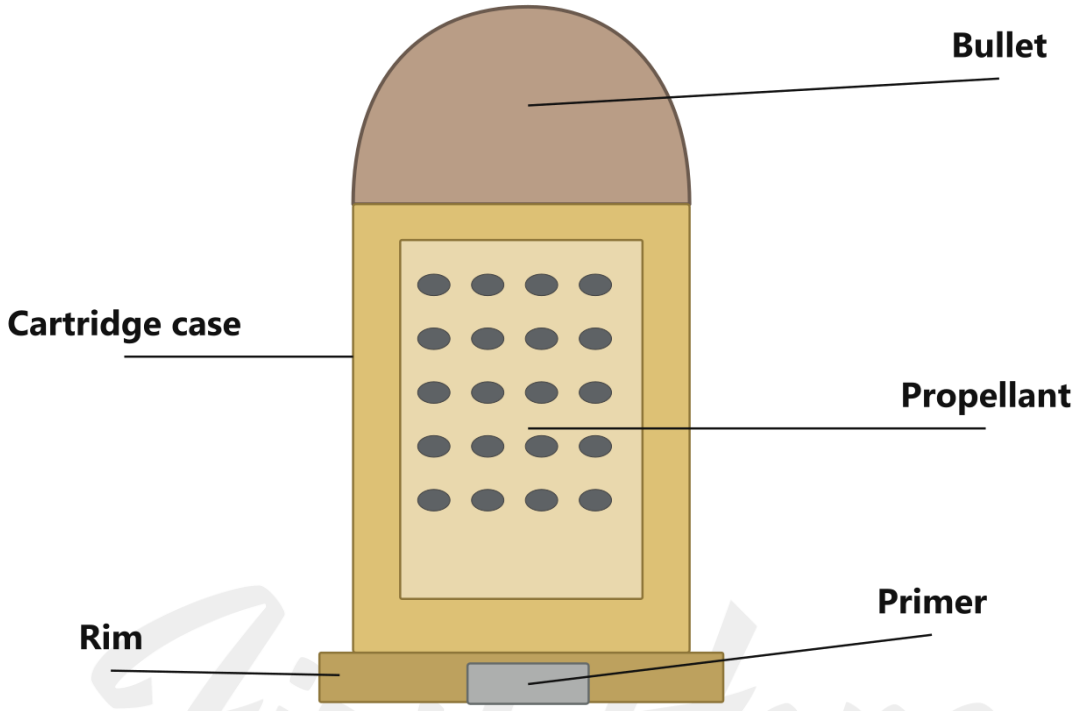
Forensic Medicine and Toxicology - Topic 6 - Clinical forensic medicine - firearm injuries

Firearms and Ammunition

- A **firearm** uses expanding gases from a propellant to discharge a projectile through a barrel.



The principal components of a firearm cartridge

Basic Structure and Terms

Parts of a Firearm

- The barrel guides the projectile, while the chamber holds the cartridge in the appropriate firing position.
- The action contains the mechanism involved in loading, firing and removing or ejecting the cartridge case.
- The muzzle is the front opening of the barrel, while the breech is its rear region.

Cartridges, Projectiles and Recovered Components

Cartridge Components and Primer Position

- A **bullet** is a projectile and is not the same thing as a complete cartridge.
- A conventional metallic cartridge contains the projectile, case, primer and propellant.
- A **centrefire cartridge** has its primer in the centre of the base, while a **rimfire cartridge** contains the priming material in the rim.

Projectile and Shotgun-Cartridge Variations

- Projectiles may be unjacketed, partly jacketed or fully jacketed, and their construction can influence deformation and fragmentation.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- A shotgun cartridge may contain pellets or a slug and additional components such as a wad.

Recovered Evidence

- A recovered case, projectile or wad may provide information even when the firearm itself is unavailable.

Smokeless Powder

- **Nitrocellulose** is the principal energetic component of smokeless firearm propellants.
  - **Single-base** propellants use nitrocellulose as their energetic base, while **double-base** propellants contain nitrocellulose and nitroglycerin.
  - The word smokeless indicates less smoke than traditional black powder, not complete absence of smoke or residue.
  - Laboratory examination of recovered material may support identification, but appearance alone does not establish its composition or a unique firearm.

Classification and Mechanisms

1. Rifled Firearms

- A rifled barrel contains spiral lands and grooves that impart rotation to a suitable projectile.
- Rifles and many handguns use rifled barrels.
- The projectile may retain marks that can be examined by a trained firearms examiner.
- The medical examiner should not infer a unique firearm from a clinical wound alone.

2. Smooth-Bore Firearms

- A smooth-bore barrel lacks conventional rifling and is commonly associated with shotguns.
- A shotgun may discharge multiple pellets or a single slug depending on its ammunition.
- **Choke** refers to a narrowing near the muzzle that influences the spread of an appropriate shot charge.
- The effect on a wound pattern depends on the firearm, ammunition, intervening material and the particular circumstances.

Calibre and Gauge

- **Calibre** refers to a specified bore or projectile dimension according to the naming convention used.
- The printed cartridge designation is not always a simple direct measurement of the wound or recovered projectile.
- **Gauge** is a traditional shotgun bore designation that differs from ordinary metric calibre naming.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- The diameter of a skin wound cannot reliably determine calibre because skin stretches and projectiles deform or strike obliquely.

Gauge and Cartridge Designations

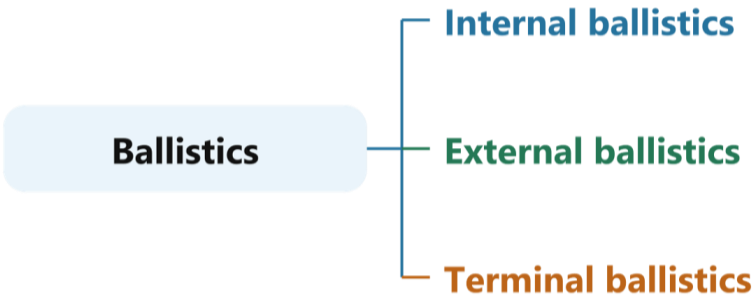
- Shotgun gauge traditionally relates to the number of lead balls of bore diameter that together weigh one pound.
- A smaller gauge number generally represents a larger bore, with exceptions to the naming convention such as the .410 designation.
- Rifled-firearm calibre may be expressed in millimetres or fractions of an inch according to the cartridge convention.
- A recovered cartridge headstamp may provide manufacturing or ammunition information for a specialist comparison.
- The designation and the measured projectile dimensions must not be confused with the size of a skin defect.

The Firing Process as a Concept

- Initiation of the primer ignites the propellant, and the expanding gases propel the projectile through the barrel.
- The discharged material may include gases, soot and partly burned propellant particles as well as the projectile.
- The distribution of these materials contributes to forensic examination but varies substantially between firearms and ammunition.
- Only trained personnel should render a firearm safe or conduct laboratory firing examinations.

Wound Ballistics

Energy and Tissue Damage



Branches of Ballistics and Energy Transfer

- **Internal ballistics** concerns events within the firearm, **external ballistics** concerns flight and **terminal ballistics** concerns interaction with the target.
- Wound ballistics studies how a projectile transfers energy and damages biological tissue.
- Kinetic energy depends on both mass and velocity, but the amount transferred to tissue also depends on the interaction and whether the projectile exits.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

Cavities and Determinants of Tissue Damage

A. Permanent Cavity

- The **permanent cavity** is the tissue track left by direct disruption.

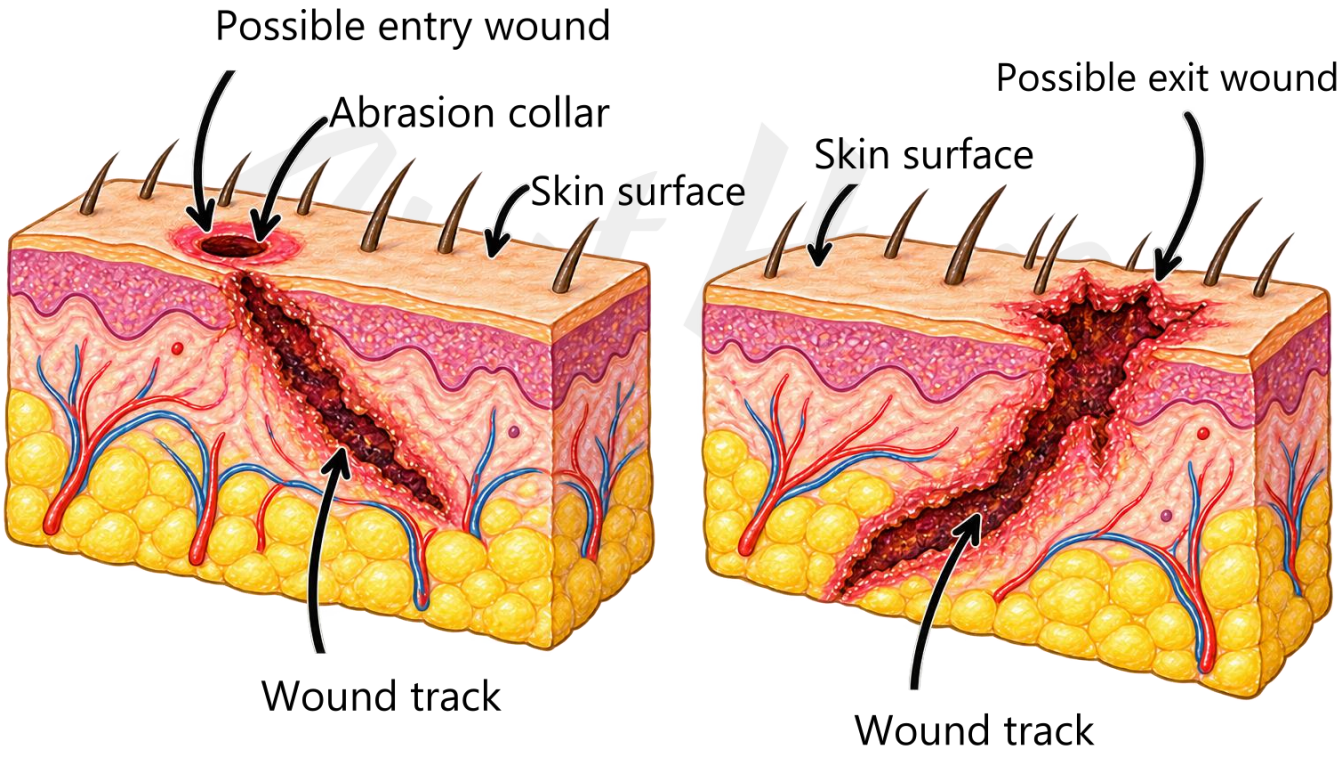
B. Temporary Cavity

- A **temporary cavity** is transient displacement of surrounding tissue during energy transfer.

Determinants and Clinical Significance

- Tissue elasticity, projectile deformation, fragmentation and contact with bone influence the injury.
- A small external opening may coexist with severe internal damage.

Interpreting Firearm Wounds



Features considered when interpreting firearm wounds

Entry and Exit Features

Possible Entry Features

- A possible entry wound may show an abrasion collar around the defect and a residue or wipe-related margin.

Exit Features and Exceptions

- An exit wound may be irregular and may lack the typical entry abrasion collar.
- These are tendencies rather than universal rules.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- An exit supported by clothing or another firm surface may develop an abrasion and resemble an entry wound.

Projectile Paths and Wound Correlation

- A projectile may remain in the body, fragment, pass through an intermediate object or produce an atypical track.
- Multiple wounds should be correlated with imaging and dissection before estimating the number of projectiles.

Important Atypical Wound Patterns

A. Shored Exit

- A firm support presses against skin at the moment a projectile emerges and can create an abraded margin.
- The abrasion can mimic an entry collar, so internal track and surrounding evidence are essential.

B. Tangential or Gutter Wound

- A glancing projectile may produce an elongated superficial wound rather than a circular perforation.
- Associated deeper damage depends on the tissues and energy transfer.

C. Re-entry and Fragment Wounds

- A projectile may leave one body region and enter another, producing more skin openings than projectiles.
- Fragments of projectile or bone can create additional tracks and should be correlated with radiology.

Soot, Stippling and Contact Effects

- **Soot** is deposited material that may be partly removable, while **stippling or tattooing** results from small particles striking or entering the skin.
- Clothing and other intervening material may filter or alter these effects.
- A contact discharge may produce local gas-related effects, but the appearance depends on the underlying tissues and other circumstances.
- Absence of soot or stippling does not by itself establish one exact firing distance.
- The apparent size of a soot field or pellet pattern should not be converted into a distance using a universal textbook formula.

Range and Direction Opinions

- A **range opinion** compares the observed findings with suitable case-specific laboratory tests when available.
- Use qualified categories or a justified interval rather than an unsupported exact distance.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

FREE PREVIEW

Click here to visit our website

MBBS PREMIUM NOTES

Complete MBBS notes for every subject and year are available only in the FirstHope app.

Scan or click here

Click here to get the app >

Available on Google Play

Browse MBBS notes by year

firsthope.co.in/mbbs

Click here to explore MBBS >

Scan or click here

FirstHope Medical on Instagram

@firsthope.medical

Click here to follow

App and notes help

Find answers about access and downloads

Click here for help

YEAR 1 / YEAR 2 / YEAR 3 / YEAR 4