

WOUND BALLISTICS

Ballistics is the study of motion of projectiles. It is studied under three sub heads-

1. **Interior Ballistics** - It concerns with the motion of projectiles inside the barrel of a firearm.
2. **Exterior Ballistics** – It is the study of the motion of projectiles in the open (air), after coming out of the muzzle of a firearm.
3. **Terminal Ballistics**- It is the motion / behaviour of the projectile at the target or inside the target. It is also known as Wound Ballistics.

Wound ballistics is concerned with the wounding phenomenon. It involves terminal ballistics. It studies how a projectile creates the wound and causes the destruction of tissues by its movements on and after entering the body, its travel inside and the exit from the body.

WOUNDING MECHANISM-

When a projectile strikes the human body, it depresses and compresses the skin, flesh and bone underneath. The continued pressure stretches them beyond the elastic limits and a hole is created. The stretched skin regains its normal state after the hole is created and the bullet has entered inside. The diameter of the hole on the skin, therefore appears, on the non-stretched skin somewhat smaller than the size of the projectile which created the wound, when it was stretched.

The minimum velocity required to penetrate the human skin has been found to be 40 to 50 metres per second. The threshold velocity for the penetration of a bone is 60 meter per second.

The projectile continues its onwards progress till it leaves the body through an exit hole, or, till its energy is spent beforehand, in overcoming the resistance. The projectile is found lodged at the end of the tunnel, in later cases.

ELEMENTS OF WOUND BALLISTICS-

Wound ballistics has following important elements-

1. Nature of target.
2. Velocity of projectiles.

3. Constructional features of projectiles.
4. Range.

FIREARM INJURIES-

The projectiles fired by firearm have certain shapes, velocities and kinetic energies which differ from most of the other agents causing injuries. The shapes of wound, the destructive effect on the tissues, presence of foreign bodies (of specific shapes and composition) and the projectile track help to identify whether the given injury is a firearm injury or not.

The evaluation of the injuries clarify if the given injury is-

1. a firearm injury or not.
2. an entrance wound or an exit wound.
3. post-mortem or ante-mortem injury.
4. from the alleged firearm.
5. fatal or not.
6. such that a person could perform the alleged acts after receiving the given injuries.
7. of alleged age.
8. caused from alleged distance.

The evaluation of injuries can also indicate of the alleged number of shots fired or the number of firearms used.

ENTRANCE WOUND-

The wounds have certain characteristics which permit their identification without difficulties, most of the times. The prominent features utilized for the purpose are-

1. The wounds are circular or oval in most of the cases. Key hole wounds are also formed by wobbling bullets.
2. The diameter of the entrance hole is, ordinarily slightly less than the diameter of the projectile creating the hole.

3. The edges are compressed inward – they are inverted.
4. A contusion ring is found around the wound in most of the times. The ring is dark red to bluish-black depending upon its age.
5. The dirt or wipe ring is not always present but whenever it is present, it is a sure sign of an entry wound.
6. Burning of skin, flesh or singeing of hair is caused when the shot is fired from a close range. The scorched skin, when it is available, it identifies the entry wound.
7. GSR deposits are from close range firing only. They also identify the entrance wound whenever they are available.
8. The presence of a muzzle impression around the wound.
9. Sometimes the bullet carries the GSR in their flight from the ejecta, from the barrel fouling and deposit on the edges or inside the entrance hole.

Extraneous deposits around the wound are from the following sources-

1. Propellant burned powder (smoke), semi burnt and unburnt propellant.
2. Primer residue.
3. Projectile, Cartridge Case and barrel material (from fouling and bore scraping).
4. Intermediate targets.

The extent of extraneous deposit depends upon-

1. The weapon.
2. The ammunition.
3. The range.
4. The angle of fire.
5. The target characteristics.

PINK COLORATION-

If a shot is fired from a very close range or in contact with the skin, some carbon monoxide (produced in the combustion of propellants) gets absorbed in the skin and flesh. It gives a pink coloration to the skin around the wound which indicates firearm injury and injury from a close range.

CHARRING, SCORCHING, BURNING, SINGEING etc.-

These are the effects of flame or hot gases produced in the combustion of propellants. The charring is caused when the shot is fired from a very close range. The size, shape and extent are characteristic of the firearm and range.

The Charring is often confused with the Blackening, Tattooing, Dirt Ring or even with Contusion Ring. The Charring is different from Blackening. The later can be removed with a cotton swab moistened with spirit while the former cannot be removed in this way.

BLACKENING-

The blackening is caused by the smoke deposits. The smoke particles are light. They do not travel afar. Therefore, smoke deposit i.e. blackening is limited to a short range. The colour of smoke is grey to black in black powder and light grey to dark grey in smokeless powder.

TATTOOING-

The tattooing is also known as peppering or stippling. It is the deposit of un-burnt or semi-burnt powder particles under the skin. Tattooing, ordinarily, cannot be removed with a swab.

DIRT RING OR PROJECTILE WIPE RING-

The dirt ring is deposited by some projectile around the wound. The materials come from-

1. The projectile may carry grease on them. The dirt gets collected on the grease which, in turn, gets deposited around the wound.
2. Deposit of soot/GSR present on bullet. The projectile pick up the soot/GSR from the powder ejecta which rush past the projectiles inside or outside the barrel.

3. Dirt due to intermediate target (clothes, mud walls etc.) or from the surface from which the projectile has ricocheted.
4. In shot gun ammunition, the pellets and buck shots are rubbed with graphite. A small amount of graphite is carried by the projectiles which they deposit around the entry hole. The lead bullets may also blacken the edges of the entry wound.

FOREIGN MATERIAL-

The projectile or their fragments and sometimes the wads are found inside the body, these may also indicate the nature of firearm used.

CONTUSION-

The edges of wound are contused by the impact of the projectile. The colour of contusion varies from reddish dark to bluish black. The contusions are in the form of a band around the wound and are often of uniform width. The tissues are ruptured and swollen.

EXIT WOUND-

All exit wounds, irrespective of range of firing, the following identifying features-

1. They have no fixed shape or size. Usually they are larger than entry wound and are irregular.
2. The eversion of edges and the direction of pushed or pressed out flesh, indicate the exit wound.
3. The presence of projectile, fixed in the exit wound.
4. If the entry wound is established and a probe through this wound comes out of another wound. The later is obviously an exit wound.

HANDELING FIREARM INJURIES-

1. Observe and record all major or minor, internal or external injuries.
2. Describe fully the wound of entrance, the internal track and the lodgement site or the exit wound. Give serial number to each injury. The description should contain (whenever possible)

- (a) The possible nature of firearm.
 - (b) The presence or absence of GSR.
 - (c) The direction of fire and deflection (if any).
 - (d) The presence or absence of any extraneous matter or the projectile from the intermediate target or from the ricocheting surface.
 - (e) The condition of projectile : Whole ? Deformed ? Fragmented ?.
 - (f) Describe site(s) of the injury without using medical terminology.
3. Log all information collected through-
- (a) Photographs – photograph the injury before and after cleaning, with a scale and an identification information chit included in the photographs. Photographs should fix the site of injury (ies) as well as nature of injuries (close up). If there is extraneous material (GSR etc.), it should be recorded photographically.
 - (b) X-Ray radiograph for locating projectiles and their fragments.
 - (c) Exhaustive description.
 - (d) X-Ray of bone damage.
4. Preserve relevant evidence-
- (a) The clothes and the evidence thereon.
 - (b) The projectiles.
 - (c) The wads (if any).
 - (d) The extraneous deposit.
 - (e) In case of burning the charred skin piece may also be preserved.
 - (f) GSR found on hands must also be collected and preserved.
 - (g) Get the help of Ballistic Expert, if required.**