

## Forensic medical examination of gunshot injuries

**Gunshot injuries** are damages caused by shots from all types of shooting-iron, by the explosions of live ammunitions or their parts.

### Classification of firearms:

- The firearms are sectioned on piece of ordnances, and shooting.
- Shooting may be: group, and individual.

**The individual shooting firearms are sectioned into following groups:**

#### 1) According to purpose:

- battle (automatic device);
- hunting (1-, 2-barrelled guns);
- spots (pistols);
- special (alarm);
- atypical: self-made and defect.

#### 2) According to length of a barrel:

- long-barreled;
- medium-barreled;
- shot-barreled.

#### 3) According to property of a barrel:

- rifled;
- smooth-bored weapons;
- combined.

#### 4) According to caliber (diameter):

- small-caliber (4-6 mm);
- medium-caliber (7-9 mm);
- arge-caliber (more than 9 mm).

#### 5) According to the mechanism of a shot:

- automatic (machine guns);
- semi-automatic (pistols);
- non-automatic (hunting rifles).

#### 6) The principal types of firearms are:

- smooth bored firearms;
- rifled firearms.

### Types of action of a bullet on an human organism:

**Penetrative action of a bullet** – it is observed at big "alive force" of a bullet (over 1000 Dg), which beating out a site of a tissue, and forms defect "minus - tissue". On bones, due to penetrative action (crushing action) of a bullet are formed defects of a tissue with formation of shallow multiple bone fragments, which are dislocated according to a direction of a bullet's movement.

**Cuneiform action of a bullet** – takes place at small "alive force" of a bullet (over 100 Dg); the bullet does not punch and moves apart tissues, forming a slit. As opposed to penetrative action of a bullet - cuneiform it is observed at an exit of a bullet from a body of the person more often.

**Explosive action of a bullet** – can take place at shots of special-purpose bullets (explosive bullets), at damages of a bullet covering, and also in cases, when a bullet, having big "alive force" (over 10 Dg), getting in the self-contained cavities with a liquid (the filled stomach), liquid tissues (heart in a condition of a diastole), organs with the big percentage of liquids (brain). In that case under action of arising hydrodynamic forces (the law of the Pascal) there are extensive destructions of these organs.

**Contusion action of a bullet** is displayed at it small "alive force" (less 10 Dg), that is observed at actions of bullets on exit, at a ricochet. Such bullets usually cause grazes, superficial wounds.

**According to action of a bullet on an organism it is distinguished 3 kinds of gunshot wounds:**

- 1) non-perforating (blind);
- 2) perforating (through);
- 3) tangential wound.

### ***Entrance and Exit Wounds***

One of the most important attributes of an *Entrance Wound*, together with the basic attribute of a gunshot wound, is *defect "minus - tissue"*. This sign of gunshot trauma distinguish it from all other damages, and it is result of penetrative action of a bullet. At attempt to pull together edges of a wound between fingers it is formed pleats on the skin.

The skin adjacent to the hole shows two zones, the inner of *Grease Collar*, and the outer of *Abrasion Collar*.

At formation of an Exit Wound the bullet has a smaller kinetic energy and defect "minus - tissue" here is not present.

Exit wounds may vary considerably in size and shape. They may be round, stellate, cruciate, elliptical, crescent-shaped, or appear as linear lacerations or even incised wounds. The edges of the exit wound rim are puckered and everted, and broken pieces of contused, haemorrhagic subcutaneous fat may protrude through the defect.

### **Wound Canal**

The path, which has passed a shell in a body, has the name the Wound Canal.

**Information of the Wound Canal it is accepted to distinguish 3 zones:**

1. A zone of immediate Wound Canal (initial destruction).
2. A zone of molecular shake of the tissue propagated sometimes on 4-5 cm and more.
3. A zone of a contusion of the tissues being walls of the Canal, width from several mm up to 1-2 cm.

In parenchymatous organs are formed radial ruptures, which are always more expressed on an entrance, than on an exit.

Hollow organs have a small entrance and significant exit wounds, and in some cases the filled hollow organs may burst due to **hydrodynamic action** of a bullet.

At damage of the tubular bones the bullet forms the perforated - splintered fracture. On entrance of a bullet the spherical or oval aperture with radial fractures is formed. On the opposite party there is a big zone of fragmentation destruction: fracture looks like plural, mainly longitudinal cracks, which are crossed with short, cross cracks. Bullet wounds of ribs, clavicles have similar character.

For flat bones (skull, scapula, flanks of ileal bones, and sternum) the most typical is a perforating fracture. Wound Canal in such bones looks like funnel or the truncated cone dilating aside of flight of a bullet. At perpendicular occurrence of a bullet on an external bone plate is formed the spherical aperture which diameter is equal or hardly less diameter of a bullet. That has forensic value for an establishment of caliber of the weapon.

In case of damage to flat bones it is necessary to take into consideration the course of fissures. The fissures, which were produced by the next shot, do not cross those ones, which were produced by the previous shot (*Shaviny's phenomenon*).

**Distance of a Shot**

The distance of a shot is understood as distance between muzzle and a surface of the injured body.

**In forensic medicine three distances are distinguished:**

- contact shot,
- close shot,
- distant shot.

Such division is caused by original distribution of accompanying components of a shot.

**Accompanying components of a shot and their action on the skin**

At a shot from a bore, except for a bullet a pre-bullet air, flame, gases, soot, powder grains, weapon greasing, and small metallic particles take off. At shots from the greased weapon from a bore droplet of weapon lubricant take off also. Specified particles call the *accompanying components* (or additional factors) of a shot, and leave fixed traces on the body and clothes, and sometimes even damages.

The contact shot is a shot from the weapon when a muzzle is pressed strongly (complete hermetic), no strongly (incomplete hermetic) or by a lateral part (lateral angled) to a surface of the body. In formation of damage, except for a projectile, powder gases take part.

**Attributes of the contact shot are:**

- "shtanz-mark";
- crosswise or stellate shape of tears of soft tissues in the area of an entrance wound;
- bright red colour of soft tissues in the area of an entrance wound due to formation of carboxihaemoglobin and carboximyoglobin;
- absence of accompanying components of a shot around of an entrance wound and their presence on a course of wound canal;
- singeing of the hair;
- "pocket" in subcutaneous fat containing blood mixed with gunpowder around an entrance wound.

In some contact wounds, the imprint of the muzzle of the gun is found as patterned abrasion on the skin around the wound ("shtanz-mark", barrel mark, or recoil injury) due to action of powder gases.

The recoil injury ("shtanz-mark") forms if under a skin is a bone, gases are distributed along a bone, detached a skin and typed it to muzzle with formation of a graze, bruise or lacerated wound repeating the form of a muzzle. Sometimes on them it is possible to judge about marks of the weapon.

**Close Shot**

The close distance of a shot is understood as such distance between muzzle of barrel and a surface of an injured body when accompanying components of a shot take place. The entrance wound is circular with inverted edges and is surrounded by blackened, tattooed and burnt area. Digital expression of distance of a close shot depends on a weapons system, character and a condition of ammunition and a degree of a deterioration of the weapon.

The blackening can be wiped off the skin. Unburnt and partially burnt powder grains will be driven into the skin producing tattooing. This cannot be wiped off the skin. Defect of a tissue, abraded collar and grease or dirt collar are present. The internal injuries are similar to the contact shot.