INJURIES CAUSED BY FIREARMS

These types of injuries are caused from a distance under the direct action of firearm projectiles. They differ depending on the utilised weapon, its trajectory, the shooting range, the characteristics of the gunpowder, the projectile etc.

Most frequently, the injuries are lacerations with specific characteristics that offer paramount information for the interpretation and reconstruction of events.

THE COMPONENT PARTS OF THE FIREARM

A modern firearm has the following parts:

- ✓the barrel;
- ✓the closing device;
- ✓the feeding mechanism;
- ✓the percussion mechanism;
- ✓the aiming system
- ✓the butt.

The barrel is a steel cylinder – rifled (the inner surface of the barrel has helicoid ridges and grooves) or smoothbore (the inner surface of the barrel has no ridges and grooves).

The closing mechanism closes the posterior opening of the barrel and loads, extracts and ejects the empty tubes of the cartridges.

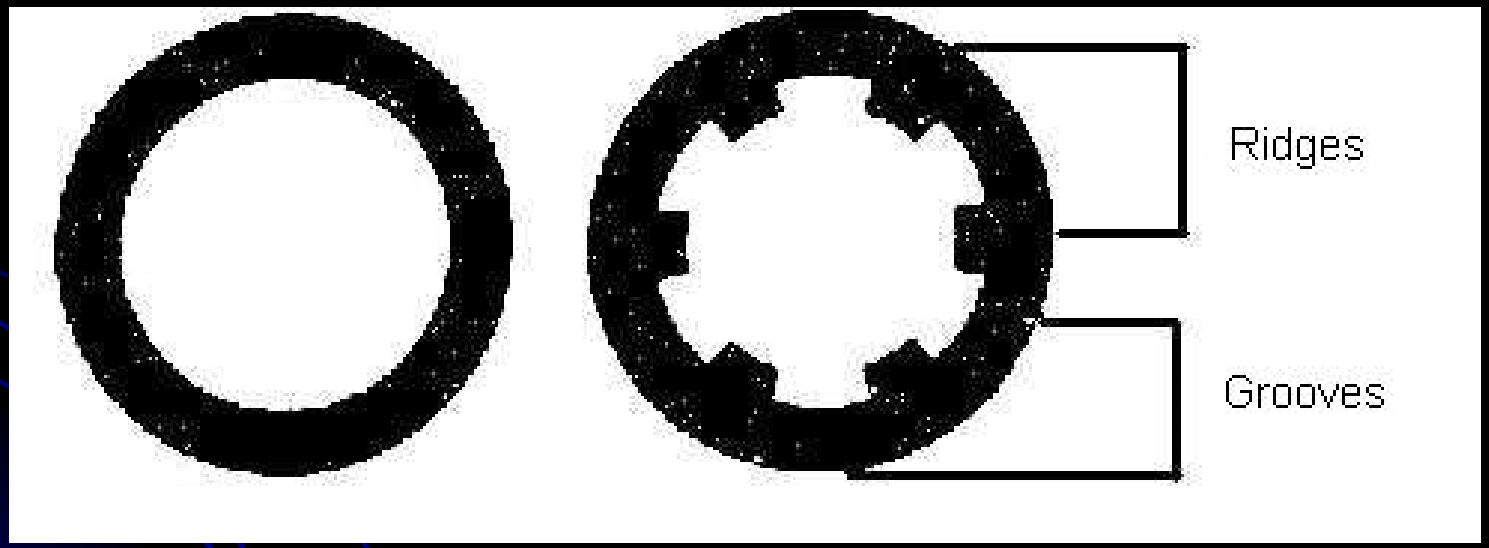
The loading mechanism is manual or automatic.

The percussion mechanism includes the trigger, percussion nail and a spring.

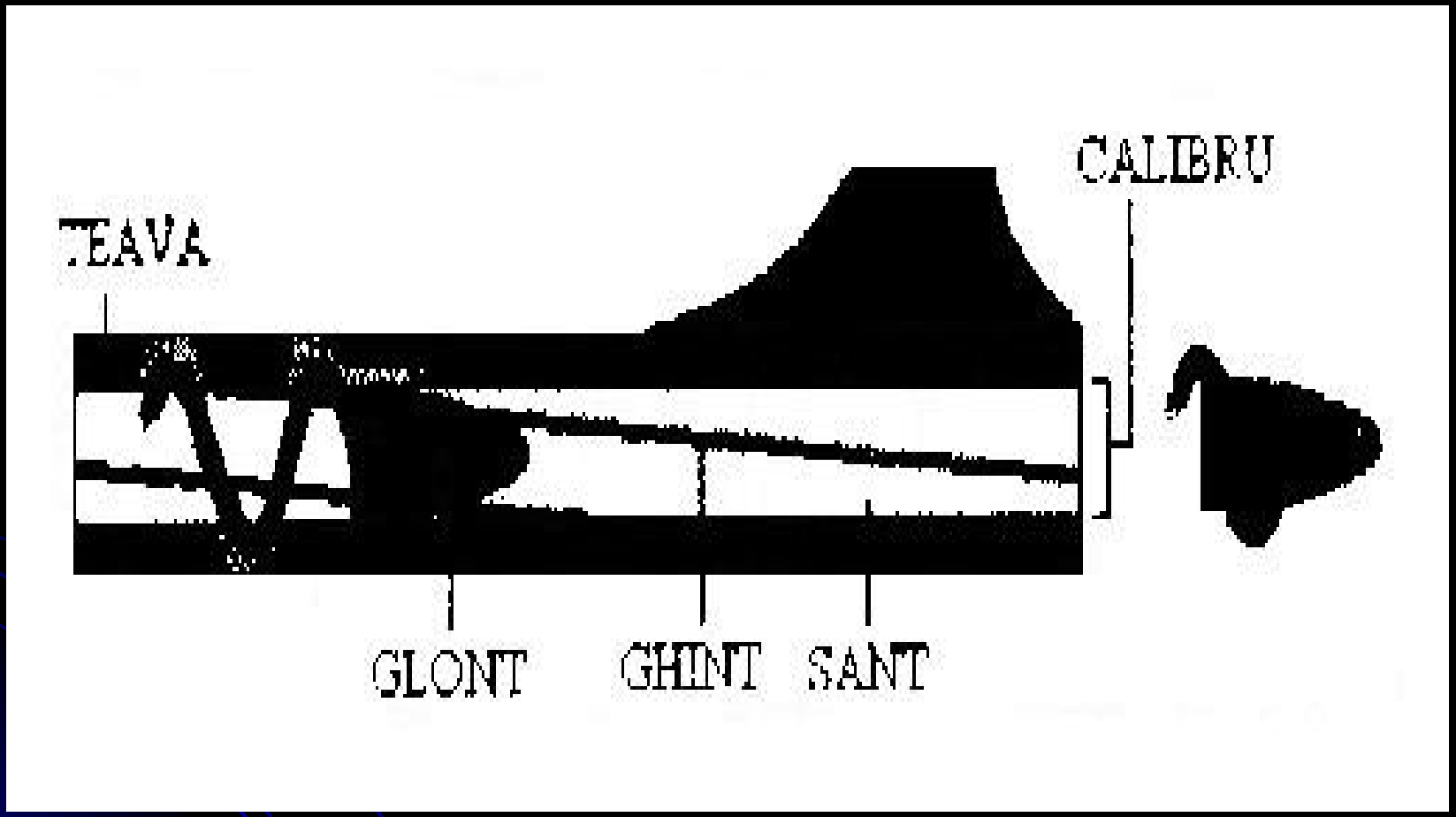
The butt sustains the weapon in the moment of shooting. It can be fix or folding, depending on the weapon's destination.

Some weapons also present a silencer that reduces the noise in the moment of shooting.

Smoothbore **Rifled**



The barrel
(transversal section)


CALIBRU
TEAVA
GLONT
GHINT
SANT

THE CLASSIFICATION OF FIREARMS

1. The functioning system

- simple, one-cartridge, manual guns
- repetition guns: more cartridges, manual loading after each shot;
- semi-automatic weapons, with manual percussion, fire by fire, automatic loading (no series can be shot);
- automatic weapons with automatic loading and serial shooting.

2. Purpose

- military
- hunting
- sporting
- special
- disguised

3. The length of the barrel

- short barrel: 3-20 cm (revolver)
- medium barrel: 20-50 cm (sporting guns, machine guns)
- long barrel: 50-80 cm (rifles, hunting arms)

4. The aspect of the interior side of the barrel

- smooth bore – hunting firearms;
- rifled (helicoid groove in the barrel)

5. The calibre (the interior diameter of the barrel between the grooves or the diameter of the cartridge)

- small: up to 6.35 mm
- medium: between 6.35 and 9 mm;
- big: over 9 mm.

6. The ammunition

bullet, pellets or mixed

THE EFFECTS OF FIREARMS ON THE HUMAN BODY

Projectiles usually do not have the capacity to unbalance the subject; it will continue to move in the initial direction, until other muscular contraction dictate another action, or they will fall in the initial direction if inclination.

If however the projectile penetrates the cerebral column or the skull, the victim will fall instantaneously.

I. The primary factors of shooting

The traumatic consequences mainly depend on the topography of the entrance wound and the corresponding internal organs.

The shock wave starts with the detonation, because of the high external pressure created by the explosion of the powder. This pressure wave precedes the bullet along its trajectory and will be the first to have contact with the body; it will produce the first dynamic changes, completed and finalised by the bullet (all within milliseconds).

The effects of the bullet are mainly due to the dissipation of kinetic energy in the tissues. These destructive effects depend on:

- ***the speed of the bullet***
- ***the density of the tissues***
- ***the resistance of the tissues***
- ***the impact angle***
- ***the material of the bullet.***

Bullets act like blunt objects with high kinetic energy, so they can penetrate the skin and penetrate the tissues, or they can explode on the surface of the skin.

In contact with the skin, projectiles with sufficient kinetic energy initially exercise a high pressure, followed by the skin depression; they finally defeat the skin elasticity, they will perforate and dilacerate the external tissue layers, determining an *entrance wound*.

By penetrating the profound tissues, the projectile creates a *trajectory-channel* that can be linear or irregular.

If the projectile still has enough kinetic energy, it leaves the body through an *exit wound*. In this situation, the result is a transfixing wound.

If the bullet remains in the body the wound is penetrating (*blind firearm wound*).

The characteristics of all these lesions depend on:

- ✓ ***the type of firearm***
- ✓ ***the shooting range***
- ✓ ***the characteristics of the projectile***
- ✓ ***the characteristics of the tissues involved.***

II. The secondary factors of shooting

The identification of burned powder residues is very important for the interpretation of the events. They can sometimes be present on the skin of the shooter or in the close proximity.

1. The flame **– its consequences depend on the type and quantity of powder.**

2. The soot **– the smoke and soot resulted for the burned powder, deposit as a collar around the entrance wound as a blackish area that easily washes away. This area called the blurry area or the smoke area is very accentuated if the cartridge contains black powder.**

3. The gases **leave the barrel under a pressure, which gradually decreases but at short-range, it can have destructive results:**

a. The mechanical effect **– manifests at a range of maximum 5 cm; it is represented by irregular tearing of clothing or ruptures of the entrance wound.**

b. The thermal effect **– at close-range, gases still have a high enough temperature to provoke small superficial burns on the skin (yellowish spots) or on the clothes.**

c. The chemical effect **– The gases are rich in carbon monoxide that reacts with the blood around the entrance wound, producing carboxi-haemoglobine. The result is a light-reddish discoloration of the entrance wound.**

4. The unburned powder

The particles of unburned powder each act as a small secondary projectile that penetrates the clothes or the skin around the entrance wound.

The result is a circular encrusted, “tattooed” area.

Much like the soot, the unburned powder is more dense in the proximity of the entrance wound and rare in the periphery.

At ranges bigger then 1 m the effects of unburned powder (the tattooed area) do not appear.

The presence or absence of the secondary factors classifies shooting ranges in the following categories:

a. long-range **– no secondary factors present;**

b. medium-range **– powder particles are present on the clothes or th skin (under 1 m);**

c. short-range **– the presence of powder particles on the skin on the clothes or skin, associated with the presence of soot – the specific element (under 35-40 cm);**

d. Contact-shooting **– total or partial contact of the barrel with the skin (all secondary factors present)**

THE EFFECTS OF RIFLED FIREARMS SHOOTING

1. General notions

The ridges on the inner surface of the barrel determine the helicoid motion to the bullet and leave a specific pattern on its surface. The calibre of rifled firearms is represented by the interior diameter of the barrel between opposite ridges. The main types of rifles firearms are:

- ✓ ***the rifle***
- ✓ ***the pistol***
- ✓ ***the revolver.***

2. The cartridge of rifled firearms

In general, the cartridge is formed of:

- ➢ ***the tube***
- ➢ ***the percussion cap***
- ➢ ***the powder***
- ➢ ***the projectile (bullet).***

Usually bullets are made of a single metal – lead – or of a lead or steel nucleus, covered with a softer alloy (copper - nickel) – bimetallic bullet. The diameter of the bullet is slightly larger than the calibre of the firearm so it opposes resistance while traversing the barrel.

The result is a circular motion around its own axe, induced by the ridges; the pattern of the ridges also impregnate, offering an important element for the identification of the firearm.

A special type of bullets are the "dum-dum", the explosive is situated in the middle of the cartridge that has a percussion system in its tip.

3. Bullet injuries

There are two major types of interactions between the bullet and the victim.

The first one is the crushing, perforation and tearing of tissues, due to the physical passage of the bullet.

The tissue elasticity determines their ulterior retraction.

The combination of the blow with the perforation is responsible for most permanent cavities (lack of tissue).

The second major interaction is represented by the elongation and distension of the walls of the trajectory, called temporary cavity. The initially dislocated tissues will “fall” into this newly formed cavity.

Some theories sustain the existence of a third interaction, represented by a sonic pressure wave that enters the body before the bullet.

The bullets perforate quicker at high speeds than during their deceleration so the severity of the injuries depends on the range of the shooting.

The bullets create an entrance wound, a trajectory-channel and an exit wound, if they still possess enough energy to penetrate the tissues.

THE ENTRANCE WOUND

1. The long-range shooting

In such shootings, there will be no secondary factors effects.

The bullet's contact with the skin determines a temporary depression and short-term abrasion between the bullet and the skin.

Finally, the elasticity of the skin is defeated and the entrance wound is formed.

The main feature of the entrance wound is the lack of tissue, so that by closing its margins one cannot reconstruct the initial skin surface.

The lack of tissue is the consequence of tissue contusion and crushing.

Fragments of epidermis can be found in the first portion of the trajectory-channel.

If the bullet penetrates perpendicular on the skin surface, the margins of the entrance wound are round, smooth, regular, punched.

If the bullet trajectory is oblique on the entrance plane, the entrance wound is oval.

Most frequently, long-range rifled firearms shooting entrance wounds are clean, circular, with a diameter between 3 and 10 mm.

The entrance wound has some particularities that differentiate it from the exit wound:

a. The erosion (contusion) collar

The contusion collar is an initially rose-reddish, narrow ring around the entrance wound. It is the result of the contact between the bullet and the skin and it consists of skin an equally distributed abrasion if the trajectory is perpendicular. If the trajectory is oblique the abrasion collar is uneven and the entrance wound is oval.

In this case, the abrasion is larger and crescentic on the first contact surface that forms a narrow angle with the bullet. One or more fine skin ruptures appear at the distal end where the skin is compressed by the bullet.

b. The parchment collar

The erosion collar becomes more evident after 12-24 hours post-mortem, due to the dehydration and parchment-like transformation of the area.

c. The cleaning collar

The "cleaning effect" appears if the bullet is made of a copper alloy and is lubricated, or if it carried soot, residues or other particles carried during the passage through the barrel. All these residues will be deposited around the entrance wound, in the inner side of the erosion collar, as if to "clean" the bullet. The cleaning collar is usually blackish and narrow.

d. The metallization collar

This collar is inconstant and superposed to the cleaning collar. It is formed of fine metallic particles from the bullet material, impregnated in the tissues surrounding the entrance wound. It can only be detected using spectroscopic or radiological methods and it is an important element for the diagnostic of entrance wound.

2. The medium-range shooting

The unburned or partially burned particles of gunpowder that penetrate the clothing or the skin with enough kinetic energy will impregnate around the entrance wound.

The result is the "tattoo" or the "engraving" collar, situated at the periphery of the entrance wound, of the erosion and the cleaning collar.

The tattoo collar only forms at ranges of approximately 1 m or shorter. The tattoo marks are small, round, almost equal, and reflect the size of the gunpowder particles.

3. The short/close-range shooting

In short-range shooting (up to 35-40 cm), new aspects will add to the already above-described ones.

The smoke collar is the most peripheral additional collar.

It is the deposit of the smoke and the soot resulted from the burned explosive powder.

The width of this collar is variable, within a 10 cm limit, at shooting ranges of maximum 5 cm.

The soot forms a fine powdery layer. Similar to the tattoo collar, the smoke collar is more intense, blackish to the centre and fades towards the periphery.

4. The contact shooting

The contact shooting is also known as the absolute unload. The morphology of the entrance wound is dictated by the following possibilities:

a. Barrel in incomplete contact with the skin, under a narrow angle

The smoke and gases escape from the free margin of the barrel and impregnate the skin but they also tear the tissues corresponding to the contact area.

In these cases, the secondary factors are present around an irregular, star-like entrance wound, surrounded by a small blackish soot collar.

b. Barrel in complete contact but not pressed against the skin

In some of these cases the secondary factors can be completely absent around the entrance wound.

If a bony structure is situated immediately under the skin (the skull) the entrance wound may be atypical, with irregular margins. This is due to the resistance opposed by the bone to the effect of the gases accumulated under the skin; consequently the gases will be expelled and will determine secondary tearing of the wound margins.

c. The barrel is in complete contact and pressed against the skin

Under these circumstances, the entrance wound can be surrounded by the barrel pattern that can help identify the weapon.

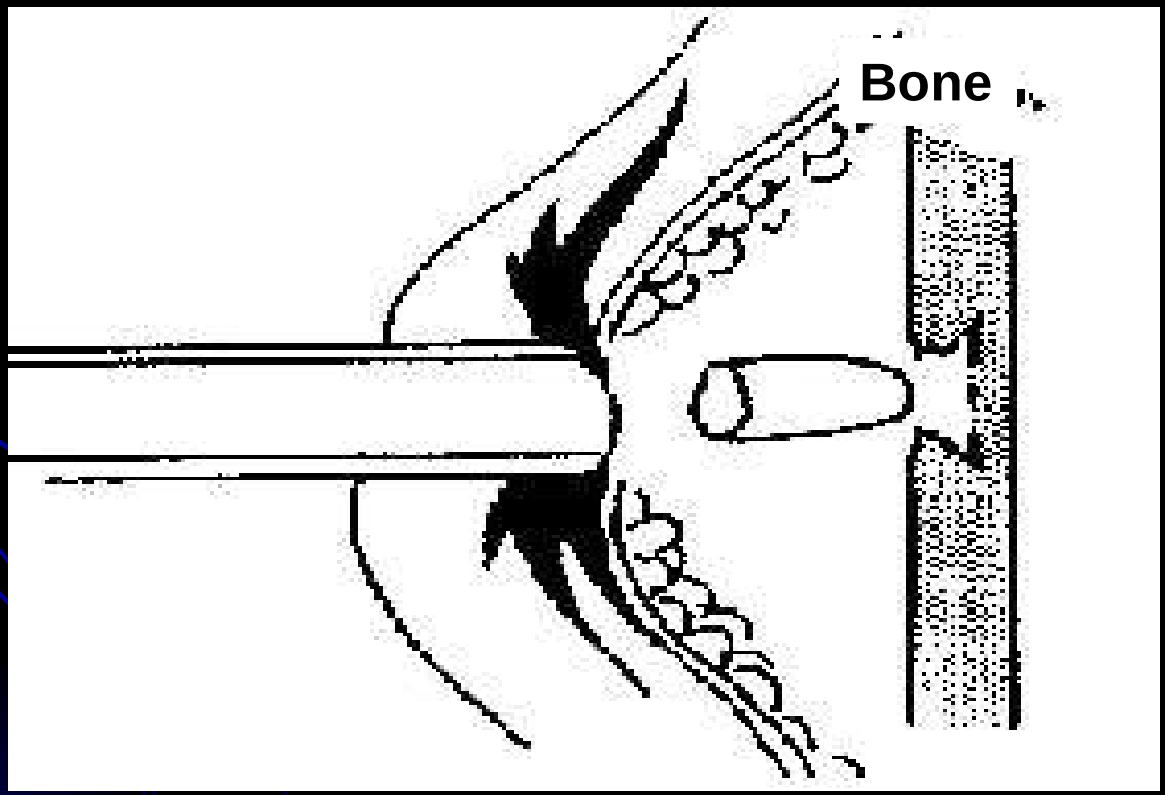
The entrance wound is round, with smooth margins, similar to the long-range perpendicular shooting.

The margins can be parchment-like due to the effect of flame while the surrounding soft tissues can be pinkish because of the effect of CO.

The punctual abrasions and the soot spots may be absent on the exterior, but the profound subcutaneous tissues are usually impregnated.

The bullet and the secondary factors penetrate together through the entrance wound, into the trajectory channel.

In some cases the entrance wound may be hidden, hard to find; it is the case of shooting in natural orifices or cavities (mouth, nose, ear, in the rectum, in the vagina) or in areas they mask the wound (axillar, under the breast).



Contact shooting

THE TRAJECTORY CHANNEL

The bullet's trajectory is more or less linear, depending on its speed and the encountered tissues, and on any deformation or fragmentation occurred along the trajectory.

The injuries produces by crossing a flat bone usually allow determining the calibre of the bullet and the direction of the shooting.

The entrance orifice at perpendicular contact is round, with a diameter similar with the bullet.

The trajectory of the orifice is a truncated cone, so the entrance plane is smaller then the exit plane, because the backwards projection of the bony fragments.

For example, in the vault of the brain the entrance orifice will have a smaller orifice in the outer table and a larger orifice in the inner table.

The exit bony orifice is also a truncated cone, with the small base on the inner table and the larger base on the outer table.

In the elastic, pulmonary tissue, the trajectory channel has a small diameter, which makes it difficult to trace. In other, more consistent organs like the liver, the trajectory is irregular.

Some projectiles can migrate (migrating projectiles) and can perforate a large vessel, like the thoracic aorta; if they do not have sufficient energy to leave the vessel, they can be carried by the blood flow in other distant regions (abdominal aorta, iliac arteries).

THE EXIT WOUND

After crossing all layers of the trajectory the bullet pushes and tears the skin form the inside, creating an irregular exit wound.

Usually the exit wound is star-shaped, with no marginal abrasion, larger then the entrance wound, or dilacerated, with turned up, reflected margins that display no bruises or abrasions.

The exit wound differs from the entrance wound from the following points of view:

- **the diameter and its general size are larger;**
- **it is irregular, with reflected, exploded-like margins;**
- **it can rarely be linear;**
- **the abrasion, cleaning, metallization, tattoo and blurry collars are absent even in close-range shootings;**
- **there is no lack of substance.**

The skin is relatively rough and elastic so there is the possibility of finding the bullet under the skin, in an opposite area to the entrance wound.

Any sing of cutaneous swelling, sub-cutaneous, fluctuant bleeding or rough nodule may signify the presence of the bullet.

The following size-related observations can be drawn from examining of entrance and exit wounds:

-*entrance wound smaller then exit wound*: is the most frequent situation; deformations of the bullet and the transportation of bony fragments towards the exit wound are the explanation.

-*entrance wound equal to the exit wound:* in this situation high kinetic energies are involved and the helicoid motion of the bullet is probably preserved. This is the situation of perpendicular trajectory to both wounds and without bony fragments carried by the bullet;

- *entrance wound is larger then the exit wound:* in these cases the bullet carries foreign objects to the entrance wound and has a trajectory channel oblique to the entrance wound and perpendicular to the exit wound.

SMOOTHBORE FIREARMS SHOOTING

1. The characteristics of smoothbore firearms and ammunition

The most common smoothbore firearms are the hunting guns. The inner surface of their barrel is smooth; the barrels can be unique, double or triple and their length vary between 61 and 81 cm.

The speed of the projectile at the end of the barrel is of approximately 400 m/s.

The cartridges are similar to the rifled ammunition. They are designed to contain up to hundreds of pellets (small lead spheres), so smoothbore firearms shoot multiple projectiles simultaneously.

The tube is made of cardboard or plastic with a bronze base that contains the percussion cap. Its percussion produces a small explosion that lights the gunpowder. The resulting gases will expel the pellets.

Smoothbore projectiles can be pellets or a unique, special projectile (Brenneker). The latter can be: cylindrical or cylindric-ogival.

Pellets can have various sizes, from 2 mm diameter to 8 or 9 mm diameter, depending on the size of the hunted game.

The range, kinetic energy and efficiency of the projectile are in direct relation with its size.

The calibre of the cartridge is dictated by the inner diameter of the barrel.

The number of pellets varies from a dozen bigger to a few hundred small ones.

SMOOTHBORE FIREARMS INJURIES

When a smoothbore firearm is shot, the pellets emerge together, grouped; along their trajectory, they gradually diverge, in a cone-shaped manner.

Because of the specific characteristics of smoothbore wounds, they are rarely confused with other penetrating injuries. If the shooting is at close-range, the entrance wound is clearly bigger then any other bullet wound and the injuries are more destructive then in high speed, rifled shootings.

Smoothbore shootings to the head, thorax or abdomen can be fatal due to massive damages in vital organs or large blood vessels.

The projectile dispersion determines multiple entrance wounds on the impact surface with the target; the dispersion degree offers valuable information about the shooting range.

The correct procedure involves multiple test shootings with the incriminated firearm, with the same type of ammunition, towards an experimental target. The distance from which the same degree of dispersion is obtained corresponds to the real shooting range.

Every entrance wound has to be measured, photographed and precisely located, using anatomical structures. At close-range, the smoothbore wound is usually lethal; the severity of the lesions and the accuracy of the aim decrease with the increase of the shooting distance.

THE ENTRANCE WOUND

Much as in rifled firearms shootings, the entrance wound, the trajectory channel and the exit wound (when present) have certain characteristics.

In short-range shootings, the pellets are accompanied by unburned powder, flames, gases, soot and pieces of cardboard or felt.

The contact-shooting is the shooting in which the end of the barrel is in partial or total contact with the target (skin or clothes);

The shooting at close-range is considered when the end of the barrel is sufficiently close to the target so it leaves traces of all secondary factors (approximately 30 cm);

The short-range shooting is considered when the entrance wound presents only some of the secondary factors (between 30 cm and 1.2 m);

The medium-range shooting is considered when the distance is big enough that no secondary factors are present. In this situation the entrance wound is represented by a large central wound surrounded by multiple small orifices produced by the dispersed pellets (1.2 – 3 m);

The long-range shooting is considered starting with a distance of 3-3.6 m.

The victim presents no central wound but only multiple small entrance wounds produced by the dispersed pellets.

1. The contact shooting

The contact shooting takes place when the end of the barrel is placed in complete or incomplete contact with the victim's body.

This shooting produces a single entrance wound, with a diameter similar to the firearm barrel (2-4 cm).

Frequently the pattern of the barrel can be observed as a round abrasion collar. It is caused by the impact between the barrel and the skin in the moment of shooting.

The margins of the entrance wound are usually smooth; in some cases, they can present bruises or abrasions due to the recoil.

If the shooting is performed with a double barrel firearm, the second barrel can provoke a circular abrasion near the entrance wound. The margins and the floor of the entrance wound are blackish because of the smoke deposits, or they can even be burned (cauterised by the flame).

a. If the *end of the barrel is completely pressed against the skin*, the entrance area is air-tight, so all secondary factors are absent from the skin or clothes. At close examination, traces of soot, and powder can be identified in the depth of the wound.

Because the whole amount of projectiles and gases penetrate in the wound, severe tissular destructions are frequent and the gases (carbon monoxide) will determine their pink discoloration. If the pressure to the skin of the head is high, the effects can be devastating (explosion of the skull due to a hydrodynamic effect).

b. If the *end of the barrel is in incomplete contact with the skin*, gases and other secondary factors can escape through the remaining free space. The escaped secondary factors will impregnate a part of the entrance wound. A blackish margin of soot and unburned powder will be found opposite to the contact side. This impregnated area offers indications regarding the shooting angle.

The margin of the entrance wound can also present small brownish burns produced by the flame; the differential diagnosis has to be made with the soot collar, which can be easily wiped.

The severity of the injuries is obvious in shootings to the head. The result is massive destruction, violent ruptures of the scalp and face, multiple skull fractures, accompanied by total or partial brain extrusion.

Such injuries are frequent in suicide cases, mostly in the temporal area, in the mouth or under the chin. Scalp, bony fragments and cerebral substance can be found scattered on a relatively wide area, while some of the pellets can be found in the remaining tissues, especially in the bony fragments.

In shootings to the trunk, the skin and subjacent tissues can be detached of the thoracic cage by the gas pressure.

If the shooting takes place with the barrel in the mouth and the lips tight, the cheeks will swell temporarily in the moment of shooting; later on superficial and profound lesional patterns will appear, irradiated from the bucal area.

2. The close range shooting

The label of close-range shooting can be made when all secondary factors are still present on the entrance wound (maximum 30 cm from the end of the barrel). The entrance wound is unique, central, surrounded by a superficial burned collar, associated with unburned powder deposits.

The projectiles and fragments of felt can be found in the floor of the wound. So, the differential element with contact-shooting is the absence of the contact injury (circular bruise or abrasion).

3. The short range shooting

Each secondary factor of shooting accompanies the pellets for a certain distance. The flame, the soot and the powder produce a complex of patterns represented by small areas of superficial burn, soot deposits and unburned powder tattoos incrusted in the skin. Their disposition is circular, around the entrance wound, with a maximum 15 cm diameter.

The flame lasts the shortest distance and the gases rapidly cool. The peripheral burn collar around the entrance wound is present up to a range of 30 cm while the unburned powder tattoos appear even at a range of 1-1.2 m. Thus, it can be stated that the short-range of shooting varies between 30 cm and 1-1.2 m and only some of the secondary factors will be present around the entrance wound, on the skin or clothes.

Over 30 cm, the burn collar is absent, but the soot and tattoo collars are present. The smoke and soot collar are absent in over 37 cm range shootings.

The tattoo collar is produced by heavier particles so it is present even in shootings from 1-1.2 m. The presence and intensity of the secondary factors also depends on the type of powder and cartridge.

4. The medium range shooting

The medium-range is considered the distance of 1.2 to 3 m between the end of the barrel and the target.

The diameter of the entrance wound is similar for all calibres up to a range of 2 m.

If the distance is bigger, the pellets start to disperse progressively.

The tattoo collar is no longer present on the skin and the fragments of felt are absent from the floor of the wound.

Up to a range of 1 m, the diameter of the entrance wound is between 2.5 and 4 cm.

Over 1 m, the wound takes the aspect of a superficial skin denudation, as if it was removed with a sharp object.

The degree of dispersion is measured by the distance between the dispersed entrance wounds.

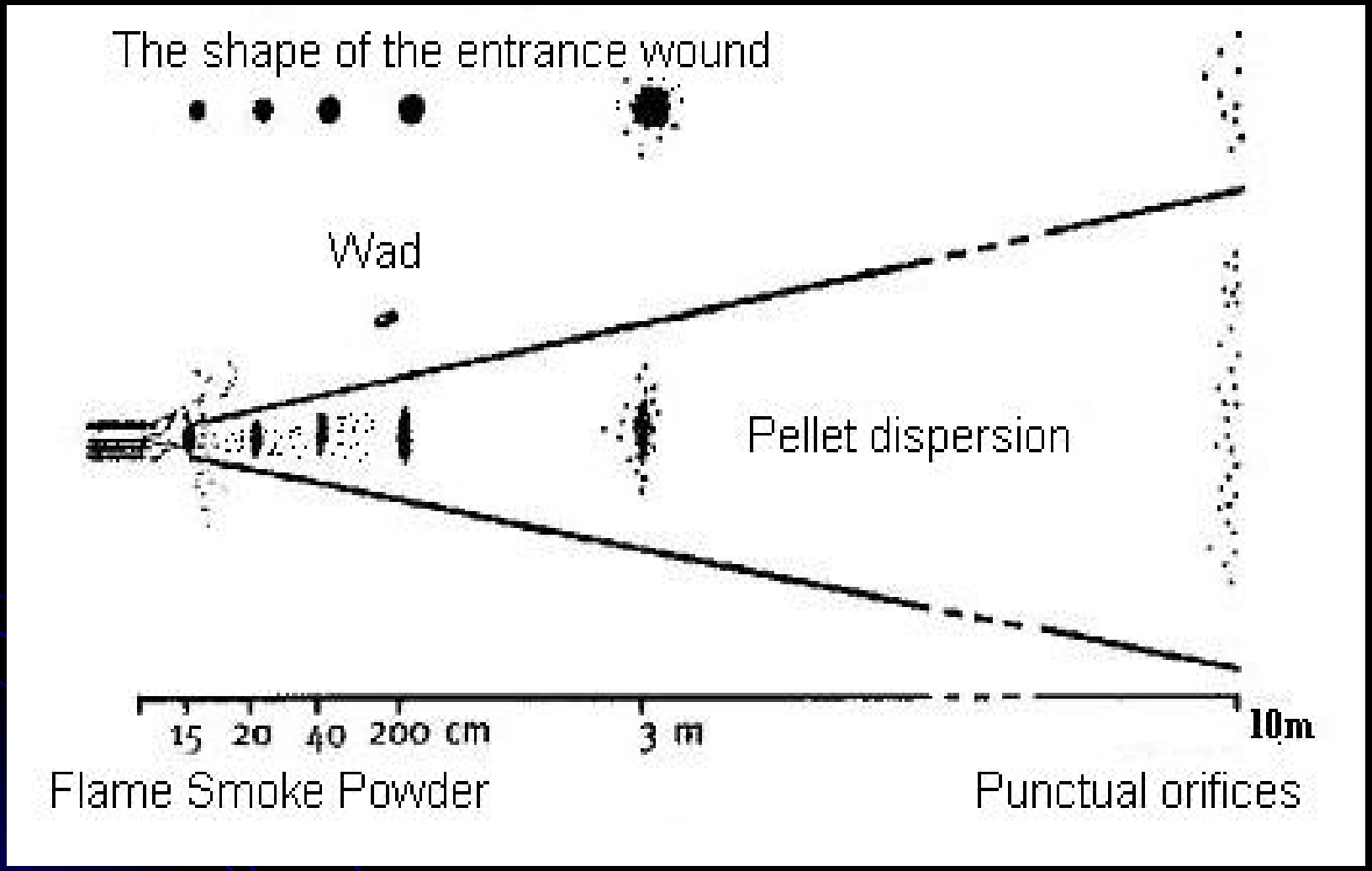
5. The long-range shooting

In smoothbore shootings, the long-range is calculated over 3-3.6 m. In shootings over 3 m, the diameter of the central wound decreases; the pellets can even be totally dispersed, with individual entrance wounds.

They are similar with the rifle wounds – orificial, with abrasion collar.

The penetrating force of the projectiles and the severity of the injuries decrease with the increase of the shooting distance.

Hunting firearms are efficient only from a range of under 50 m. For human victims, the lethal range is rarely over 20 m.



The pellet dispersion in smoothbore shootings

THE TRAJECTORY CHANNEL

The trajectory is situated between the entrance and the exit wound, or between the entrance wound and the point where the projectile stopped, inside the body.

In smoothbore shootings the entrance wound can be big, unique, or big, irregular, surrounded by small, satellite entrance wounds (partial dispersion), or there can be multiple orificial entrance wounds for each pellet (total dispersion).

The channel can be linear or irregular, interrupted (deviated channel), when the projectile meets high consistency tissues and is deviated by them (bones). A thorough examination of the trajectory channel can offer important information regarding the shooting direction. This examination is first performed in situ, before extracting the cadaver's internal organs, in order to avoid the appearance of false trajectories.

The content of the channel is also important; it can consist of liquid or clotted blood, dilacerated tissues or even bony fragments.

Because the pressure of the gases and/or the kinetic energy of the projectile, the trajectory channel can be larger then the calibre of the firearm is the pellets are grouped.

In some cases, various foreign objects carried by the projectile can be found in the initial part of the channel. They are important for differentiating the entrance and exit wounds (textile fibres).

When encountering bony structures, the features of the trajectory channel depend on the shooting range and angle (perpendicular or oblique), the internal structure of the bone and the kinetic energy of the pellets.

Grouped pellets can produce various fractures: orificial, comminuted, multi-fragmented or only fissures of the skull tables.

The irregular trajectory appears when the pellet crosses structures of different densities (cavitary and parenchimal organs).

Dispersed projectiles produce multiple thin channels; their diameter is smaller then the pellets' because of tissue elasticity.

Dispersion presumes long-range shooting so often the pellets do not have the necessary kinetic energy to create an exit wound and leave the body ("blind" shooting).

Large pellets are efficient at long-ranges and their speed is over 300 m/s. Each large pellet can produce the effects of an individual small calibre bullet.

THE EXIT WOUND

Smoothbore projectiles are usually small and aero-dynamically unstable. They can be stopped by high-density structures (bones) and have a low penetration capacity, especially at longer ranges.

If exit wounds exist, they are either unique, irregular, with dilacerated, pushed out, reflected margins (close-range shooting, grouped pellets), or multiple, small orifices corresponding to each dispersed pellet (in rare cases, because once dispersed, the pellets have low kinetic energy)

THE FORENSIC EXPERTISE IN FIREARM INJURIES

The positive diagnostic of firearm wound is generally easy to establish.

In many cases it can be made at first look and eventually confirmed with radiological examination, if the bullet is retained in the body

Examining and preserving the clothing is of major importance and a priority in all cases, especially for the estimation of the shooting range.

Residues from medium and close-range are to be found rather on the clothing then on the skin of the victim.

Identifying the complementary factors of shooting can be performed using physical and chemical methods.

The physical methods include microscopy, micro-photography, spectroscopy, radiology, stereo-radiology, infra-red photography, panchromatic and infrared clichés etc.

Chemical tests include more or less specific reactions, like the Castelanos-Plasencia reaction with brucine and diphenylamine.

The capital problem is identifying the entrance wound, because based on its topography the experts can establish the shooting direction and sometimes can differentiate suicide from homicide.

Regarding the forensic types of death, firearm injuries can be classified in: accidental, homicidal or suicidal.

Forensic expertise objectives

1. Gunshot wound – positive? (cause of death?)
2. Entrance wound(s), exit wound (s)
3. Number of shootings (not always even!)
4. Direction of shooting (s) (angle, inclination of barell, possibilities of infliction – self vs. by other?)
5. Range (complementary factors, dispertion of pellets etc.)
6. Other clues (complementary factors on the hand of victim/suspect, blood traces on surrounding objects, on the victim, suspect, etc.)