Wounds

PRESENTED BY

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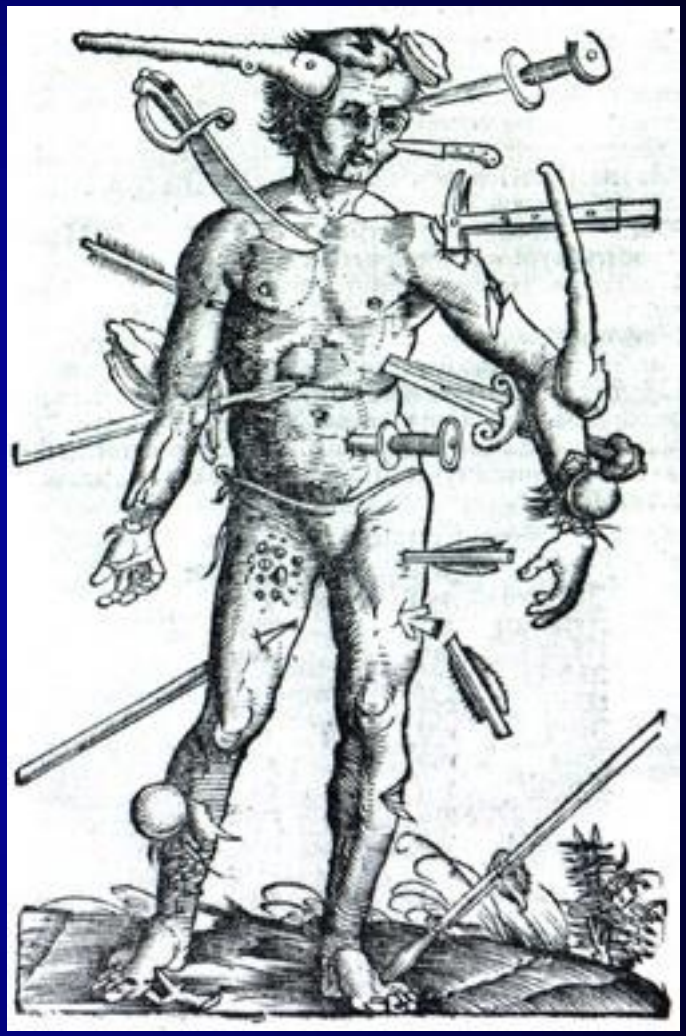


DEFINITION

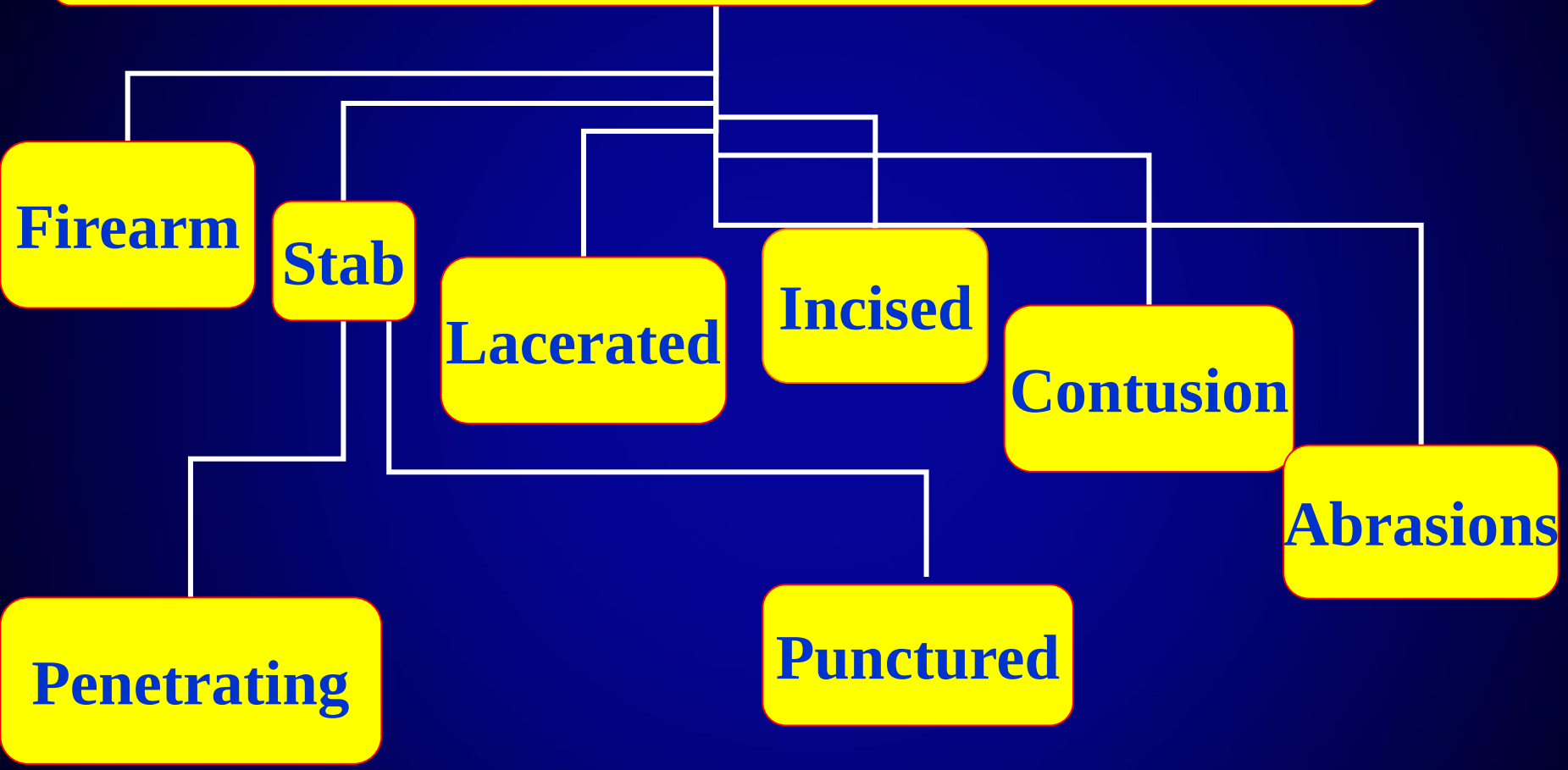
It means discontinuity in any body tissue, whether it is external as skin- or mucous membrane (m.m.) or internal as muscles, bones or viscera

Classification of Wounds

I- From the legal point

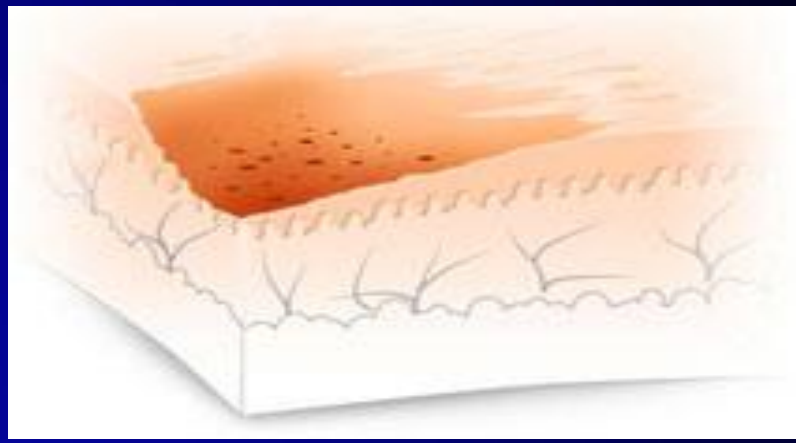
- Simple wound
- Dangerous wound
- Fatal wound

II- From the medico legal point



A-Non-penetrating injuries

1-Abrasions



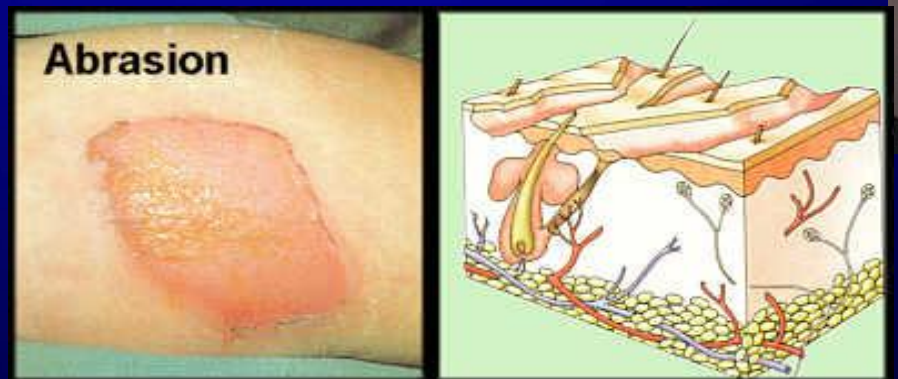
Definition :

They are the simplest type of wound

It is a destruction of the

superficial layer of the skin

(cuticle



Abrasions

Are classified in to:

a) Scrape or brush abrasions

Domestic hen. Abrasion of the wing

A-Non-penetrating injuries

1-Abrasions

B-Scrape or brush abrasions

Scrape or brush abrasions are created when a blunt object scrapes off the superficial layers of the skin, sometimes exposing the deeper dermal layers and causing fluid leakage from the vessels. This causes a serosanguineous fluid covering on the abrasion. When the area is incised, there usually is no hemorrhage in the underlying soft tissue, indicating the injury is confined to the epidermis. Grating or sliding abrasions are caused when the body slides across a surface such as a pavement. Ligatures, nooses, and dragging a body across a rough surface cause scrape abrasions. It is theoretically possible to find a bunching of epidermis at one end of the abrasion indicating direction of movement, but this is not commonly seen in humans.

Abrasions

b) Impact wound

c) Patterned abrasion

Rope marks

d) Artifacts are

Postmortem ant bite marks, with no evidence of a vital tissue reaction

Abrasions

b) Impact Abrasions Impact abrasions are crushing injuries caused when the blunt force impacts perpendicular to the skin. This may occur from a weapon or a fall. Impact abrasions usually affect the skin over bony prominences in which there is less underlying protective tissue.

c) Patterned Abrasions A patterned abrasion shows the imprint of the weapon or surface that caused the abrasion. This may be seen with ligature injuries that leave a patterned imprint revealing the type of ligature used. In humans, intermediary material on the body such as clothing may leave an imprint from the crushing force of the weapon used.

d) Artifacts Postmortem artifacts may be misinterpreted as abrasions. Insect feeding postmortem may be mistaken for abrasions. The drying of areas of skin may resemble abrasions. Careful examination should allow the differentiation between true abrasions and artifacts.

Medico legal importance:

- 1- Suggest the cause of injury or crime, e.g. nail abrasions around the throat suggest throttling, around the mouth and nose suggests smothering and about the thighs and genitalia suggest rape or sodomy.
- 2- Dating Abrasions
- 3- The pattern of abrasions may gives a fair indication of the causal agent, fingernails cause small semi lunar abrasions, if the body is scratched with the nail, long linear ones are produced.
- 4- The presence of abrasions around the edges of wounds of the scalp and other wounds is a clear differentiating evidence between contused and cut wounds
- 5- Abrasions inflicted after death leave a whitish surface, which soon dries, and become brown and parchment like, thus simulating an ante-mortemabrasion, but without any hyperemia or extravasations of blood around. Postmortem abrasions may results from ants and cockroaches, etc., eating the cuticle of dead bodies especially around the mouth and nose. Spontaneously around the scrotum or anus from the irritation caused by urine or feces, which may, expelled by rigor mortis.

➢AGE OF ABRASION

In humans, the dating of abrasions is possible with histological examination by documenting the stages of healing. The first stage is scab formation. The deposit of serum, red cells, and fibrin indicate survival after the injury. Infiltration of neutrophils in a perivascular formation may start in 2 hours but is clearly visible in 4–6 hours, indicating the injury is 4–6 hours old. Under the area of epithelial injury, a zone of infiltrating neutrophils in the bed of the scab is present by 8 hours.

➢AGE OF ABRASION

A surface zone of fibrin and red cells, followed by a zone of infiltrating neutrophils, and then a layer of damaged abnormally staining collagen appear by 12 hours. In impact abrasions, the surface zone is comprised of crushed epithelium. Epithelial regeneration marks the second stage of healing. The regeneration comes from the margins of the abrasion and the surviving hair follicles. In scrape abrasions, this growth of epithelium may appear in as little as 30 hours. In most other abrasions, it is visible by 72 hours. The third stage of healing is subepidermal granulation, which occurs only after epithelial covering of the abrasion is complete. Perivascular infiltration and chronic inflammatory cells are present. It becomes prominent during days 5 to 8. During days 9 to 12, changes in the overlying epithelium are most prominent as it forms keratin and becomes progressively hyperplastic.

➢AGE OF ABRASION

. Collagen fibers may begin to appear. The fourth and final stage of healing is regression, which starts around the 12th day. The epithelium is remodeled, becoming thinner and atrophic. The collagen fibers become more prominent. The vascularity of the dermis decreases, and a definitive basement membrane develops.

2-Bruises (Echymoses,Contusions)

Definition : **It is an extravasation of blood in the tissues following injury or violence.**

Factors affecting the size of bruises

- The amount of force causing injury.
- The size and shape of causal instrument.
- The type of tissue in which it occurs.

Age:

Health condition

Postmortem Findings

•Postmortem exam can reveal the true extent of the bruising, which is usually quite a bit larger than what was apparent on the surface. The fur may need to be shaved to look for bruising. It is possible to see bruising even in dark-pigmented skin. Bruising may take minutes to several hours to form in animals and may fade quickly depending on the extent of damage. Photographs must be taken of the bruising pattern hourly as they form to capture the full representation. It is possible that early on the bruise may be more reflective of what caused the bruise and as bleeding continues, especially from the deeper tissue, the pattern may become obscured. The skin should be reflected over the entire body to look for subcutaneous or deeper tissue bruising. At first appearance, contusions may be grossly difficult to differentiate from postmortem lividity. A contusion involves hemorrhage into the soft tissue and the blood cannot be wiped or squeezed out when incised. This is not the case in areas of lividity. Over time, decomposition can make it extremely difficult to differentiate antemortem bruising and lividity. Hemolysis of the red blood cells creates diffuse discoloration of the soft tissue. The blood within the vessels and the erythrocyte leakage caused by the breakdown of the blood vessels from decomposition hemolyze. The erythrocytes in the soft tissue from antemortem bruising also hemolyze, making it impossible to distinguish from an area of livor mortis

Medico-legal important:

- They **Usually occurs at the site of the trauma**
- **The bruise take the shape of the causative instrument**
- **small round bruises of about 1cm in diameter may indicate finger tip pressure.**
- **In human bite → two curved raw of bruises**

  In animal bite → two parallel raw of bruises

Medico-legal important:

- **They differentiate cut wound from lacerated wound (they present around lacerated wound)**
- **Determination age of bruises**

(1) First two days → red (oxy -Hb)

(2) Another 2-3 days, → blue (reduced-Hb)

(3) Another 2-3 days → green (biliverdin)

(4) Another 2-3 days → yellow (bilirubin)

Dating Bruising

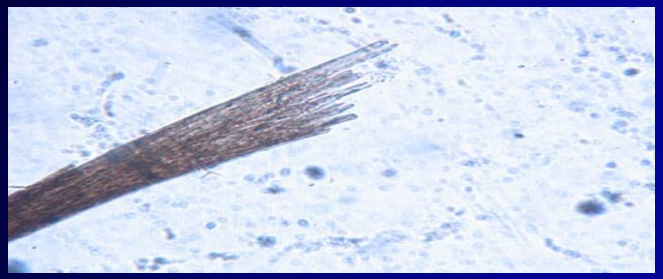
The healing of a bruise is dependent on the number of bruises in the area, vasculature of the injured area, amount of subcutaneous tissue and fat, type and severity of the force that caused the bruise, and any underlying disease that may impair local tissue reactions. Contusions undergo color changes over time because of the breakdown of hemoglobin, but the color change and time for change are variable. In animals, bruising initially may appear red, purple, or dark blue. As time progresses the bruise may fade and turn brown. At best, one can say the bruise appears recent or is older. It is possible to cause contusions postmortem if a severe enough blunt force is directed at the body within a few hours after death. This causes rupture of capillaries and forces blood into the surrounding tissue. Ante mortem contusions that occur immediately prior to death may not have had enough time to show a vital reaction detectable by histology. If the contusion occurred ante mortem with enough time for the body to mount a response, evidence of a vital reaction may be seen with microscopic examination of the injury. . Sometimes after putrefaction, hemolysed blood permeates into the tissues and stains them red, which may be mistaken for a bruise. Usually a bruise resists putrefaction for some time and in early-putrefied bodies it appears as a collection of blood and not a diffuse red staining.

Ante-mortem bruise	Post-mortem bruise
➢ well defined edges	Flat edges
➢ Blood clotted in the tissue spaces and may be in form of big clots	Blood only partially clotted or not at all
➢ May be extensive in size	Usually small in size
➢ May show colour changes if the victim has lived	Never shows colour changes
vital reaction and swelling present	absent

Item	Bruise	hypostasis
time		
Cause		
site		
swelling		
Color		
Cut&wash		
Abrasions &sepsis		
edges		
Microscopic examination		

II- penetrating injuries

1-Lacerated or contused wounds



Crushed or brushed hair

Incised (cut)Wounds

These are wounds caused by sharp instruments (as a razor or knife)

Ante-mortem wounds	Post-mortem wounds
1- gaping and eversion of edges	- No gaping or eversion
2- blood oozing from the wound	- No blood oozes from the wound,
3- blood clot infiltrating the tissues	- No blood clot
4- Edges are usually swollen	- No swelling of edges
6- Accompanied by signs of healing	- No signs of healing

Contused wounds	Incised wounds
1- Edges are irregular and angle not sharp with crushed hair	-Edges and angles acutely cut -With sharply cut hair
2- Accompanied by bruises and abrasion of edges	- Rarely presence of slight bruises and no abrasion
3- Usually accompanied by tearing, laceration and bridging of tissues	- All tissues cleanly cut
4- Haemorrahge is slight	- Haemorrahge is profuse
5- Commonly liable to sepsis	- Less liable to sepsis
6- Healing is followed by a moderately large scar which may cause disfigurement (healed by the 2nd intension)	- Resultant scar is small and less liable to cause disfigurement (healed by the 1st intension)

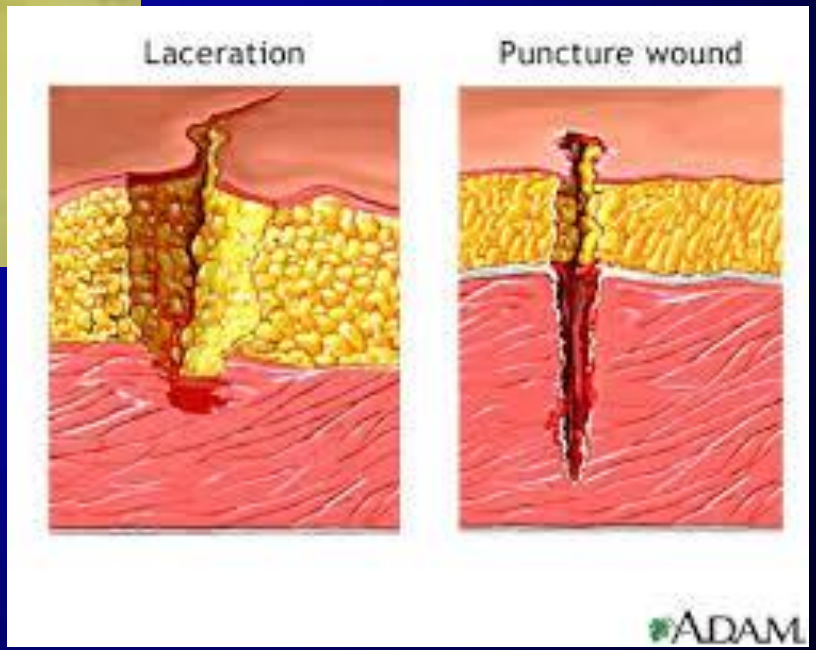
Stab and Punctured Wounds

These are **deep wounds** caused by blows with **pointed instruments** and are characterized by the following:

- They are deeper than wide and usually have sharp edges.

➢ **Stab wounds may be caused by pointed and sharp-edged instrument as knives and swords**

➢ But **pointed blunt-edged** instruments as nails, files and pokers cause **"punctured wounds"** they take the shape of the instrument that causes them.


Laceration
Puncture wound
ADAM.

Stab and punctured wounds,

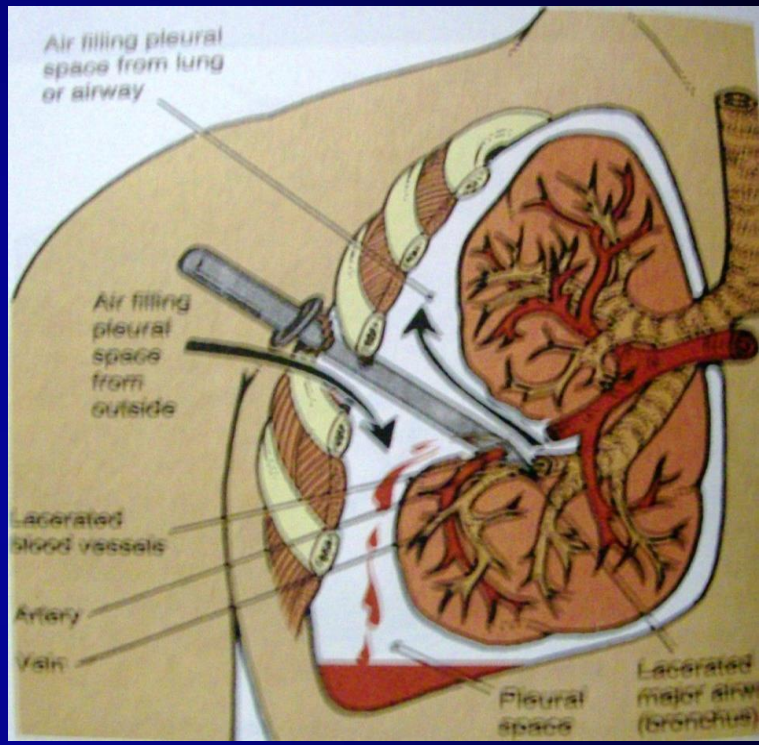
a stab wounds may caused by pointed and sharp edged instruments as knives and swords, but pointed blunt edged instruments as nails, files and pokers cause punctured wounds. Punctured wound is differ from stab wounds in shape as they are not linear and sharp as stabs, but take the shape of the instrument that cause them so they are rounded if caused by a nail, rectangular or star shaped if caused by a rectangular nail or poker and rhombic if caused by scissors.

Transfixing and penetrating wounds

is a stab or punctured wound transfixes the whole body or limb from one side to the other, it is then called transfixing wound. If the stab reaches a body cavity as the abdominal or thoracic cavities it is called penetrating wound.

- "transfixing wound".

- "penetrating wound".



Stab and punctured wounds are more dangerous than incised wounds due the following reasons

Medico-legal importance:

1- The presence of foreign particles or broken pieces of the instrument, when it is thrust against bone may help in identifying the instrument used.
2- Age of wound may be identified, after about 8 to 12 hours, the edges become red and swollen. In 2 or 3 days a sticky serous or purulent material covers the wound. In about 5 days, definite granulation tissue appears. Complete healing occurs in about 10 to 14 days, unless sepsis sets in when healing will be delayed.
3-They may help in identification of the instrument used as they usually take the shape of the instrument so that the wound will be triangular with one sharp and one broad lacerated end, if caused by a single sharp edged knife and in case it is caused by a double sharp edged one the two ends of the wound will be sharp.

Causes of death in wounds may be either direct or indirect

(1) Direct causes of death in wounds

- A- **Haemorrhage**
- **B- Shock**

C- Mechanical injuries to vital organs as heart, liver, spleen, brain and lung.

(2) Indirect causes of death in wounds

- Infections
- Septicemia
- Infectious disease
- Fat embolism
- Air embolism

Causes of death in wounds In all cases of wounds, complete and thorough external and internal examinations of the body are essential. There are direct and indirect causes of death in wounds Direct causes, include hemorrhage, shock and injury to vital organs. 1- Hemorrhages, the amount of hemorrhage that causes death depends on: a) Site of hemorrhage, external hemorrhage causes death when it is accompanied by loss of at least one third of the total volume of blood. With internal hemorrhage, the amount of blood varies with the locality, so that death may result after an effusion of one or more litters of blood in the pleural or peritoneal cavities, whereas effusion of only one fourth of a liter or even less of blood in the pericardial cavity is quite sufficient to cause death. Only few cubic centimeters of blood effused in the brain may be fatal. b) Rate of hemorrhage as rapidly effused blood is much more dangerous than slow hemorrhage. c) Age, sex and state of health, as Small and large animals are more susceptible. Female could stand hemorrhage somewhat better than male. The state of health has also an important effect on its resistance to hemorrhage.

2- Shock, death from shock has got no characteristic postmortem signs and it could be only suggested from the history of the case and the absence of other causes of death. It may follow minute injuries, which may leave no mark, e.g. slight burns, slight violence to the generative organs or even severe fright. It may follow a number of minor injuries, as occurs in beating by sticks, where no one injury could alone cause death. 3- Injury to vital organs, injury to brain or liver is an evident cause of death and could be easily detected in the postmortem examination. In such cases, death may occur immediately follow the injury or even few days or weeks after the injury. Indirect or secondary causes include Secondary hemorrhage, tetanus, septic inflammations, septicemia and pyaemia, hypostasis, aspiration pneumonia or any other complications that may follow operations may cause death of the victim. Embolism, bone necrosis, tissues gangrene or asphyxia during animal slaughtering may also of the secondary causes.

Fire arms wounds

Prof.Dr. Walaa Moselhy

Cartridge of rifled weapons

fired
automatic

non fired
non automatic

non fired
automatic

Wounds of rifled weapons A single missile traveling at high velocity produces these wounds. Determining Gunshot Range. Gunshot range is defined as the range from the muzzle to the target. There are four categories of gunshot range: contact, near-contact, intermediate, and distant Characteristic findings of gunshot wounds help define the distance from which the animal was shot

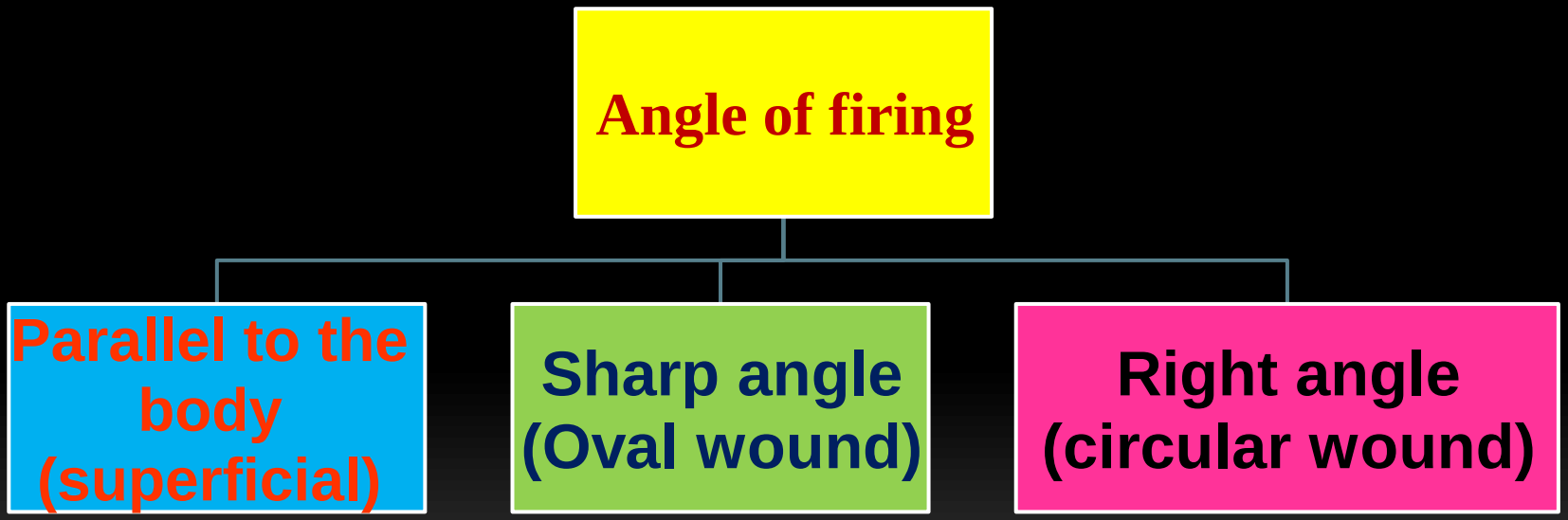
1- Contact or close range wound When the muzzle of the weapon is held against the surface of the animal body at the time of discharge. Skin at the point of entrance is torn often in a cross shape due to the expanding gases. Soot, powder and vaporized metals from the bullet, powder, and discharge gases are deposited in and along the wound tract, the last being found up 1-1.3 meter.

2- Near-contact or Close range firing wound Explosive effects of soft and the high initial velocity of the bullets will produce hard tissues at entrance. If there is no resistance to their passage, the size and shape of the entrance and exit wounds may be very similar. The products of explosion (flame-soot-unburned powder) escaping from the muzzle with the missile will mark the skin around the entrance wound with a ring of blackening by soot and tattooing by fragments of unburned powder driven into the skin. Hair may be signed.

3- Intermediate range wounds Clean punctured wound. The entrance wound is approximately the size of the causal bullet. 4- Distant range firing wounds There are no any marks. The characteristics of the entrance wound are entirely due to the bullet. As the later penetrates the skin it inverts and abrades the margins. The inlet wound is irregular and lacerated owing to the loss of velocity. The wound will appear as a round hole with a band of abrasion

Rifled weapon’s wounds

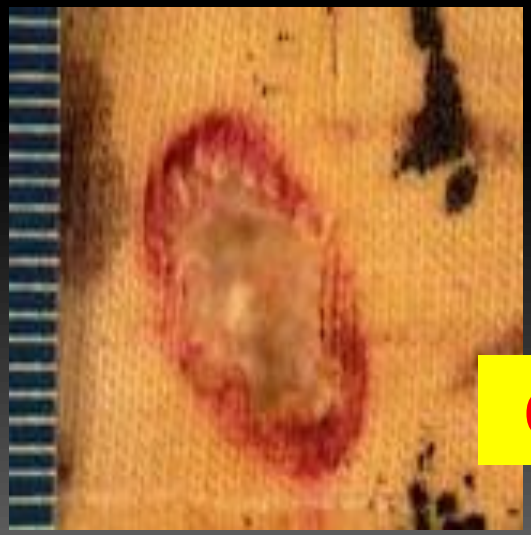
Shape of the wound differ according to:



Shape of the inlet

Superficial

Circular



Oval

Inlet and exit wound

Inlet wound	Exit wound
Smaller in size except in near firing	Bigger in size
Regular except in : •Near firing •Firing in wrinkled area as axilla	Irregular
Presence of burnt hair	absent
Inverted edges except in: •Near firing •Firing in fatty area •After putrefaction	Everted edges
Less hemorrhage	More hemorrhage
Powder marks as burning, blackening or tattooing present except in:. Distant firing	Absent

Inlet and exit wound

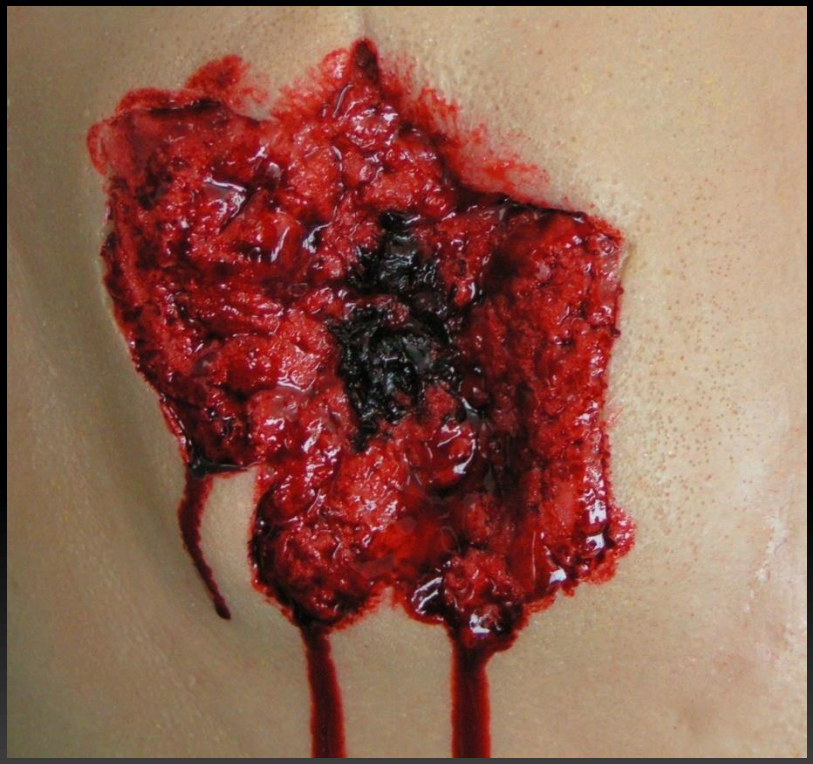
inlet

exit

Inlet and exit wound

inlet

exit



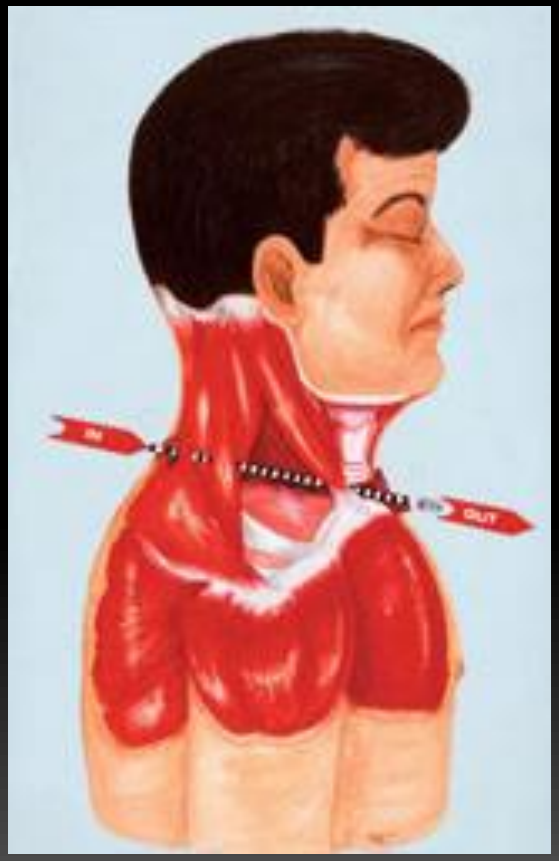
Direction of firing

The direction of firing can be easily made out by joining the entrance and exit wound with an imaginary line.

In case the missile is still inside the body by joining the entrance wound with the site of the missile in the body, as detected by x-rays in the living and dissection in the dead. Such imaginary line will indicate the direction of firing.

It should be noted that the missile might be deviated from its original direction especially with more or less spent bullets being fired either from a long distance or a weak weapon. In such case, when the bullet hits a bony surface, it gets deflected instead of perforating the bone.

Direction of firing



Determination the time of discharge of the weapon

- It is possible only in case of black powder.
- A characteristic smell of burnt powder can be detected in the barrel up to 10-12 days after firing depending on the conditions to which the weapons has been exposed.

- A rough estimation is by the chemical examination of the residue in the barrel in case of black powder has been used.
- The muzzle of the weapon would smell strongly of sulphurated hydrogen (chemically detected within 20-30 minutes, by putting a moistened lead acetate paper over the muzzle of the barrel, if H_2S is present the paper gets blackened).

Non-rifled Weapon’s cartridges

Wounds of smooth weapons

At close range the shotgun is the most formidable and destructive of all small arms. Unlike bullets, shotgun pellets rarely exit the body. As the distance of firing increases, there is dispersion of the shot with resultant decrease in the number of pellets that strikes the target. If the muzzle of a shotgun is held in loose contact or near contact with the animal body, there will be a circular area of soot deposited on the skin surrounding the entrance hole. As the range increases the diameter of the soot deposit increase but the density decreases. Deposition of soot continues out to a range of approximately 30-cm. As the range increases beyond 1 to 2 cm from muzzle to target, powder tattooing will occur. As the muzzle of the shotgun is moved farther from the animal body, the diameter of the circular wound of entrance increases in size until a point is reached where individual pellets begin to separate from the main mass.

In deaths from shotgun wounds, the size of the shot pattern on the body should be measured so that the range can be determined accurately by conducting a series of test shots as to reproduce on paper the pattern of the wound on the body. The diameter of the shot pattern in centimeters is some 2.5-3 times the muzzle distance from the wound in meter's (or the spread in inches is equivalent to the distance in yards); estimates derived in this way must be checked by test firing whenever possible. At close range, when there is only a single large wound of entrance, the wad from a shotgun shell will be found inside the body. As the range increases, the wads gradually fall and separate from the main shot mass. As still relatively close range the wad may impact the side of the wound of entrance before sliding into the body. Thus one will have a circular entrance surrounded by a symmetric abrasion ring with a large, irregular area of abraded margin on one side where the wad impacted.

Distance of firing determination

in smooth weapons It depends on the nature of the weapon and the type of powder. The gases reach about 15 cm and would cause tearing of the inlet. Flame and smoke reach about 1 - 1.5 meters causing burning and blackening respectively (faint and grayish reaches about one meter in smokeless powder. Unburned particle travel for about 3 meters causing tattooing. In case of smokeless powder, where combustion is more complete, the powder marks would be less marked and reach shorter distance thus burning may not be present at all or only at a distance of few centimeters and gases reach 15 cm. Blackening is rather faint and grayish, reaches about one meter and the range of tattooing which is lighter in color than that of black powder, is about 2 meters. In case of short weapons, whether rifled or not, the powder marks only reach a distance of not more than 50 cm.

جرح من سلاح أملس من مسافة 2 متر

Wadding

The wads can also give an indication about the distance, whether they have entered the body or simply struck it, and to what depth one or both of them penetrated into the tissues. External wad, (made of thin cardboard), may penetrate the body at one meter and reach a distance of 3 meters in the air. Internal wad (made of thick felt or compressed cardboard), may travel about 10-12 meters in the air and penetrates the body at a distance up to 3 meters. Between distances of 3-10 meters, it may strike the body, causing a circular bruise just at the edge of the dispersion area of shots or outside this area, generally on a lower level. Approximate formulae are given as a way of estimating the distance from the powder marks, which can be used in all types of weapons. Flame and smoke reach a distance equal to about 1-1.5 times the length of the barrel. Unburned particles reach a distance equal to about 2 or 3 times the length of the barrel. At longer distance, the estimation in case of shotguns is based on the extent of dispersion of the shots. The longer the distance the bigger the space between neighboring shots and the less the power of penetration that at 50 meters or even less in old weapons, the shots may simply strike the body and fall on the ground causing only bruises

Shape of the wound	Distance of firing
The whole number of shots enter in one mass	Up to one meter.
A central hole and few surrounding separate shot holes	At two meters.
The number of dispersed shots increased and the central hole gets smaller in size	At 3 meters
Complete dispersion of the shots occupying a circular area of about 16 cm in diameter	At 4 meters

Shape of the wound	Distance of firing
A circular area of about 32 cm in diameter	At 6 meters
A circular area of about 50 cm in diameter	At 8 meters
A circular area of about 60 cm in diameter	At 10 meters

This is an unusual close range
suicide gunshot
wound to the chest.