

# Forensics Medicine

**Definition:** The branch of medicine dealing with the application of medical knowledge to establish facts in civil or criminal legal cases, such as an investigation into the cause and time of a suspicious death.

The duty of the doctor

1. Present when needed
2. Legal behavior
3. He cant refuse his job
4. Cant refuse his request from courts

Forensics groups divided into:

1. Live groups
2. Dead groups
3. Lab tests
4. Exhume from the grave
5. Books and reports of forensics medicine

## Alive Groups

1. different wounds with different instruments
2. Burns of different types might be caused by flames, scalds, and chemicals.
3. Poisoning (might be chemicals or bacterial)
4. Anaphylactic reaction that doesn't result in death
5. sexual assault and its outcome
6. Pregnancy (illegal) and paternity test (the women claims she's pregnant, he denies. This test is to prove he is the father)
7. Abortion (someone forces the women to abort the fetus)
8. Age estimation
9. Disability of loss of limbs or temporary/permanent organ failure
10. Disfigurement in exposed areas after injury.

## Refuse to be examined:

When someone is sent to forensics medicine, he/she might refuse to be examined, especially in sexual assaults and abortion. In this case, the doctors should not force them but rather record the refusal and send a report to the courts.

### **Legal Reports (consist of)**

There are different types with different purposes, they should be written in short, simple, meaningful way and consist of 3 parts:

1. Beginning: Contains the doctors name that performed examination and his work place, hour and date of receiving the case, the name and age of the case individual, the number of the date of the police report, and the time and date of the examination.
2. Middle (soul of the report): It contains discussions about the facts and causes or removal of causes for damage or death depending on the facts and different scientific reports that leads the examiner to a good result?
3. End (or results): Contains the results of what has been seen during examination and direction of the discussion and usually in the shape of answers and either directly or indirectly like it happens in wounding or sudden death depending on the strength of the evidence and the lab tests.

### **Medico-Legal Reports (types):**

1. Primary reports, in less than 24 hours
  - 2.
  3. Final reports
  4. Autopsy reports
- (The first 3 are done for alive groups and the last one is done for passed groups)

In all types of deaths, there are 3 basics:

1. Cessation of circulation is concluded by diminished pulses in arteries, diminished heart beat in left side of chest or center of the chest in those with thickened chest wall (in case of obese women). If there is doubt, tighten a finger with a string, if there is still circulation, the color of the skin above the tightening will be pale and there will be blush/reddish congestion of the finger. Also, you can inject colored material under the skin, if there is evidence of circulation, it will distribute. If the colored material stays in its place, there is stasis of circulation.
2. Respiratory arrest can be checked by looking at the chest and abdomen for cessation of movement. Also, you can check the nostrils and mouth for air exchange and you can do that by putting something, such as a metal in front of the individual's face, if you see fog on the metal, which means that there is still circulation. You can also put a feather or a cotton ball, if they move, it indicates respiration, but the approved method on respiratory arrest is diminished breathing sounds on stethoscope on all parts of the chest.
3. Cessation of CNS function and activity: There is diminished reflexes (knee, eyes, and abdomen) but cessation of electrical activity can be tested by EEG, if the axis is flat, it means brain death and should be continued for 30 minutes to conclude death.

### **Changes after death: (postmortem changes)**

1. Primary relaxation (30-60 minutes), cessation of CNS.
2. Livor Mortis (hypostasis), starts at death but is seen 30-60 mins. Red-purple discoloration accumulation of blood.
3. Rigor mortis: stiffness of muscles.
  - \*Face: 1-3 hours
  - \*Complete: 8-10 hours
  - \*Remains: 24 hours
4. Secondary relaxation: starts after 24 hours and completed at 36 hours.
5. Putrefaction: starts after 50 hours (in blood)

Green patches expands

Blisters: 2-4 days

Abdomen open: 14 days

Chest wall: 21 days

Mummification: 1 year

### **Hypostasis.**

A change in the color of skin that results from filling of the capillaries by blood in the lower part of the dead body which is the result of gravity on blood after cessation of circulation. The hypostasis depends on the color of blood before death, which is dark blue in cases of asphyxia, reddish in cases of CO or cyanide poisoning, brown in KCl poisoning or pinkish in cases of death by cold exposure. The hypostasis usually occurs in the back, arms, legs and it doesn't appear of the high pressure areas. If the body wasn't laying on its back, the hypostasis can occur on any low part. For example, in cases of asphyxia, it appears on upper and lower limbs. The hypostasis also appears in the deep organs. The hypostasis starts to appear after 1-2 hour from death, then it increases till it peak after 8-10 hours. The speed of the spread depends on the amount of blood and the duration in which the blood stays in a liquid form. About clotting after death it depends on the presence of fibrin, in cases of asphyxia, we found a large amount of this enzyme so the blood stays in the liquid form for a long time.

Why is hypostasis important?

It gives information regarding:

1. Duration of death, depending on the spread of the hypostasis
2. the position of the body. After clotting the hypostasis stays in its place, so if the hypostasis was on the back but the body was lying on his abdomen, then the body position had been changed.
3. Identifying the cause of death.

**Algor Mortis:** defined as the reduction in body temperature following death until the temperature is equal to its surroundings. It starts in the superficial parts then goes deeper. The body loses its temperature by 2-3 degrees in an hour after death. After that, it reduces until it reaches 0.5 degrees/hour 18 hours following death, then the body will be equal to its surroundings. The speed of the loss is affected by many factors; some are in the body itself, like the cause of death, the body temperature at the time of death, size of the body, and its nutritional state. Other causes are outside the body, such as surrounding temperature, blankets, clothes, whether surrounding is water or air.

**Why is Rigor mortis important?**

1. Determining the time of death, it starts in the facial muscles 2 hours after death and then spreads to the chest and upper limbs in 4-8 hours and finally to the abdomen and lower limbs until it involves the whole body by 12 hours. After that, it then diminishes in the same order.
2. Position of the body
3. Gives clues about the cause of death which is fast in cases that are accompanied by muscles contraction, like in tetanus, which speeds up the destruction of ATP.

**\*\*Factors affecting Rigor Mortis**

-It appears faster at high temperature and slower at low temperature.

-The age of the dead person and the degree of muscle growth before death in which is faster in children and old people.

Rigor Mortis can happen in other cases:

1. Stiffness, it can happen in cases of sudden death if the person was very angry/stressed/emotionally distressed prior to death. Ex: suicides, drowning, and wars. Stiffness is continuous and no primary relaxation after death, the muscle stays in the same manner before death because of this stiffness. In most cases, the cause of death can be known. The stiffness is a natural effect.

Differences:

Stiffness

It doesn't occur in all over the body

It affects voluntary muscles

Appears with death

Rigor Mortis

occurs all over the body

affects voluntary/involuntary

After death and spreads gradually

2. Stiffness due to high temperature, it can happen in cases of severe burn due to protein denaturation and it stays in this manner till the body will relax by putrefaction. It leads to flexion in upper limbs and lower limbs (boxer hands).
3. Stiffness due to freezing of the body fluids and this joints at 0 degrees celcius, like in cases that occur in cold areas or if the body is kept in a freezer.

**Putrefaction:** It is the final step of changes that occurs to the body mainly due to the effect of bacteria that gradually break down the tissues into gases, liquids and minerals (salts).

**Putrefaction occurs due to the following:**

1 – Enzymes, which are liberated from the cells after death that lead to the breakdown of the tissues without the effect of bacteria. This is called Self degradation or Autolysis. Autolysis by these enzymes can be prevented by cold temperatures such as 0 degrees Celsius.

2 – Bacteria: The most important are the anaerobic bacteria that live in the intestines which later on pass through the mucous membranes after death and are then transported by the blood to the rest of the body tissues where they multiply. Other bacteria that participate in putrefaction include aerobic bacteria which can be found in the respiratory tract (lungs).

3 – Pathogenic bacteria: That infects the body leading to septicemia.

4 - Insects and rodents

The Blood is the first organ to be affected. The RBC's lyse and release hemoglobin which react with hydrogen sulfide gas released from the bacteria causing pigmentation of the vessels and tissues, Brown to dark green pigmentation.

The first sign that appears as a result of the sepsis is a dark green patch just below the navel or near the appendix (Right iliac fossa). The patch gradually becomes bigger and then later on affects the entire abdomen. At the same time branching lines resembling a treelike structure appears under the skin in the chest, abdomen and back (this is known as marbling). The reason of the appearance of these lines is described above involving the breakdown of the red blood cells and affecting the superficial veins. The release of gas by the bacteria also causes swelling (bloating).

The gases that are formed within the capillaries include: Hydrogen sulfide, Methane, Carbon dioxide and Ammonia. At the end of the first week after death the release of these gases will lead to the formation of tension in the tissues and later on swelling of the face, scrotum and the abdominal wall. This could lead to the outpouring of the stomach contents from the mouth, rectal contents from the anus and even the unborn fetus from the uterus of the mother. As stated before this will also lead to the formation of treelike structures under the skin (التشجر) due to the accumulation of these gases within the blood vessels as well as swelling.

The accumulation of the tension formed by the formation of the gases lead to the bulging of the eyes, protrusion of the tongue and outpouring of froth from the mouth and nose, these events occurs during the second week after death.

Gaseous Blisters formed under the skin will soon rupture and the releases gases will be responsible for the bad odor of the dead body. This event is accompanied by the separation of the epidermis known as desquamation or epidermal slippage.

Although the decomposition begins in the blood and skin the degradation originates from the intestines and then involving the liver and spleen. As it effect the liver , the liver will be filled with dark green liquid contained within sack like structures. As the pressure increase this will lead to the rupture of these sack like structures.

The sequence of putrefaction of the organs include: Intestine, stomach, brain followed by the liver, sleep and later heart and lungs ending with the bladder and the uterus. However in the pregnant female the putrefaction of the uterus precedes the heart and lungs.

Note: last organ to putrefy is Prostate/Uterus.

Then we have opening of the abdominal wall at the second week and opening of the chest in the third week.

**Putrefaction depends on several factors:**

1 – Temperature: Temperatures lower than 10 degrees Celsius cause stopping of the growth of the bacteria hence any signs of decomposition may not be available. Temperatures exceeding 40 degrees Celsius will also stop the bacterial growth.

The optimal temperature for microbial growth and decomposition is 37 degrees Celsius.

In general putrefaction occurs faster in the summer than in the winter.

2 – Humidity and Air currents: These factors aid in speeding up the decomposition process. Dry and still air slows down or stops decomposition and might even let to the appearance of mummification.

The water factor present in the humid air is necessary for the growth of the bacteria and therefore the decomposition of a body that has drowned is much faster than in the case of bleeding or fluid loss.

Decomposition in the chest and abdomen is much faster than in the limbs and the rest of the body due to the natural presence of bacteria.

3 – Air: The presence of air is required for the growth and activity aerobic bacteria. There for a body exposed to air putrefies much quicker than a cover body such as buried bodies or those in coffins.

4 - Age: slower decomposition occurs in the bodies of new-borns and old people especially with chronic non infectious diseases.

5- Cause of death: This factor has a clear impact on putrefaction. For example a dehydrated body putrefies much slower than in normal condition to the effect of microbial organism which accelerate decomposition. Also if the cause of death is due to an infectious disease, this will speed up the process due to the high amount of bacteria. In the case of poisoning such as arsenic poisoning the decomposition will be a lot slower since the poison also kills all of the microorganisms present in the body.

The sequence of events regarding putrefaction of a body buried in a piece of cloth underground in an air filled grave (the usual method of burial in Islam) includes the following:

A – After 24 – 36 hours, Green patch appear in the abdominal wall(right iliac fossa)or around the umbilicus .Also shows alot of ramified blood vessels of the skin of the abdomen, chest and soften the eyeball and corneal dimming.

B – After 2 to 5 days there will blood froth pouring out from the mouth and nose, later the abdomen and scrotum will putrefy which starts as the green patch, and green colour then spreads in the skin of the abdomen and chest. And appear gaseous bubbles under the skin, and the gas formed during the process that accumulate under the skin, and the eyes, tongue become prominent and facial features disappear. The body emits an unpleasant odour due to the gas formation.

C –After five to ten days the eyeballs will liquefy and there will be flaking (shedding) of the skin and also falling of the nails, hair. Multiple location will then show the appearance of larva and maggots, especially around the mouth, nose and the genitals and then the tissues will gradually dissolve flowing into the dirt, and after about a year only the bones will remain.

(التصبنأوالتشمعالموتي) التغينالموتي

### **Adipocere or Saponification of the body**

This condition indicated that the body has been buried in a wetland (very wet and humid conditions). In these conditions the normal process of decomposition is replaced by a special kind of transformation which affects the fatty tissue known as Adipocere or Saponification. By the process of hydrolysis and hydrogenation the fatty tissues will turn into a yellow smelly solid waxy substance especially in the cheeks, breasts and buttock. Previously it had been thought that it was due to the reaction between the fatty tissues of the body and calcium and magnesium salts, however is has now been found that this phenomenon also occurs in distilled water. The mechanism of this process involves the hydrolysis and hydrogenation of the body from unsaturated fats to saturated fats which are more solid.

Importance and benefits of this condition from a forensic point of view:

1 - Identification: because this condition maintains the external appearance of the body.

2 – Estimation of time of death: The adipocere formation in the body begins in the fatty tissues and can be seen after 3 weeks. The saponification of the chest can be seen after 1-3 months. And complete saponification of the whole body can be seen in 5- 6 months.

3 – Cause of death: Since this transformation preserve the condition of the body certain wounds can still be seen such as cuts. This allows the examiner to identify the cause of death even after several years.

## **Mummification**

This condition can be seen in bodies that are buried in the sand during the summer. The bodies will not putrefy due to the rapid evaporation of the body fluids as a result of the dry air and high temperatures which disrupts the microbial growth. Mummification retains the body at approximately the same condition which was present at the time of death. This type of mummification is natural.

Artificial mummification was practiced by the ancient Egyptians when burying their dead especially the kings and princes.

## **Sudden death**

When describing death , three things has to be mentioned:

- 1- Cause of death.
- 2- Manner of death.
- 3- Mechanism of death

1- Cause of death: Usually the cause of death is determined by a physician based on the diagnosis of a state of the deceased during his life. This is known as a (Clinical cause of death). Or by a pathologist after conducting an autopsy on the body of the deceased, this is known as (Pathological cause of death). Both of these determine the severity of the illness or injury that led to the death of that person.

2- Manner of death: This determines whether the death was due to natural causes, by homicide, accidental or for unspecified reasons.

3-Mechanism of death: This entity determines whether the cause of death determined by the attending physician is compatible with the image of death that has occurred such as in deaths that were immediate, sudden, unexpected or has occurred a long period of time ago. It also includes disease complications including bleeding, blockage of vessels and inflammatory effects that may have precipitated the death. These complications raise the suspicion of the presence of non-natural causes of death.

### **Definition of Sudden Death:**

Sudden death is defined as a natural cause of death which occurs as a result of rapid development of and unexpected condition. Therefore the individual seems to be in normal condition and does not suffer from any sign or symptoms prior to death, or the individual suffers from minor symptom however these symptoms are insignificant and does not attract attention during the short period before death. Since these symptoms are usually undetected, the treatment is usually not initiated.

Importance of Sudden Death: The occurrence of sudden death typically lead to the formation of doubt and suspicion especially regarding why and how the death has occurred and if there is an existence of a criminal act. This suspicion is particularly considered if the deceased person has had a fight or an argument with another individual or individuals prior to death. In this case you have to determine the extent and impact of the person and situation in context to the sudden death, which can be very difficult to estimate.

These investigations has to be made in order to release (to give) a death certificate for the deceased person, without a death certificate the body cannot be buried and funerals cannot be held. In these suspected cases the body requires to undergo an autopsy including various laboratory, chemical and microscopic tests in order to determine the actual cause of death. This kind of work is mainly in the hands of forensic doctors

### **Causes of Sudden Death:**

Causes of sudden death can be divided according to the system involved:

- 1- Cardiovascular System:
  - a- Causes related to the coronary arteries الإكليلي, بالشرياناتاجي
  - b- Myocardial Infarction and its complications. مضاعفاتاحتشاء
  - c- Causes not related to the coronary arteries.
- 2- Respiratory system:
  - a- Pneumothorax
  - b- Pulmonary embolism
  - c- Pneumonia
  - d- Asthma
- 3- Nervous system:
  - a- Brain haemorrhage
  - b- Stroke due to clot thrombi or emboli
  - c- Brain tumour and inflammations
  - d- Epilepsy and seizures
- 4- Gastrointestinal system:
  - a- GIT bleeding
  - b- As a result of acute trauma to the abdomen.
- 5- Urinary system
- 6- Other:
  - a- Haematological disorders
  - b- Acute edema
  - c- Sudden infant death syndrome

## Wounds

Wounds from a forensic medical point of view can be defined as the determination of any contact or injury to the body tissues as a result of external force. This includes injuries from different types of objects (sharp, blunt etc.)

The names of the wounds vary according to the tissue,

If the tissue is skin it's called "جرحا"

If the tissue is mucosa it's called "تشققا" (crack)

If the tissue is muscle it's called "تمزقا" (rupture) (tear)

If the tissue is viscera it's called "تهتكا"

If the tissue is bone it's called "كسورا" (fracture)

Wounds are judicially (legally) divided into three types according to the degree of severity:

1 – Simple wound that heal in less than 20 days and leaves no disfigurement (scar)

2 – Serious (dangerous) wounds heal within more than 20 days, or heal in a shorter period but is accompanied by disfigurement (scars).

3 – Fatal wounds which lead to death immediately or its complications may lead to death after a period of time.

Wounds are divided according to instruments that caused the injury in to the following:

- |                          |                       |                   |
|--------------------------|-----------------------|-------------------|
| 1- Abrasion              | 2- Bruises            | 3- Lacerations    |
| 4- Cuts (cutting wounds) | 5- Stab (stab wounds) | 6- Gunshot wounds |

### 1- Abrasions

Abrasions are the simplest type of wounds; it's confined only to the superficial layers of the skin (epidermis only). It has little importance from a surgical point of view; however it has great importance from the medico legal aspect.

Abrasions around the neck may indicate strangulation, Abrasions around the nose and mouth may indicate smothering and abrasions in the area of the thighs and sexual organs may indicate sexual assault such as rape. In general abrasions found in any position on the body indicate resistance or use of violence.

The shape of the abrasions may be different according to the instrument used. ظفريّة قوسية سحجات

It may in the form of arcs as in the case of nail abrasions. خطية تسلخات

Or Abrasions may also be associated with the presence of external trauma, trauma to the soft tissues under the skin or abrasions can be in a specific pattern such as from care tires. Hence we can understand that the shape of the abrasions can be used to identify the instrument used.

And by the changes that occurs to the abrasion over time, we can estimate the time of the injury. A recent abrasion has a reddish surface and is cover with serous fluid. There may also be a small amount of blood. The outpouring of serous fluid stops after a few hours forming a red crust that gradually dries up within two days forming a hard structure. The color of the crust then gradually changes and it begins to separate after about one week leaving a reddish colored tissue behind. This reddish color then gradually disappears within two to three weeks without leaving any marks behind. Abrasions do not form scars unless it's associated with another type of injury in which the injury breaks the dermis leaving a scar.

Abrasions may also occur after death as a result of dragging the dead body on the ground, or when a body is exposed to insects such as ants and beetles. These insects injure the skin around the corners of the mouth, around the nose, eyes and anus as well as somewhat moist parts of the body. Abrasion made after death are brown in colour and unlike vital abrasions which are red in colour the post mortem abrasion are not associated with bruising and redness. Vital and non-vital abrasion can also be distinguished by microscopic examinations and biochemical reactions.

Importance of abrasions in forensic medicine:

- 1- The shape of the abrasions helps in the identification of the instrument (weapon) used such as nails, ropes, etc.
- 2- It helps in the differentiation between cutting wounds and lacerations which can be difficult at times. Abrasions are almost always associated with bruising and can be seen in lacerations and not in cuts.
- 3- Identification of the offender, there might me resistance wounds present on the offender. These injuries have to relate with the time of the crime.
- 4- The location of the abrasion can help to determine the type of crime. Abrasions around the nose and mouth may indicate smothering whereas abrasions around the neck may indicate strangulation and abrasions on the inner surface of the thigh may indicate sexual assault.

Dangerous abrasions: Abrasions are not dangerous or fatal unless they are contaminated with tetanus spores or anthrax.

## **2- Bruises and Contusions**

Bruises or contusions are types of a wound that occur due to the rupture of small blood vessels under the healthy skin. The outpouring of blood which later accumulates under the skin lead to the redness of the skin. Bruises occur due to blunt force on the body and may be accompanied by abrasions. The size of the bruise depends on the area and the strength of the blunt force applied as well as the thickness and nature of the skin affected.

Bruises are larger and easier to determine in fatty tissue and in the tissues near to the bone. It is also clearly present in individuals with scurvy and haemophilia. These individuals acquire bruises from minor injuries.

The shape of the bruise can also help in the identification of the weapon used. A bruise resulting from the blow from a piece of wood may be rectangular or form linear marks, a bruise from a fist is usually polygonal or irregular in shape, several round bruises can be seen in the case of bites and in the case of whips two parallel marks can be seen.

Bruising usually appears at the site of injury except in certain cases such as in the case of trauma to the base of the skull or the top of the head and forehead the bruise will appear around the eyes (black eye, racoon eye) . Another case is injury to the calf where the bruise will appear in the ankle.

As the bruise heals the colour of the bruise will change, starting from a red blue or red purple colour at the time of the injury. After 4-5 days the colour will change to a green colour, after 7-10 days the colour will change to a yellow colour and the bruise will disappear in about 15 days after the injury.

Bruises start to disappear from 1-4 weeks depending on the severity of the injury and the condition of the patient, the changes start from the periphery toward the center. Bruises differ from hypostasis by the presence of swelling and scraping in the skin in addition to blood stasis in the tissues.

### **3- Lacerations**

Lacerations are wounds that are characterized by causing rupture of the affected tissue as a result from blunt force such as injury from an iron weapon, stones, falling from heights on a rough surface or from car accidents. These injuries are often accompanied by injury to the viscera and fractured bones . Lacerations can be seen in most of the wounds in the field of forensic medicine.

Lacerations are characterized by irregular margins, rupture of tissue in an irregular fashion. There will be breach of the tissues, small amount of bleeding. Lacerations are life threatening if it's associated with infections and inflammatory complications.

Sometimes there is a similarity between lacerated wounds and cutting wound especially if the wound is located above the eyebrows, cheek bones or located in the scalp. However in these cases if you examine the wound by a magnifying glass you can easily see differentiate the lacerations. Lacerations are usually accompanied by abrasions and bruises+.

If the lacerated wounds are accompanied with disruption of the skin and tissues, then the wound is called "wounds Mthtkh" " متهتكة جروحا "

If the lacerations is accompanied by severe compression of the body as in traffic accidents the wound is called "crush injury" " اهرسية جروح "

If the laceration is made by a fast moving object which injures the skin and the skin beneath it such as by a machinery belt the wound is called “مزعية جروحا”

#### **4-Cutting wounds (cuts)**

Cutting wounds occur as a result of a sharp instrument being dragged across the surface of a tissue. They are characterized by having regular borders, causing separation of the tissues, they are relatively clean wounds with minimal contamination, sharp angles and is associated with bleeding to the outside of the wound. The length of the cut is usually greater than its depth. In certain cases the edges of cutting wounds are irregular such as in the cases of multiple cutting wounds or whenever they are located in certain body parts such as the neck, armpit and scrotum.

Cuts may be due to broken glass causing knife like wounds. These wounds are associated with small abrasions and bruises and usually fragments of broken glass can be found at the bottom of the wound.

In the case of heavy weapons such as swords, axes and cleavers the wound may be so severe that it may even cut the bone or cause the separation of the entire limb by a single hit.

Cutting wounds can either be homicidal as in the case of multiple severe wounds, accidental as in the case of cuts from broken glass, suicidal as in the case of cuts in the neck or they can be (self-inflicted) artificially fabricated to inflict personal gain or to accuse someone else of wrongdoing such as cuts in the left wrist. These wounds are usually multiple and superficial.

In order to estimate the time of the injury we focus on the following; The cut will be covered with serous fluid after 36 hours, the edges will later unite after 3 days and after 7 days it will leave a red linear scar.

To estimate how long after getting the wound, it is noticed that the regular cutting covering wounds with serous fluid after 36 hours the edges of the wound approximate and adhere to each other.

After seven days of injury, leaves a red linear scar. If the edges of the wound were distant and inflammation occurred, the edges become swelled and the wound secretes a serous fluid for two or three days and it becomes filled with red flesh. This occurs in about five days then the skin grows from the edges of the wound till they adhere in about 12-14 days leaving a thin linear scar.

### Difference between laceration and cutting wounds:

Laceration	Cutting wounds
<ol style="list-style-type: none"><li>1- Edges (borders) and angles of the wound is irregular and there is rupture of the tissue (breach tissue)</li><li>2- Associated with abrasion and bruising.</li><li>3- Small amount of bleeding and usually contaminated (dirty)</li><li>4- Heals by second intention which requires a longer time leaving an ugly irregular scar which may lead to distortion.</li></ol>	<ol style="list-style-type: none"><li>1- Edges (borders) are regular with sharp angles. No rupture of tissue (no breach tissue)</li><li>2- Not associated with abrasion and bruising.</li><li>3- Large amount of bleeding and rarely contaminated (clean)</li><li>4- Heals by first intention which requires less time a linear scar without distortion.</li></ol>

### 5- Stab wounds

Stab wounds occur as a result of a sharp bladed object pointed end penetrating through the body. This wound is called الطغنية الجروح) If the instrument is not sharp bladed with pointed end such as a screwdriver it's called "جرح او خزيا" (impalement)

One character of stab wounds is that it takes the shape of the cross section of the instrument used for example it might have a sharp angle on both sides or on just one side, it might be rounded in shape, triangular, rectangular and so on. The length of the stab wound is usually equal to the length of the instrument use to inflict the injury however it might be less if the blade or instrument haven't penetrated the tissue entirely.

It might also be deeper than the length of the blade especially in the abdomen or limbs. The length of the wound is usually less than the width of the blade as a result of contracture of the skin after the departure of the blade. And the depth of the wound is greater than the length.

The wound margins diverge from skin or muscle contraction, and more than this Widen if the length of the wound perpendicular to the direction of the muscle fiber as in the cuts wound

In certain cases there might be only one wound present in the skin but multiple wound present in the viscera and internal organs. This may be due to the movement of the victim or attempt of the victim to remove the causative weapon while it is still in the body. This usually cause change in the external shape of the wound found in the skin. In these cases the shape of the wound becomes cruciform.

Stab wounds are the most dangerous type of wounds due to the depth of the wound and possibility of involvement of internal organs such as the heart, liver etc. These conditions are associated with internal bleeding. They are also often discovered after a long period of time which makes the wound

more severe and more difficult to treat. Another point is that as a result of the depth of the wound it is commonly infected and is more difficult to clean and disinfect compared with other types of wounds.

Stab wounds are often homicidal but it may be accidental in the case of falling on sharp pointed objects. They are rarely suicidal or self-infected.

**6- Gunshot wound:** Will be discussed in a separate chapter

**Medico-legal reports in the case of wounds:**

When a medico legal report is written the wounds have to be accurately described in the terms of the number, location, dimensions (Length – width – depth), shape, edges, direction, condition of surrounding tissue, amount of bleeding and the presence of any foreign object such as broken glass. Also describe the clothing including stains and tears. In the case of dead bodies autopsy may be required to determine the cause of death, to assess whether the death was due to the injury or due to diseases or associated factors. You should also determine the relation between the injury and the death. Whether the injury caused the death alone or the injury assisted in the process due to an already present illness or injury or if the injury was not even related to the death in the first place. The penalty and charges of the offender differs according to the case.

Is the wound vital? (Ante mortem vs. post mortem)

Dead bodies often become injured after death such as those wounds that can be seen in the case of dismemberment, revenge crimes or other trauma. They can also be caused by animals and insects.

In these cases it's important to differentiate between vital and non-vital wounds.

Vital Wounds	Non Vital Wounds
<ul style="list-style-type: none"> <li>1- Borders are apart and the wound is swollen.</li> <li>2- Associated with bleeding. (external or internal)</li> <li>3- There is coagulated blood interspersed within the tissue at the wound margins and base.</li> <li>4- Appearance of vital reactions such as healing, inflammation and suppuration</li> </ul>	<ul style="list-style-type: none"> <li>1- Borders are close to each other.</li> <li>2- Not associated with bleeding.</li> <li>3- There is no coagulated blood interspersed within the tissue.</li> <li>4- No vital reactions.</li> </ul>

**Is the wound homicidal, accidental or suicidal?**

This can be answered by a detailed examination of the body including the clothing, the crime scene including furniture as well as the presence or absence of the weapon used at the crime scene and blood stains etc.

The presence of a dead body in a closed room without any signs of resistance on the body or the crime scene, or the presence of a suicidal and the presence of the weapon nearby indicated suicide+.

Also the type of the wounds and their number and their position in the body and whether the victims hand can reach it or not , all indicate a clear answer.

### **Self-inflicted wounds:**

Are those wounds which a person inflicts on himself to either prove a case of self-defense or charge somebody else with that injury. This can also be seen in prisoners.

Features of Self-Inflicted wounds:

- 1- Location of wound must be reachable by the person's hand.
- 2- They are not serious wounds. Usually in the form of superficial cutting wounds, rarely traumatic. They are usually not consistent with the tears present on their clothes and usually the time of the injury is not consistent with time stated by the individual.

### **Causes of death from wounds:**

In some cases the wounds, the cause of death is clear.,Such as decapitation or rupture of the chest or heart and other severe injuries, and

Conversely may be difficult to find out why, especially when multiple wounds or when there is a disease associate with the wounds. Therefore must take caution when performing Full autopsy of the body on each wound to see if the death was a result of the wound alone or as a result of diseases alone or both of them combined.

. In all cases, the responsibility of the offender according to the results of the wounds he/she inflicted.

### **Causes of death include:**

Nervous Shock: It involves circulatory collapse due to a reflex response to injury and there may occur immediately after injury. It has two main types:

A-Shock arising from the stimulation of the parasympathetic intervention of the hear as a result of the stimulation of the vagus nerves ( ..... ). This is related to fast emergence of symptoms such as fainting, pallor, profound sweating , nausea, severe drop in blood pressure and slowing of the pulse until it all stops together. The individual quickly loses consciousness. In most cases the symptoms disappear after a few seconds or minutes at most.

In the neck (as in cases of hanging or suffocation) or choking (the entry of water or food into the trachea) or when you make a puncture of the chest or any Carotid sinus Another simple process, especially if the patient is unstable nerves (these shocks do not occur at all if the patient is given Atropine before operation ), Or the sudden fullness of some viscera like intestines or uterus (when trying to abort by

injecting water or other in the womb), or as a result of minor strokes

Especially if signed the throat, abdomen or genitals, and in rare cases the death may result from sudden and severe psychological trauma (as it gets

When a person hears the death of a close person).

In most cases, these symptoms disappear after a few seconds,

because of the resumption of heart ventricle work. And rarely the heart stops completely without being able to

Continue to work and out of the influence of the vagus nerve.

In all these cases, we don't find any congestion in the body after the death. The body organs become pale and the heart becomes empty of blood especially the right side. Also all the major veins are empty of blood and their walls are collapsed.

If the wounds were painful, especially if accompanied by irritation neurological, psychological or nervous effort or inability of my body as it happens in bickering and secretion of adrenaline. Maximum impact this alert in a healthy heart is the emergence of sympathetic, for example, the heart of alert through the sympathetic nerve. Some disturbance in a heartbeat and rapid breathing and congestion in the face and the signs and symptoms similar to heart failure. If the heart

When Iz ventricular fibrillation disease (as in the case of hardening of the arteries of the heart, for example), such injuries lead to ventricular fibrillation

Get death. Symptoms of this type of shock are the same symptoms of acute congestive heart failure, and severe pain begins like angina

Accompanied by shortness of breath with the blue face and cough, with foamy froth out bleeding from the nose and mouth, and the speed of the pulse, and a rise in

Blood pressure, and muscle tremors in the limbs. These symptoms persist for up to an hour or more and could begin after the hassle or

Beating directly or may not appear until after a few minutes or more as a result of nervous irritability which follows bickering. The death is the result of this alert

Friendly to the heart, which is not located in heart healthy person but there must be a previous heart disease. Should clarify this meaning in the forensic reports

Liberated or death certificates for these cases.

The autopsy shows in all these cases, a former heart disease such as coronary atherosclerosis (coronary) or myocardial fibrosis or brown atrophy

Or other diseases, and then appear on the body usually symptoms of severe congestion and small hemorrhagic points

in the peritoneum and pleura peritoneum under pleura

From all this it is clear that death should not be attributed to nervous shock, unless immediately after the injury occurred, or shortly after only a few

Minutes to an hour, and the body free of any other cause of death.

Blood or secondary trauma: a blood disorder appears gradually after an injury, and the resulting lack of blood in the circulatory system.

There are explanations for the lack of blood, one attributes to nominated a large amount of blood serum or the subject of the second injury and that arising from expansion

General capillaries, leading to the accumulation of a large amount of blood, and thus can not keep blood from only a fraction goes on in the heart and blood. Truth

That factors always overlap, since the filament stretches lead to plasma nominated them or

vice versa.

The symptoms of circulatory shock gradually after a period of injury may be noticeable only after a long time. They start to feel

Body exhaustion and muscular weakness and lethargy and general decline and fall of temperature and pale skin color, with copious cold sweat covers the skin, thirst

Severe, rapid pulse and breathing, and a drop in blood pressure accompanied by a more severe drop in pulse pressure. The anatomical signs are in congestion

in the peritoneum and hemorrhagic spots under the pleura and all tissue and cavities with the edema of the lungs and signs similar to those that exist in

Death from suffocation (Alasvksya).

Bleeding and Blood loss:

This results from the rupture of arteries, veins or capillaries. More serious bleeding occurs when arteries are involved especially in the case of cutting wounds and stab wounds. Venous bleeding are usually less dangerous unless they involve the large veins in the neck. And capillary bleeding is of little danger unless it's accompanied by bleeding disorders such as Haemophilia.

Bleeding can be divided into External Bleeding, where the blood flows from the body to the outside and Internal Bleed where the blood flows into the body cavities such as the abdomen, chest and head.

An adult may lose half a liter of blood without causing any symptoms. The symptoms appear on the injured individual once the amount of blood loss reaches one litre. And the case become life threatening if the injured individual loses 2 litres (1/3 total amount of blood).

The speed of the bleeding is an important factor to determine the severity. A person may bleed more than 2 liters over a long period of time without producing any symptoms. The internal bleeding is not dangerous

Due to the amount of blood lost, but due to the blood pressure of the bleeding arteries on some important organs. Few tens of cubic centimetres of blood inside the brain may lead to death.

Bleeding leads to the small amount of blood circulating in circulatory system and thus less oxygen in tissues of general, as in of case of secondary trauma, and therefore

Signs and symptoms resulting from bleeding are of same symptoms and signs of circulatory shock.

Signs include absence of hypostasis and pale colour of the body.

Also pale colour in the gut and devoid of blood in the heart and blood vessels, and small spleen size.

Often there are small hemorrhagic points under

Endocardium (of lining of heart) and specially of left ventricle and right.... All this of addition to the presence of blood bleeding, either outside the body, or within its cavities.

Air Embolism:

Is an entry of air into the circulation and is divided into arterial AIR embolism and venous air embolism.

Arterial air embolism occurs usually in the case of chest wounds where the air enters the pulmonary veins and from there moves to the left side of the heart and later on is distributed to another part of the body where they will block smaller arteries particularly in the brain and heart. Only a few cubic

centimeters of air is enough to cause death. Venous air embolism usually occurs in the case of neck wounds and abortions. The air enters the veins

The venous air embolism it occurs in the neck wounds, as occurs after abortions, and in this case air enters through the veins due to negative pressure which occurs in the veins during inspiration, leading to the withdrawal of the air to the left side of the heart, Then to the lung. Minimum amount of air to cause death is at least 100 cc .

Fat embolism:

Fat embolism occurs as a result of liquid fatty materials entering the blood stream and obstructing capillaries and arterioles in different parts of the body. It usually happens after long bone fractures. adipocytes enter into the circulation, and from there to the right side of the heart then the lungs, where it blocks capillaries And arteries leading to get fatty pulmonary embolism, and part of it sometimes passes into the general circulation, leading to brain fat embolism.

Infections:

Arise from entry of germs into the wound at time of injury from the skin or clothing or, road. The germs that contaminate wounds and double it maybe Anaerobic. Germ spores, such as, staphylococci (S. aureus) or Streptococcus (Almkor Alsobha) or E. coli TB bacilli, etc., and infection occurs Abscesses local (abscesses or inflammation) or abscesses generalized (pyoderma of blood). The anaerobic bacteria infection causing especially in dirty wounds in road accidents, where there is gas gangrene bacteria (gangrene). And wound infections by bacilli tetanus doesn't occur except in those who are not immunized. And tetanus bacilli do not fall deep in body, but live near the surface where secrete Vefana (poison) severe effect on the nerves. Effect usually appears after period ranging between 5-15 days, has been longer in rare cases to a few weeks or months. -

Wound healing:

Wound healing may be the cause of death as a result of contraction of scar tissue or expansion, as it gets in healing wound in the intestines, where lead wound contraction Scar to intestinal obstruction, or when, healing wound in, heart where this leads to stretching of scar tissue which causes explosion of this tissue as a result of blood pressure Within the heart. The person inflicting the wound is responsible for all of these complications regardless of the time passing. .