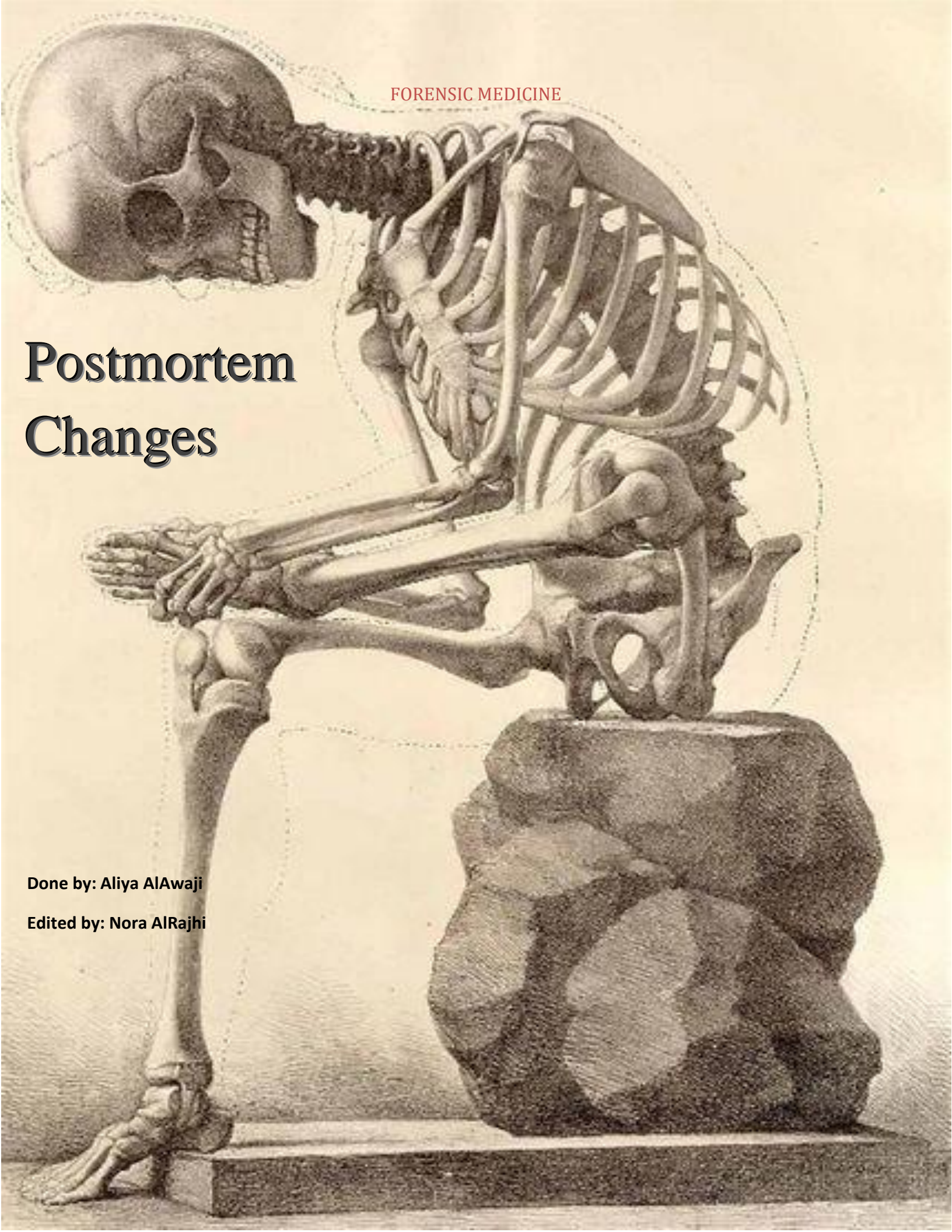


FORENSIC MEDICINE

# Postmortem Changes

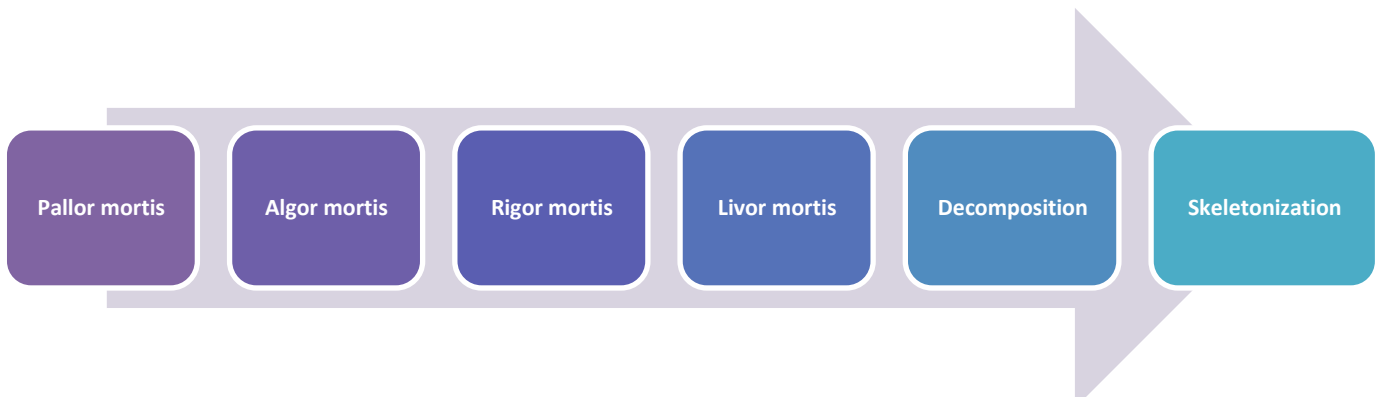
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## POSTMORTEM CHANGES

### Stages of death:



**What is post-mortem interval (PMI)?** It is the time that has elapsed since a person has died. If the time in question is not known, a number of medical/scientific techniques are used to determine it. This also can refer to the stage of decomposition of the body.

### Types of change after death:

Many types of changes to a body occur after death. Some of those that can be used to determine the post mortem interval are:

- **Algor mortis** – cooling of the body after death.
- **Rigor mortis** - postmortem stiffening of the body's muscles.
- **Livor mortis** (hypostasis) - purple-red coloration that results from settling of blood in the lowest-placed parts of the body under the force of gravity.
- **Forensic entomology** – the use of insect activity on the decomposing remains to aid legal investigations.
- **Tache noire** – is the dark, red-brown stripe that develops horizontally across the eyes when the eyelids are not closed after death.
- **Decomposition** - autolysis (process of self digestion) and putrefaction (process caused by bacteria found within the body).

### **Postmortem (PM) Changes:**

#### **A-Pallor Mortis:**

It is a Latin for **pale**ness of death. This is a post mortem paleness which happens in those with **light skin** almost instantly (in the 15–20 minutes after the death) because of a lack of capillary circulation throughout the body. The **blood sinks down** into the lower parts (due to gravity) of the body creating **livor mortis**.

## B- Algor mortis (Cooling of the Body):

A body is not a uniform structure: its temperature will not fall evenly and because each body will lie in its own unique environment, each body will cool at a different speed, depending upon the many factors surrounding it.

### Factors that affect the PM cooling:

1. Mass of the body.
2. Mass/surface area.
3. Body temperature at the time of death.
4. Site of reading of body temperature(s).
5. Posture of the body – extended or curled into a fetal position.
6. Clothing – type of material, position on the body – or lack of it.
7. Obesity – because fat is a good insulator.
8. Emaciation – lack of muscle bulk allows a body to cool faster.
9. Environmental temperature.
10. Winds, draughts, rain, humidity etc.

## C- Rigor Mortis:

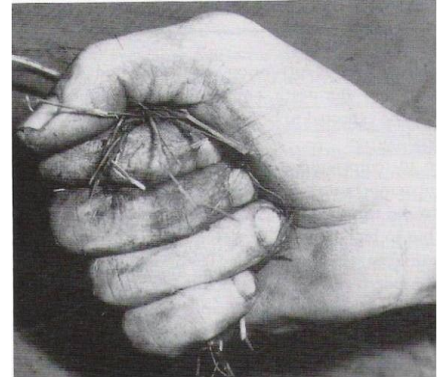
- The **initial** flaccidity of the body after death is soon followed by **stiffening** or rigor mortis (RM).
- Caused by exhaustion of ATP and accumulation of lactic acid.
- It is a process that affects all muscles of the body but it shows in **small** muscles first (e.g ocular muscles) and then in **larger** muscles.
- It is affected by temperature: the colder the temperature the slower the reaction is and vice versa.
- In a cold body, the onset of rigor will be delayed and the length of time that its effects on the muscles can be detected will be prolonged, whereas in a body lying in a warm environment, the onset of rigor and its duration will be short.
- Children and older adults have RM earlier than young adults.
- It appears earlier in athletic because they have greater muscle bulk.
- It can be first detected in the face between 1 and 4 hours and in the limbs between 4 and 6 hours after death, and the strength of the rigor increases for the next 6–12 hours.
- Strength of rigor reaches a maximum by approximately **18 hours** after death. Once established, rigor will remain for up to **50 hours** until autolysis and decomposition of muscle cells occur.

### A crude but useful aide-memoire is:

1. Body feels **warm and flaccid** – dead **less than 3** hours.
2. Body feels **warm and stiff** – dead **3–8** hours.
3. Body feels **cold and stiff** – dead **8–36** hours.
4. Body feels **cold and flaccid** – dead **more than 36** hours.

**RM could be mistaken with other conditions of stiffness after death like:**

- **Cadaveric spasm** (instantaneous rigors, instantaneous rigidity, cataleptic rigidity).
  - Associated with **violent death** in circumstances of intense emotion e.g. (fear, drowning...etc ).
  - Occurs in a group of **voluntary muscles** only.
  - An object usually is held by hand e.g.(gun, knife or even grass!)
- **Heat stiffness:** Coagulation of muscle protein in case of burn, leading to stiffening of the body.
- **Cold stiffness:** Due to freezing of the intra and extra cellular fluid and also the synovium.



**D- Livor Mortis (Hypostasis):**

- **Gravitation** of blood inside the capillaries and blood vessels of the dependant part, giving skin its violent color **Except Pressure areas**.
- Starts **at the moment of death**, appears after 2 hours, and get completed after 8 hours.
- Appears in all bodies although it may be difficult to detect in dark skin people.

**Lividity:** the quality of being livid; discoloration, as of dependent (inferior) parts, by gravitation of blood.

**Lividity Artifacts:**

- **Tardieu spots** which are petechiae and purpuric hemorrhages that develop secondary to the rupture of degenerating vessels under the influence of increased pressure from gravity.
- Hypostatic artifacts may be misinterpreted as **strangulation**.



**E- Decomposition:**

**1. Putrefaction:**

- This is by far the **commonest** route of decomposition.
- This route will be followed unless some unusual conditions apply.
- This form of decomposition results in **liquefaction** of soft tissues over a period of time.
- **Green discoloration** usually starts at the **Right Iliac fossa**.



- This 'greening' is the result of the extension of the commensal gut bacteria through the bowel wall and into the skin, where they decompose hemoglobin, resulting in the green color.
- Blood vessels provide an excellent channel through which **bacteria** can spread with some ease throughout the body. Their passage is marked by the **decomposition of hemoglobin** which, when present in the superficial vessels, results in linear branching patterns of **brown** discoloration of the skin that is called '**marbling**'.
- Considerable gas formation is common the body begins to swell, with **bloating** of the face, abdomen, breasts and genitals. The increased internal pressure causes the eyes and tongue to protrude and forces **bloody fluid** (not pure blood) up from the lungs and it will often leak out from orifices like the mouth and nose as '**purge**'.
- Over time, generalized skin discoloration occurs and, as the superficial layers of the skin lose cohesion, blisters containing red or brown fluid form in many areas. When the blisters burst, the skin sloughs off.
- **Slippage:**
  - **Epidermal peeling:** it's like degloving of the skin
  - **Hair and nails detach.**
- The prostate and the uterus are relatively resistant to putrefaction.



#### Factor affecting the rate of putrefaction:

- **Age:** less in children
- **Causes of death:** death caused by poisoning delays putrefaction.
- **High temperature** and moisture accelerate putrefaction.
- **Air.**
- **Blood** (no putrefaction without blood).

## 2. Adipocere:

- Adipocere is a chemical change in the body fat, which is hydrolysed to a waxy compound.
- This process is most commonly seen in bodies found in **wet** conditions (i.e. submerged in water or buried in wet ground).
- In some cases original body water was sufficient to allow the hydrolysis of fat and adipocere formation. Even if said bodies were found in dry conditions.
- It is a pale, rancid, greasy semi-fluid material with a most unpleasant smell.

## 3. Mummification:

- It's the postmortem **drying** of the body: skin is leathery, tissues are dehydrated and organs become desiccated.

## 4. Taphonomy: (Taphonomy is the study of decaying organisms over time)

- **Environmental** influences on body after death.
- Most common:
  - **Insects** (maggots)
  - **Carnivores** (postmortem predation)
  - **Humans** (clandestine activity)

More than one form of decomposition can be found in one body.

## Pseudo-injuries:

- Pseudo-injuries look like injuries sustained during life, but they are **not** evidence of **trauma** e.g. cockroach bites.



## F - Skelentonization:

- It's usually the last stage that takes place in a decomposing body.
- It will occur much more quickly in a body on the surface of the ground than in one that is buried.
- The microenvironment in which the bone has lain is of crucial importance and the examination and dating of bones is now a specialist subject.
- If in doubt, the forensic pathologist should enlist the assistance of a forensic anthropologist or archaeologist who have the specialist skills and techniques to manage this type of material.
- Examination of the bone marrow space may reveal residual organic material that can sometimes be suitable for specialist DNA analysis.
- No reliable 'timetable' for decomposition can be constructed because environmental factors may favor enhanced or delayed decomposition.