Lecture 3:

- CHAPTER (5): THE APPEARANCE OF THE BODY AFTER DEATH
- CHAPTER (6): UNEXPECTED AND SUDDEN DEATH FROM NATURAL CAUSES

● Book ● notes ● Important

CHAPTER (5): THE APPEARANCE OF THE BODY AFTER DEATH

Rapid changes after death:

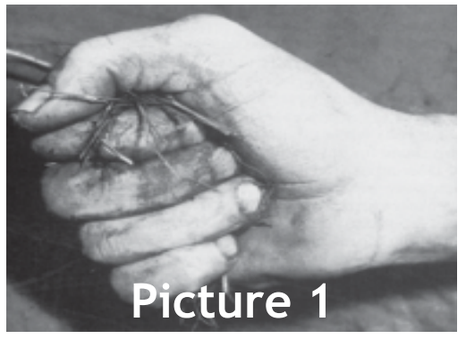
- fall in blood pressure, all nervous activity ceases, the reflexes are lost and breathing stops, corneal reflex ceases and the pupils stop reacting to light, retinal vessels show the break-up or fragmentation of the columns of blood, which is called 'trucking' or 'shunting'.
- The muscles rapidly become flaccid (primary flaccidity), with complete loss of tone, but they may retain their reactivity and may respond to touch or taps and other forms of stimulation for some hours after cardiac arrest.
- Skin, conjunctivae and mucous membranes are pale, face and the lips may remain red or blue in colour in hypoxic/congestive deaths.
- Loss of muscle tone may result in voiding of urine, Emission of semen is also found but cannot be used as an indicator of sexual activity shortly before death.
- Regurgitation of gastric contents is a very common feature cannot be used to indicate that gastric content aspiration was the cause of death unless associated with inflammatory response.

Rigor mortis: develops uniformly throughout the body but it is generally first detectable in the smaller muscle groups such as those around the eyes and mouth, the jaw and the fingers. It has very little utility as a marker of the PMI because of the large number of factors that influence it (eg. in a cold body, the onset of rigor will be delayed). It is best to test for rigor across a joint using very gentle pressure from one or two fingers.

Cadaveric rigidity: is said to be the stiffness of muscles that has its onset immediately at death. **(picture1)**

Post-mortem hypostasis: pink or bluish color to the lowest areas of the body and it is this colour change that is called post-mortem hypostasis or lividity. **(picture2)**


Picture 2


Picture 1

Cooling of the body after death:

Newton's Law of Cooling states that heat will pass from the warmer body to the cool erenvironment and the temperature of the body will fall.

Box 5.1 Examples of factors affecting the rate of cooling of a body

- Mass of the body
- Mass/surface area
- Body temperature at the time of death
- Site of reading of body temperature(s)
- Posture of the body – extended or curled into a fetal position
- Clothing – type of material, position on the body – or lack of it
- Obesity – fat is a good insulator
- Emaciation – lack of muscle bulk allows a body to cool faster
- Environmental temperature
- Winds, draughts, rain, humidity

Decomposition/putrefaction:

- The warmer the temperature, the earlier the process starts and the faster it progresses.
- In temperate climates, the process is usually first visible to the naked eye at about 3–4 days as an area of green discoloration of the right iliac fossa of the anterior abdominal wall. 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 colour.
- When present in the superficial vessels, results in linear branching patterns of variable discoloration of the skin that is called **'marbling',** the **prostate** and the **uterus** are relatively resistant to putrefaction and they may survive for months, as may the **tendons and ligaments**, bones may remain for years.

Immersion and burial: Immersion in water or burial will **slow the process of decomposition**.

- **Casper's Law (or Ratio) states** that: if all other factors are equal, then, when there is free access of air, a body decomposes **twice as fast** than if immersed in water and **eight times** faster than if buried in earth.
- The level of moisture in the surrounding soil and acidity of the soil will both significantly alter the speed of decomposition.

Adipocere: A chemical change in the body fat, which is hydrolysed to a waxy compound not unlike soap .

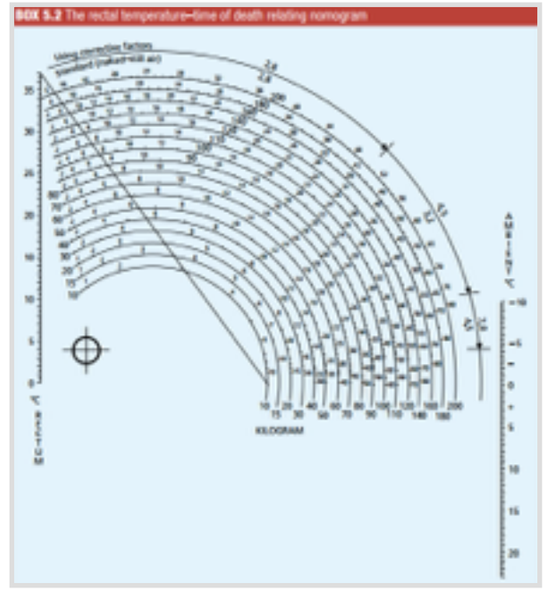
- Most commonly seen in bodies found in wet conditions.
- In the early stages of formation, adipocere is a pale, rancid, greasy semi-fluid material with a **most unpleasant smell**. When fully formed, adipocere is a grey, firm, waxy.

Skeletalization: in a formally buried body, the soft tissues will be absent by 2 years. Examination of the bone marrow space may reveal residual organic material that can sometimes be suitable for specialist DNA analysis.

Post-mortem injuries: **It is not true to say that post-mortem injuries do not bleed because many do leak blood.**

➢ In general, post-mortem injuries do not have a rim of an early inflammatory response in the wound edges.

Estimation of the post-mortem interval



The pathologist is often asked for an opinion on PMI (the 'time since death') based on the pathological findings. While none of the changes after death is capable of providing a precise 'marker' of PMI, the most reliable would appear to be **related to the cooling of the body after death.**

- Currently, **the most useful method of estimating the time of death is Henssge's Nomogram which relies on three measurements : body temperature, ambient temperature and body weight.**

Mummification: a body lying in dry condition Mummified tissue is dry and leathery and often brown in colour. It is most commonly seen in warm or hot environments such as desert.

Forensic entomologist: who can determine a probable time of death - in the region of days to months from examination of the populations and stages of development of the various **insects that invade a body.**

Notes from the doctor:

- **Decomposition:**

1- Autolysis (due to body enzymes).
2- Putrefaction (due to bacterial normal flora). First part of the body that will undergo putrefaction is Cecum.

- **Skeletalization: due to**
  1- Autolysis and putrefaction.
  2- Eaten by animal (if you notice that the deceased has lost his lips and nose then think about a cat in house).

- **Mummification is natural in Dry Climate.**

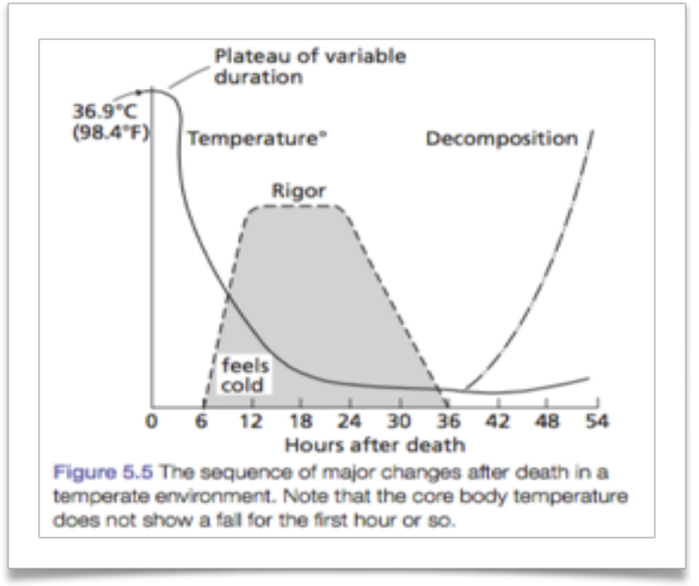


Figure 5.5 The sequence of major changes after death in a temperate environment. Note that the core body temperature does not show a fall for the first hour or so.

CHAPTER (6): UNEXPECTED AND SUDDEN DEATH FROM NATURAL CAUSES

Introduction :

- In countries where deaths have to be officially certified, the responsibility for certification falls either to the doctor who attended the patient during life or one who can reasonably be assumed to have sufficient knowledge of the clinical history to give a reasonable assessment of the cause of death.
- Many studies have shown that there is a large error rate in death certificates and that in 25–60% of deaths there are significant differences between the clinician's presumption of the cause of death and the lesions or diseases actually displayed at the autopsy.
- **Definition of sudden death (by WHO)** is the one that occurs ~24 hrs of onset of symptoms. But in forensic medicine it may occur even mins/secs prior to death. Sudden and unexpected death are not synonymous but they're often combined.
- There is a different approach to sudden and unexpected deaths, as these deaths are usually reportable to the authorities for medico-legal investigation. Before completing the death certificate, the body must be examined after death, unless the patient had been examined by that doctor in life within the previous 14 days; changes proposed to the death certification process are likely to remove this 'time-limit', instead relying on the doctor's ability to certify the cause of death 'with confidence'.
- It is very likely that a death that is delayed by hours will not be referred to the Coroner or other medico-legal authority, as a diagnosis may well have been made, and a death certificate can be completed by the attending doctors.

Cardiovascular system:

Disease of the heart:

- **When natural death is very rapid the most common cause of irreversible cardiac arrest is a cardiovascular abnormality.**

A. Coronary artery disease:

- Narrowing of the lumen by atheroma leading to chronic ischemia.
- Bleeding into a plaque > seen as sub-intimal hemorrhage at autopsy.
- Area of infarct is weak after 3 days - 1 week of clinical onset of infarct. Its rupture leads to sudden death from a haemopericardium and cardiac tamponade.

B. Hypertensive heart disease:

- Normal heart weight 400 g for the average man.
- Enlarged heart > chronic myocardial hypoxia and electrical instability + 'trigger' a fatal arrhythmia.

C. Primary myocardial disease:

The cardiomyopathies comprise a group of disorders including:

- Hypertrophic cardiomyopathy (HCM): symmetrical/asymmetrical hypertrophy, a sub-aortic mitral 'impact lesion' and myocyte disarray.
- Dilated cardiomyopathy (DCM): may be a 1ry or 2ry (to chronic alcohol misuse).
- Arrhythmogenic right ventricular cardiomyopathy (ARVCM): rightventricular thinning with fibro-fatty myocyte replacement.
- Channelopathies: Small proportion of cardiac sudden deaths with normal investigations (with a structurally normal heart). Often 'triggered' by a stimulus (exercise, sudden loud noise). Such deaths fall under sudden adult death syndrome (SADS).

Disease of the arteries:

The most common lesion of (extracardiac) arteries associated with sudden death is the aneurysm.

A. Atheromatous aneurysm of the aorta:

- Most commonly found in elderly in the abdominal aorta.
- Saccular (expanding to one side) or fusiform (cylindrical).
- Bleeding into retroperotineal space.

B. Dissecting aneurysm of the aorta:

- The commonest site is in the thoracic aorta with dissection tracking distally.
- Found in individuals with hypertension. May also be seen in younger individuals

with connective tissue defects, such as Marfan syndrome.

C. Syphilit ic aneurysms:

Rarely Seen in autopsies of elderly, Found in arch of thoracic aorta and their Rupture causes torrential hemorrhage.

Intracranial vascular lesions:

A. Ruptured berry aneurysm:

Common cause of sudden collapse/rapid death of young - middle aged men/women is subarachnoid haemorrhage from ruptured berry aneurysm of the basal cerebral arteries. Clinically silent or causing severe headache, neck stiffness, unconsciousness/other neurological symptoms. Classic scenario: intoxicated individual receives blow to head. Collapses and suffers cardiac arrest.

B. Cerebral hemorrhage, thrombosis and infarction:

- Bleeding common in old age and with HTN.
- Sudden expansion of hematoma compresses internal capsule > hemiplegia.

Respiratory system:

Major cause of sudden death is vascular.

Most commonly - and often underdiagnosed- is pulmonary embolism. Associated with immobility. Interfere with pulmonary function and lead to myocardial ischemia/ cardiac arrest.

GI system:

Major cause of sudden death is vascular.

- Severe bleeding from ulcer.
- Mesenteric thrombosis/embolism related to atherosclerosis.
- Strangulated hernia > intestinal infarction.
- Torsion of bowel / adhesions > obstruction.
- Peritonititis.

Gynecological conditions:

When a female of childbearing age is found dead, a complication of pregnancy must considered to be the most likely the cause of death until other cause if found (e.g. Illegal abortions ruptured ectopic pregnancy .. Etc..).

Epilepsy and asthma:

Asthma: hyper-inflated lungs and mucus plugging on autopsy.

Epilepsy: May be specific (e.g., drowning from seizure while swimming) or unspecific (sudden unexpected death in epilepsy).

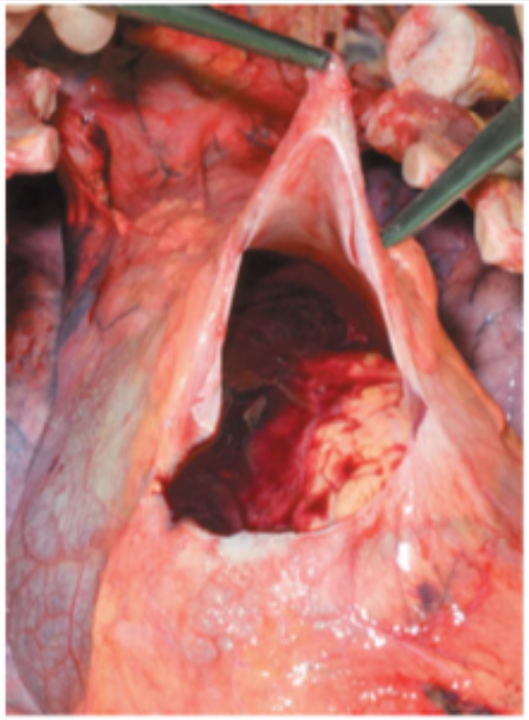


Figure 6.3 Haemopericardium causing cardiac tamponade. The distended pericardial sac has been opened to reveal fluid and clotted blood.

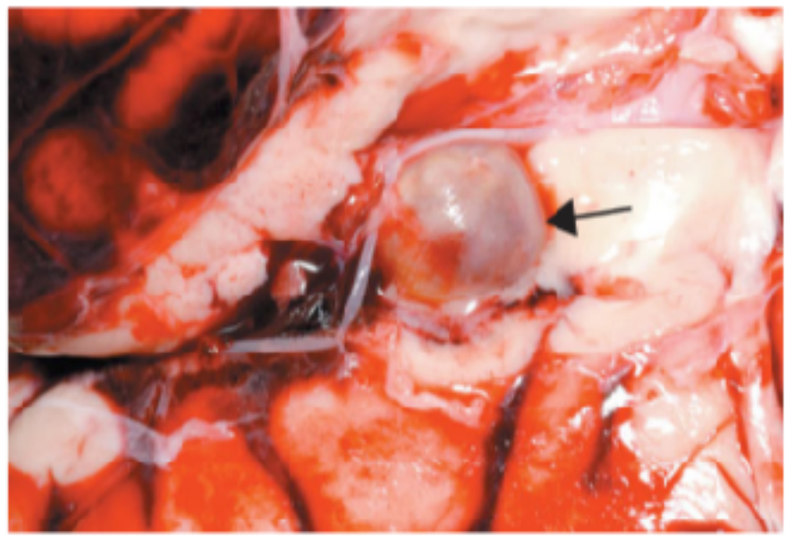


Figure 6.6 Berry aneurysm of the proximal middle cerebral artery and associated subarachnoid haemorrhage.

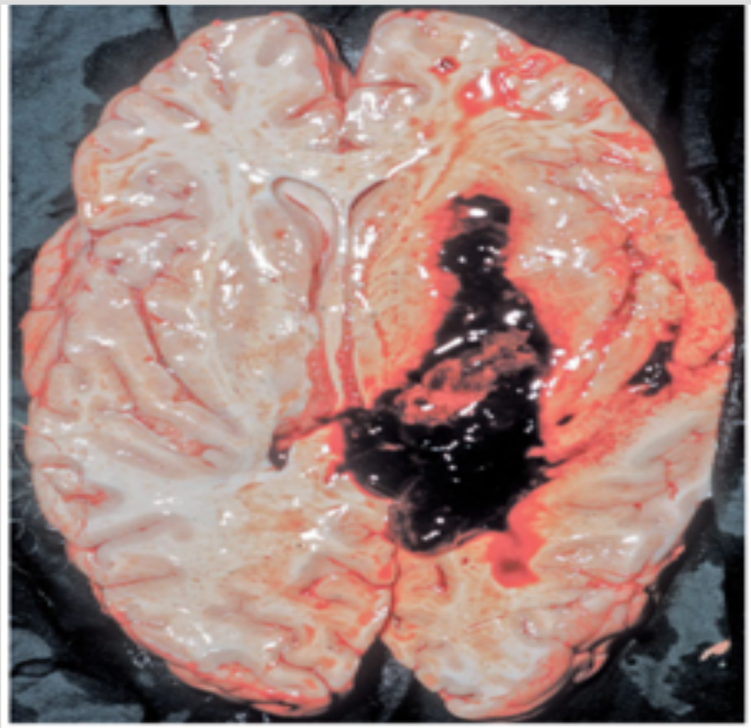


Figure 6.8 Recent intracerebral haemorrhage in a hypertensive individual.

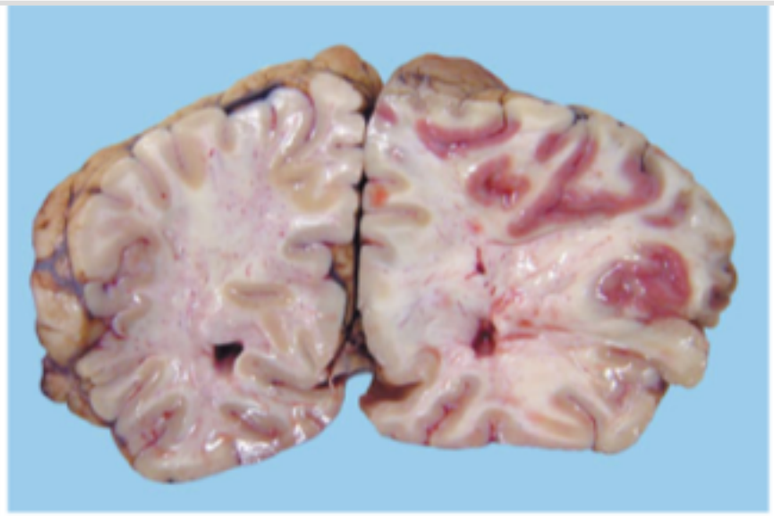
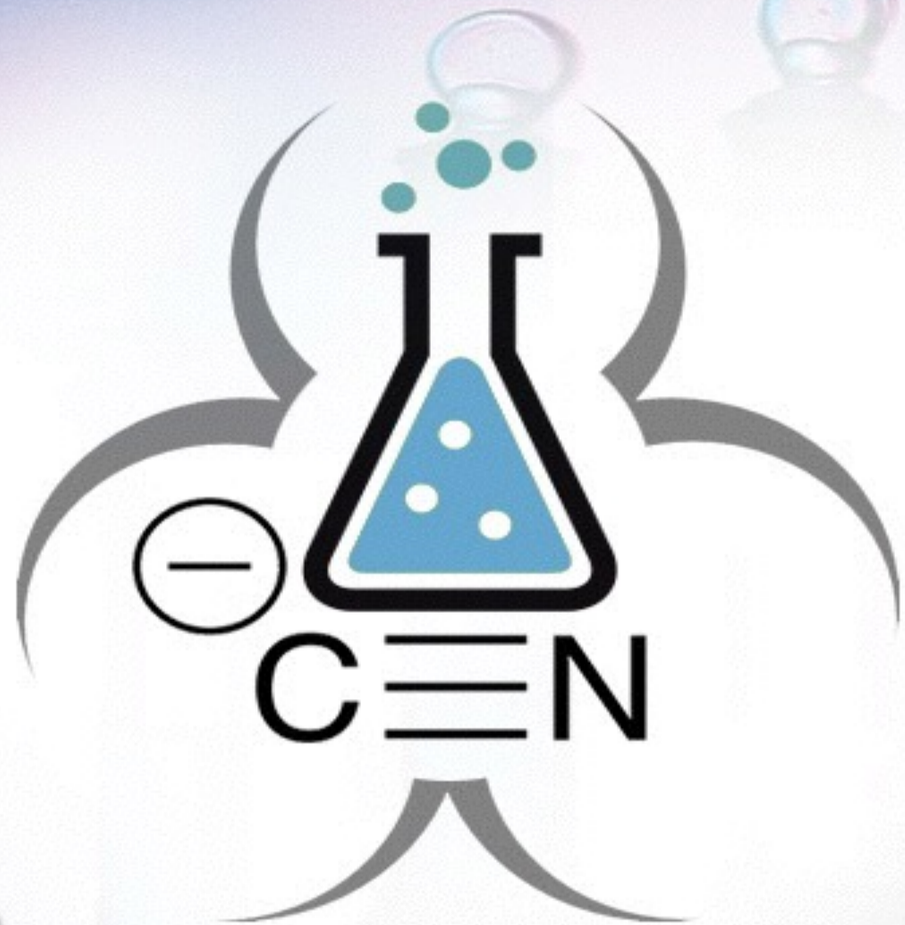


Figure 6.7 Acute cerebral infarction (predominantly middle cerebral artery territory).

Figure 6.13 Peritonitis. Note the fibrinous deposits on the surface of loops of intestines.



If you have any questions
You can always contact us
at : forensic433@gmail.com

Done By: Ziyad Alajlan & Abdullah Alatar

Revised By: Reem Almassoud