Changes after Death

د.سمير المرغني- دكتوراة من بريطانيا

استاذ مساعد-كلية الطب -جامعة بنغازي

رئيس قسم الطب الشرعي والسموم-كلية الطب-جامعة اجدابيا

عضو هيئة التدريس بكلية الطب - الجامعة الدولية الليبية

Changes after death

- **Immediately** detectable
- **Early** – within a few hours after death
- **Late** – from 24 to 48hours after death

Immediate changes

- Cardio-respiratory failure
- Absent breath sounds
- Absent chest movement
- Absent pulse
- Absent heart sounds
- Pupils not reacting to light
- Loss of corneal reflexes
- Muscle flaccidity

Post-mortem change in the eye, the so-called ‘tache noire’. These are brown areas of scleral drying caused by failure of the lids to close after death.

Early Changes

Rigor mortis

- Chemical reaction –
- Decrease in ATP and
- an increase in ADP + LACTIC ACID
- Onset smaller muscles first – jaw (1-4hours), then arms and finally legs (4-6hours)
- Temperature dependent

Early Changes

Rigor mortis

- Usually complete within 12hours
- Static until decomposition begins
- Secondary flaccidity within 24-50hours

Cadaveric spasm –

- Instant rigidity
- High level of physical or emotional stress before death
- Drownings, war deaths, gunshot suicides

Early Changes

Rigor mortis

- *Warm and flaccid, dead less than 3hours*
- *Warm and stiff, dead 3-8hours*
- *Cold and stiff, dead 8-36hours*
- *Cold and flaccid, dead more than 36hours*

Full rigor mortis 12 hours post-mortem.

Cadaveric spasm, an instantaneous form of rigor, in the victim of a fall into water. The victim was recovered within a short time (as can be seen from the absence of skin maceration) but had grass from the river bank firmly clutched in the hand.

Early Changes

Hypostasis

- Blood vessels relax
- Blood settles under the influence of gravity
- Positional
- Colour depends on colour of the blood
- Normally RED to PURPLE - depending on the oxygen level in blood

Early Changes

Hypostasis

- Visible within 2 to 3 hours
- Usually fixed after about 12hours
- Useful as an indicator of movement of the body after death

Early Changes

Hypostasis

- Cherry pink in carbon monoxide poisoning
- Pink in hypothermia
- Deep pink in cyanide poisoning
- Brown in methaemoglobinaemia
- Bronze in Clostridia perfringens septicaemia

Blotchy post-mortem hypostasis, forming in the early hours after death. The patchy disposition has no significance and this usually sinks down and becomes confluent in the most dependent areas within a few more hours.

Post-mortem hypostasis in the normal distribution. The pale areas are the result of pressure against a hard supporting surface.

Post-mortem hypostasis in a death from hanging. The discoloration of the skin is in the legs and hands, due to the vertical posture after death.

Extensive confluent skin haemorrhages may occur within the dependent hypostasis. They worsen as the post-mortem interval lengthens and must not be taken to indicate so-called 'asphyxia'.

White patches within the hypostasis on the face merely indicate pressure against the supporting surface after a face-down position. As in this case, they are usually post-mortem and are not indicators of suffocation.

Early Changes

Cooling of the body

- Normal temperature 37C
- After death – circulation and cell metabolism stop, inside and outside temperatures equilibrate, after delay of minutes to hours ‘core’ temperature begins to fall

Early Changes

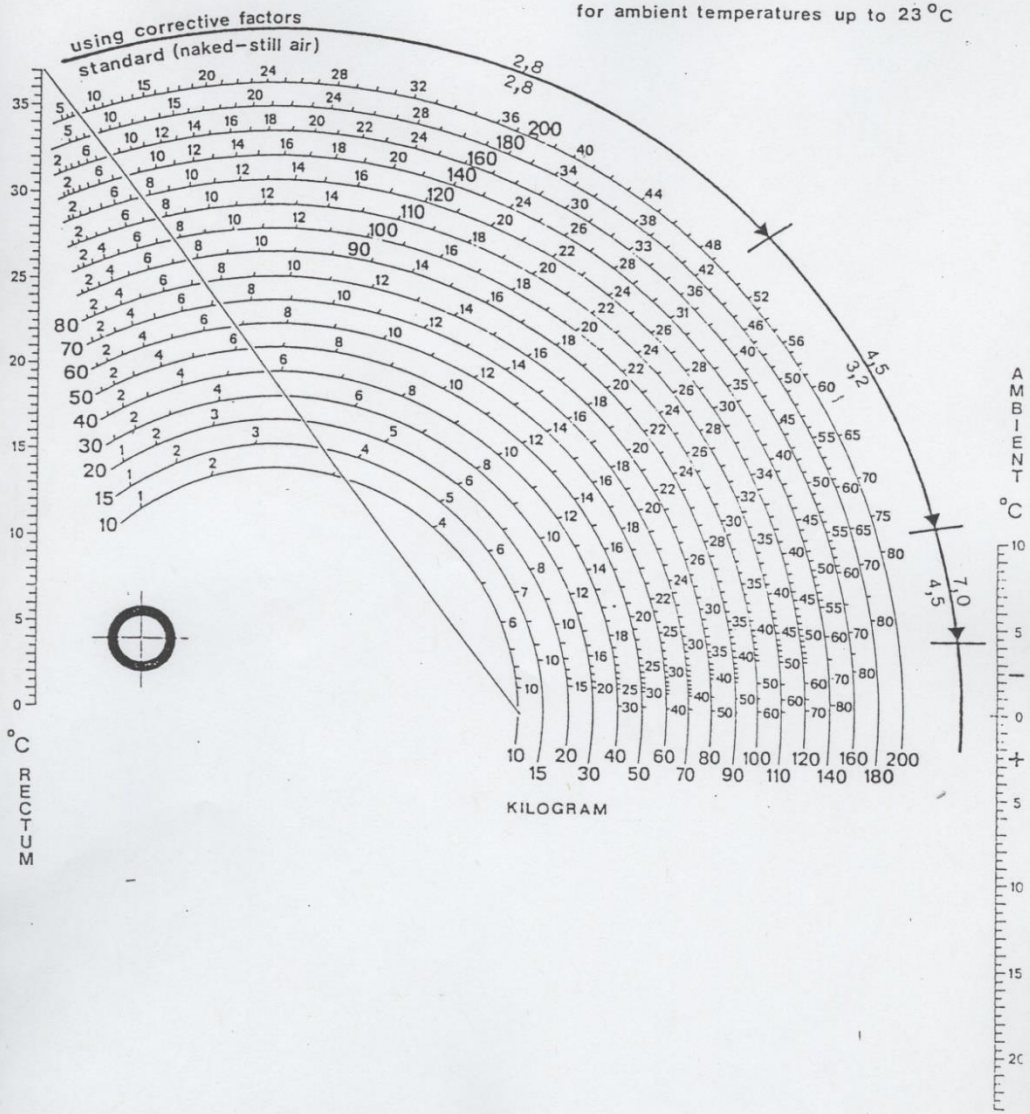
Cooling of the body

- Newton's Law of Cooling
- Exponential graph – not straight line
- Rate depends on ambient temperature and conditions, clothing, wet or dry
- Measure core temperature with low reading thermometer
- Average rate = 1 degree per hour

TEMPERATURE TIME OF DEATH RELATING NOMOGRAM

for ambient temperatures up to 23 °C

PERMISSIBLE VARIATION OF 95% (±h)



The nomogram expresses the death-time (t) by:

$$\frac{T_{rectum} - T_{ambient}}{37.2 - T_{ambient}} = 1.25 \exp(B\,t) - .25 \exp(5\,B\,t);\ B = -1.2815\,(kg^{-.625}) + .0284$$

The nomogram is related to the chosen standard i.e. naked body extended lying in still air. Cooling conditions differing from the chosen standard may be proportionally adjusted by corrective factors of the real body weight, giving the corrected body weight by which the death-time is to be read off. Factors above 1.0 may correct thermal isolation conditions, and factors below 1.0 may correct conditions accelerating the heat loss of a body.

Measuring the rectal temperature at the scene of a murder. This should be done only after forensic procedures such as rectal swabbing have been completed. Normally the temperature should be taken at the mortuary where removal of clothing can be carried out with full photographic and forensic science monitoring. In this case the body was unclothed at the scene and the circumstances did not warrant rectal swabbing.

Late Changes

- Decomposition
- Putrefaction
- Mummification
- Adipocere
- Skeletonisation
- Animal scavenging

Putrefaction

- Liquefaction of tissues
- Chemical and enzymatic process
- Bowel bacteria proliferate, breakdown Hb.
- Green discoloration abdominal wall
- Gas formation, swelling and bloating
- ‘marbling’ of skin due to bacteria in vessels

Putrefaction

- Skin blistering, ‘slippage’
- Liquefaction of internal organs e.g. bowel, lungs and brain
- Purging of fluid from orifices
- Vessels, uterus and prostate relatively resistant
- +/- insects – common flies, bluebottles etc., lay eggs which hatch into maggots

Moderately early changes of decomposition, showing gaseous distension of scrotum and abdomen, and skin slippage and blistering in dependent areas. This was after about one week since death, but the changes vary greatly with environmental temperatures.

Post-mortem decomposition of about 2 weeks' duration in water in a summer temperature. There is 'marbling' of he skin where breakdown products of haemoglobin have stained the venous channels.

Post-mortem decomposition showing putrefactive changes in the face, arms and trunk after one week in a warm room. The illustration shows the contrast sometimes seen between one part of the body and another, as the legs are hardly affected. The face, neck and hands are swollen with gas, and the clothing is stained by leaking skin blisters. The tongue is protruding because of gas pressure from the tissues below. Death was due to carbon monoxide poisoning caused by faulty installation of a room heater.

Almost complete destruction of the facial soft tissues by maggots. Postmortem time about 2 weeks in a centrally heated apartment.

Bloating of face and effusion of blood-tinged fluid from the nostrils and mouth. A body recovered from water, postmortem time approximately 11 days.

Marine predation in a body after 3 months in the North Sea. The victim was from an oil rig and had floated on the surface in a life jacket. Much of the skin has been removed by crustaceans, and the arm muscles by larger fish who have cleaned out most of the body cavity.

Adipocere formation in a body after 3 months in the sea. Subcutaneous fat has been released from crustacean bites on the skin and has been converted into adipocere, which has been rolled by wave action within the clothing to form ovoid masses.

Complete conversion of a body to adipocere. The body was recovered from a deep lake 8 years after disappearing in a boating accident during a heavy storm.

Entomology

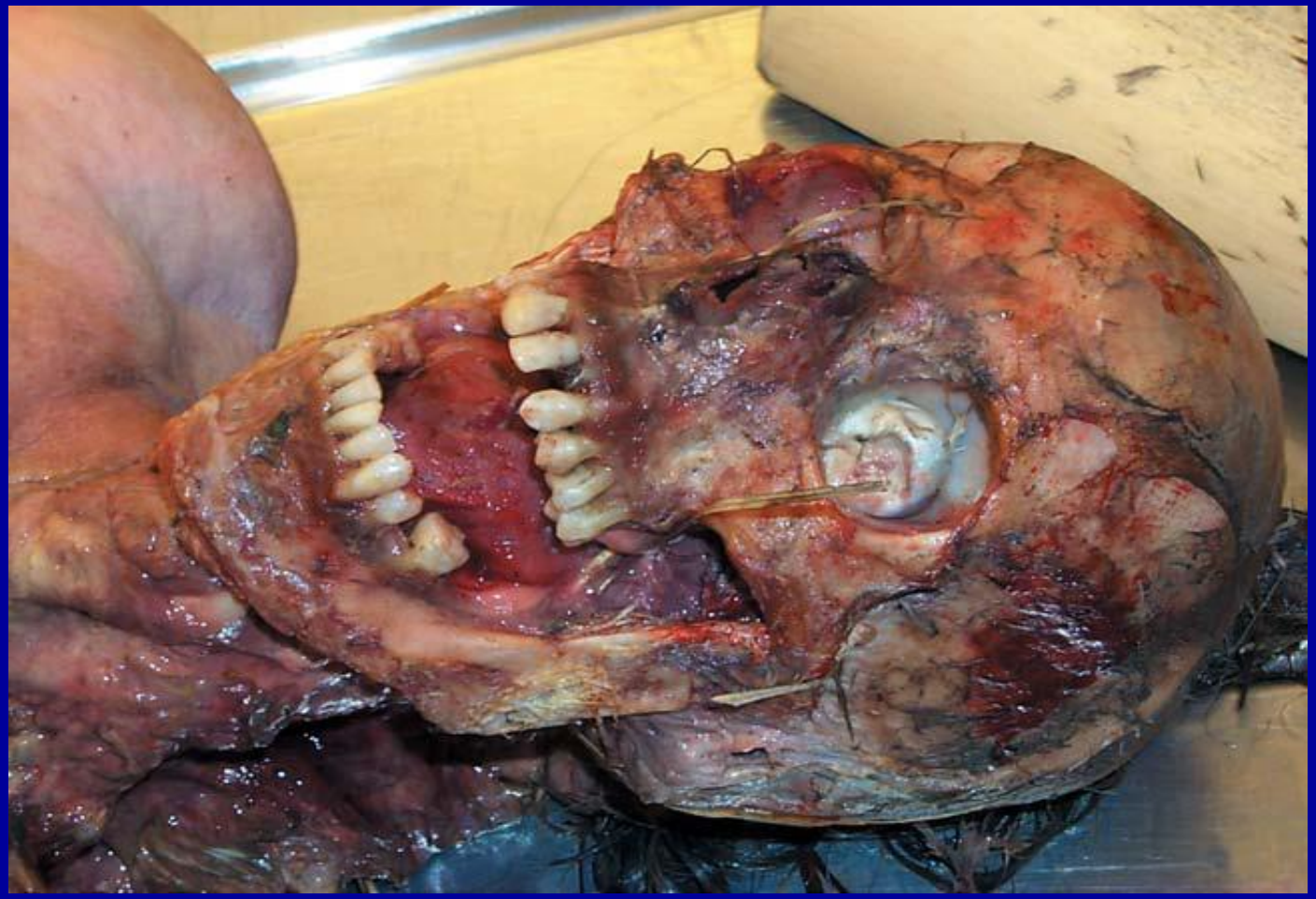
- Insects – common flies, bluebottles etc., lay eggs which hatch into maggots
- Eggs deposited in body orifices
- **Flies are attracted to bleeding injuries**
- Life cycle of fly used to help determine the time of death
- Different species of insects used to determine the time of death

Mummification

- Dry conditions, cool, air flow
- Dessication or tanning
- Newborns – sterile
- Attracts moths and beetles

Mummification in a man dead in a locked room for 10 weeks. The corpse is dry and leathery, with very little moist putrefaction.

Extensive mould formation and lack of putrefactive changes in a child who accidentally locked himself in a box and asphyxiated. The body was not found for 6 weeks.



Loss of all soft tissues of head
and neck, in areas not covered by clothing,
by post-mortem animal predation.

Post-mortem rat bites of the orbit. Such injuries are – not unnaturally – often regarded with suspicion by the police. The complete absence of bleeding or reddening of the wound margins, as well as the unlikely shape and situation of the injury, make its postmortem origin obvious.

A body recovered from the Baltic Sea with numerous superficial skin defects on the face and neck due to postmortem predation, probably by the crustacean Saduria entomon, shown in the inserted picture with a smaller shrimp in the middle.

A post-mortem animal bite that was mistaken for a criminal assault. The old lady was found locked in with a cat, having died from a gastric haemorrhage. The wound has not bled, the margins are not reddened and tooth crenations can be seen round its edge.

Adipocere

- Damp or wet conditions
- Chemical change – hydrolysis
- Body fats changed into waxy material – saponification
- Retains shape and outline of the body or some body parts

Skeletalisation

- Loss of soft tissues
- Climate dependent
- Assisted by animal activity
- Remains scattered
- Anthropologist required for identification
- Only bone injury apparent in homicide cases