FORENSIC THANATOLOGY

Prelection by Vasile Șarpe
MD, MS, PhD, assoc. Professor
Lecture items

• Death, classification. Terminal states.
• Positive diagnosis of death.
• Early cadaverous changes.
• Belated cadaverous changes.
• Assessment the time of death.
Reasons of medico-legal examination of a the cadaver

- violent death (homicide, suicide, accident);
- sudden death (suspicious death, without a doctor's supervision, etc.);
- corpses of unknown persons, including the corpse of a newborn babies;
- death occurred in hospital within 24 hour after hospitalization (without a clinical diagnosis);
- death in hospital due to a disease and followed more than 24 hours of hospitalization, if there are complaints of relatives
- malpractice (medical errors, mistakes, iatrogenic diseases, etc.)
Death, classification

Thanatology is a science that studies installation of the death and changes which occur after death

(from the Greek - Thanatos (θάνατος: "death") & suffix -logia (-λογια: "speaking", "collections of sayings").

Death is an irreversible process and it is the cessation of the main vital functions
Death, classification

Biological point of view
• natural
• unnatural

Juridical point of view (2 categories)
• violent
• nonviolent
Death, classification

Manner of death

• Natural
• Accident
• Suicide
• Homicide
• Undetermined (or “Could not be determined”)
Terminal states

• **Preagony** – filiform pulse, pale or stained skin, breathing is superficial and frequent. May take several hours

• **Terminal break** - stopping breathing (lasts 2-4 minutes)

• **Agony** - rare and superficial breathing, gradually, till irregular breathing act and CNS inhibition

• **Clinical death** - respiratory and cardiac arrest (4-7 minutes)

• **Biological death** - irreversible - death itself
Positive diagnosis of death

Negative signs of life

– lack of consciousness
– passive position of the body
– pale skin
– absence of respiratory movements
– absence of heart contractions and pulse
– lack of response to painful, thermic and odorous stimuli
– absence of reflexes
Positive diagnosis of death

Positive signs of death

  cadaverous changes
    – Early
    – Belated

Diagnostic tests

• Magnus
• Beloglazov
Early cadaverous changes

- Algor mortis (cooling)
- Dehydration
- Livor mortis (postmortem hypostasis, lividity)
- Rigor mortis (postmortem stiffness of muscles)
- Autolysis (self-digestion)
Early cadaverous changes

**Algor mortis** (cooling) - reduction in body temperature after death

Depends on:
- External factors
- Ambient temperature
- Humidity
- Movement of air
- Clothing and their character
- Medium of the corpse finding (immersion in water, at air)

Internal or individual factors:
- Thickness of fat tissue (body mass)
- Age
- Cause of death
Early cadaverous changes

Dehydration
Fine and wet structures of the skin and body (lips, sclera, genitals)

Signs of dehydration
• brown-parchment spots on the skin (scrotum, lips)
• triangular yellow or brown spots over the sclera of open eyes (L’Arche spots)

Depends on
• Environment: temperature and ventilation
• Individual features: nutrition, degree of dehydration, clothes
Early cadaverous changes

Livor mortis
• Hypostasis
• Stasis
• Imbibition
Early cadaverous changes

**Rigor mortis** - postmortem stiffness of muscles
The rigidity occurs faster
- high temperature
- convulsions

Rigor mortis may be weak or even absent
- poisoning (hemolytic substances, mushrooms, narcotics)
- malnutrition
- sepsis
Early cadaverous changes

**Autolysis** (self-digestion) - destruction of biological objects by their own enzymes depends on

- saturation of tissues by enzymes
- environment temperature
- tissue acidosis

is faster in pancreas, adrenal glands, spleen, stomach, liver
Importance of early cadaverous changes

- fact of death
- time of death
- probable cause of death by its color and intensity
- tempo of death installation
- initial position of the body
- if the initial position of the body was changed
- relief of corpse lodge
Belated cadaverous changes

Destructive
  – putrefaction
  – destruction of the corpse by animals (insects, fish, birds, mammals)

Conservative (preserving)
  – Mummification
  – Lignification
  – Saponification
  – Congelation
  – Petrification
Belated cadaverous changes

**Putrefaction** (decomposition) disintegration of proteins and tissues by aerobic and anaerobic microorganisms

The conditions of putrefaction are

• temperature
• aeration
• humidity
Belated cadaverous changes

Types of putrefaction

1. dry, when is less liquid and low humidity (massive bleeding, cachexia)
2. moist: the presence of excessive water (e.g. edema)
3. gaseous: infectious (bacterial) disease, anaerobic putrefaction (e.g. sepsis, drowning (water and microbes pass through skin in soft tissue))
Belated cadaverous changes

Signs of putrefaction:
• green-grey discoloration of the skin
• venous net
• vesicles of putrefaction
• cadaveric emphysema
• fetid smell
Belated cadaverous changes

Mummification is complete dehydration of the tissues due to dry air, high temperature and good ventilation.

Saponification (adipocere) develops in humid conditions with minimum access or lack of oxygen.

Lignification (tanning) occurs in acid medium rich in tannic and humic acids (e.g. swamps).
Assessment the time of death

Time of death

• the supravital reactions
• early cadaverous changes
• belated cadaverous changes
• biochemical markers
Assessment the time of death

Supravital reactions

- Beloglazov test is positive in 10-15 minutes.
- Mechanical excitability of the muscles
  - Tendon reaction (Zsako’s phenomenon) - 1.5-2.5h
  - Idiomuscular contraction – till 10 h
- Electrical excitability of the skeletal muscle
- Pharmacological excitability of the iris muscle
Assessment the time of death

Early cadaverous changes:
- L’Arche spots occur over 5-6 hours
- At 16-18°C of environment, the cooling is near 1°C per hour
- Livor mortis
  - hypostasis 1.5-2h - 8-12h
  - stasis – 8-12h – 24-36h
  - imbibition – over 24-36 hours
- Rigor mortis
  - instals in 3-4 hours
  - in all muscles over 8-14 hours
  - destroyed after 10-12 hours does not restore
  - 24h it reaches its peak
  - complete and independent resolution is found by 3-4 days
## Assessment the time of death

<table>
<thead>
<tr>
<th>Phenomenon (presumed starting time)</th>
<th>Duration (at ambient temperature 16-18°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green-grey discoloration of the skin</td>
<td>2-3 days</td>
</tr>
<tr>
<td>in the right iliac region</td>
<td></td>
</tr>
<tr>
<td>summer in the open air</td>
<td>near 1 day</td>
</tr>
<tr>
<td>at ambient temperature 16 -18°C</td>
<td></td>
</tr>
<tr>
<td>in the left iliac region</td>
<td>12 h later than in the right region</td>
</tr>
<tr>
<td>of the whole abdomen</td>
<td>3-5 days</td>
</tr>
<tr>
<td>of all the skin (no flies)</td>
<td>8-12 days</td>
</tr>
<tr>
<td>Venous net of putrefaction</td>
<td>3-4 days</td>
</tr>
<tr>
<td>Green-grey discoloration of livor mortis</td>
<td>3-5 days</td>
</tr>
<tr>
<td>Evident abdominal distension by putrid gases</td>
<td>4-5 days</td>
</tr>
<tr>
<td>Marked cadaveric emphysema</td>
<td>2nd week</td>
</tr>
<tr>
<td>The appearance of putrefaction vesicles</td>
<td>2nd week</td>
</tr>
<tr>
<td>Destruction of organs and tissues (no flies)</td>
<td>3 months</td>
</tr>
<tr>
<td>Skeletonization (preserving ligaments)</td>
<td></td>
</tr>
<tr>
<td>on the ground in the summer</td>
<td>≈ 2 months</td>
</tr>
<tr>
<td>on the ground in winter</td>
<td>≈ 1 year</td>
</tr>
<tr>
<td>Fragmented skeletonization (on the ground)</td>
<td>≈ 1-3 years</td>
</tr>
</tbody>
</table>
### Assessment the time of death

<table>
<thead>
<tr>
<th>Flies:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>presence of oviposition (eggs)</td>
<td>1-3 days</td>
</tr>
<tr>
<td>presence of oviposition and larvae</td>
<td>2-3 days</td>
</tr>
<tr>
<td>predominance of larvae</td>
<td>3 days - 2.5 weeks</td>
</tr>
<tr>
<td>emergence of pupae</td>
<td>more than 2 weeks</td>
</tr>
<tr>
<td>emergence of flies</td>
<td></td>
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<tr>
<td>at 15-20°C</td>
<td>20-30 days.</td>
</tr>
<tr>
<td>at 20-25°C</td>
<td>15-20 days.</td>
</tr>
<tr>
<td>at 25-30°C</td>
<td>9-15 days.</td>
</tr>
<tr>
<td>Start of mummification &amp; saponification</td>
<td>2 weeks till 2 month</td>
</tr>
<tr>
<td>Complete mummification &amp; saponification</td>
<td>6 month to 1 year</td>
</tr>
</tbody>
</table>
Euthanasia

Euthanasia (from the Greek "good death": eu (well or good) + thanatos (death))

an intentionally ending the life in order to relieve pain and suffering

There are different euthanasia laws in each country

In Republic of Moldova according to art 148. Deprivation of the life due to desire of the person (euthanasia) shall be punished with imprisonment up to 6 years.
Resuscitation
Transplantation