ZAPOROZHIAL STATE MEDICAL UNIVERSITY

THE DEPARTMENT OF PATHOLOGICAL ANATOMY and FORENSIC MEDICINE

GENERAL QUESTIONS OF FORENSIC MEDICINE

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FORENSIC OR LEGAL MEDICINE

Forensic or legal medicine deals with the application of medical knowledge to aid in the administration of justice. It is used by the legal authorities for the solution of legal problems.

Some examples are: applying the medical knowledge in deciding cases of injuries, asphyxias deaths, sexual offences, infant deaths, poisoning, etc. In short it deals with medical aspects of law.

FORENSIC MEDICINE

Forensic medicine deals almost entirely with crimes against the person, in which medical examination and evidence are required. Forensic medicine is mostly an exercise of commonsense, combined with the application of knowledge and experience, already acquired in the study of other branches of medicine, surgery, obstetrics, etc. Its aim is to find out the truth.

FORENSIC MEDICINE

Its particular field of activity is judicial investigation, both civil and criminal.

In all cases of crime involving the person, e.g. homicide, suicide, assault, sexual offences, traffic accidents, poisoning, etc., the help of the medical practitioner is sought by the police. In all such cases, the doctor will be required to appear as an expert witness in a Court of law.

FORENSIC MEDICINE

The medical expert should be very careful when he is examining living people.

He should not encourage an accused person to talk about the crime with which he is charged, or about the events that led to his arrest.

If, during a medical examination, a person says anything that might incriminate himself, it should be neither recorded not repeated.

FORENSIC MEDICINE

Three things are needed for success:

1) the power of observation,
2) a wide range of exact knowledge,
3) the power of deduction.

A good command of language, clear presentation, and ability in expressing a relatively firm opinion are necessary for the success of the forensic pathologist.

The forensic pathologist must be alert to where evidence should be looked for, and how it should be interpreted.

FORENSIC MEDICINE

Forensic medicine is not an exact science. Unexpected results are produced due to biological variations.

In every case, there is an element of uncertainty, and absolute proof is a rarity in any medical problem.

Doctors should bear in mind the essential difference between probability and proof.

The medical witness should not be dogmatic about his opinion.

FORENSIC MEDICINE

The doctor should be ready to defend every finding and conclusion on the report on clinical and scientific grounds.

He should be aware of professional and scientific viewpoints which might differ from his, and should be familiar with the latest scientific literature in relation to the subject involved.

FORENSIC MEDICINE

For the purpose of illustrating and clarifying his testimony, the medical expert may employ photographs, maps, diagrams, charts, X-rays, skeletons, models, etc., when they are properly verified.

FORENSIC-MEDICINE EXAMINATION

Forensic-medical examination is performed only when there is a written resolution or direction from the investigative or judicial organs.

Objects of forensic-medical examination:

1. **Dead body.**
2. **Living person (a victim , is suspected and other persons).**

FORENSIC-MEDICINE EXAMINATION

Objects of forensic-medical examination:

3. Material evidences.
4. Materials of crime cases.

FORENSIC-MEDICINE EXAMINATION

Examination or research of these objects is produced in Bureau of forensic-medical examination or Institute of Forensic Medicine which consists of the following departments:

1. Forensic-medical mortuary (morgue).
2. Department for examination of victims, suspected and other living persons.
3. Forensic-medical laboratories (histological immunological, cytological, chemical, criminalisticals).

INVESTIGATION OF THE SCENE OF DEATH

I. The first research of dead body an expert conducts on the scene of death.

The basic rules for investigation of any scene of crime are:

1) verify that a crime has been committed,
2) look for signs of how it was committed,
3) recover and preserve evidence that might lead to the arrest and conviction of the guilty.

INVESTIGATION OF THE SCENE OF DEATH

Medico-legal Masquerades:

Many cases of homicide go undetected because of the lack of suspicion and improper or inadequate investigation. All cases of death should be regarded as unnatural, until proved otherwise.

INVESTIGATION OF THE SCENE OF DEATH

Accidental deaths and suicides can occur under circumstances which suggest homicide.

In a suicide case, alterations may be made at the scene because of stigma. In a homicide case, the scene may be altered or rigged to suggest that death resulted from suicide or accident.

INVESTIGATION OF THE SCENE OF DEATH

The doctor must look for any possible inconsistencies between the apparent death scene and his actual scientific findings. In a case of hanging, the manner in which a ligature is applied to the neck, or the mode of suspension of a body may be determining features in the circumstances.

INVESTIGATION OF THE SCENE OF DEATH

In such cases, the real cause of death can be established by complete autopsy and police investigation.

The investigating officer should obtain information about the circumstances of death and the background of the deceased.

INVESTIGATION OF THE SCENE OF DEATH

The answers to the following questions have to be found:

1) **Who is the victim? (identification).**

2) **When the death and injuries occurred? (time of death and injuries).**

3) **Where the death occurred? (scene and circumstances of death).**

4) **What injuries are present? (description of injuries).**

INVESTIGATION OF THE SCENE OF DEATH

The answers to the following questions have to be found:

5) **Which injuries are significant? (major, minor, true, artifacts, post-mortem injuries).**

6) **Why and how injuries were produced? (mechanism and manner of death, i.e., accidental, suicidal or homicidal).**

If the death is violent, determine the means or agent causing death, e.g., knife, firearm, poison, etc. and if homicide assist in identifying the person responsible for death.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

- Complete and accurate recording of the scene as it was found is very important.
- This can be done by accurate diagrams, notes and photography.
- The scene may show evidence of a struggle, and on the body vital trace evidence may be present.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

1) If the victim of an assault is living when first seen, the doctor must do everything to save the life.

2) If death is imminent, he should obtain a dying declaration.

3) He should also retain any material which is relevant, e.g., in cases of suspected poisoning, he must retain vomit, excreta or drinking utensils.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

4) He must make sure that death has occurred.

5) If he suspects foul play, the police should be informed.

6) He must obtain all possible information regarding the crime.

7) He must identify the body, which should also be identified by the relatives and the police.

8) He must enquire whether the body has been moved at all before he first saw it.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

9) He should ask the investigating officer before moving anything.
Photograph the scene from several angles.
He should follow but not lead the police around the scene.

10) He should not give opinion without proper thought.

11) He should make adequate notes:

a) Date, time, address or location,

b) Name and sex of deceased,

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

c) A list of all persons present,

d) General observation about the scene; any evidence of struggle, such as overturned furniture or trampled ground. Note surroundings of the body, such as walls, flooring, fixtures, furniture, doors and windows.

e) Temperature of the surroundings, and the rectal temperature of the deceased should be taken,

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

f) Make a sketch noting such points or importance as direction and position of blood (pools or splashes), position of the body and any weapons. If the weapon is in the hand of the deceased, note whether it is loosely held or tightly grasped.

The distribution of blood stains and their shape which may point to the site of injury should be noted.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

Note the amount of bleeding at the scene. Describe the clothing and note any tears, cuts, missing buttons, etc. Examine the hands and forearms for defense wounds. Make note of injuries and record them on body diagrams,

g) Position and appearance of the body, rigor mortis, postmortem lividity, etc., which assist in estimating the time of death,

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

h) Free hair, fibers or other foreign matter which is likely to be dislodged when the body is moved, should be searched and removed with adhesive tape,

i) If there are any bite marks, they should be swabbed with a cotton wool swab moistened with saline,

j) The pubic hair should be combed in situ in cases of sexual assault, and loose hair collected.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

k) The objects on premises, e.g., dates on mail and newspapers, condition of food on table, etc., to determine the time of death.

l) Photograph any ligature before removal, cut if necessary leaving the knot or knots intact.

CONDUCT AND DUTIES OF THE DOCTOR AT THE SCENE OF CRIME

m) If a weapon is found, handle it with care to preserve fingerprints, blood stains, hair, fibers, etc.

n) Leave firearms in the condition they are found.

o) Note position of each bullet and casing. Bullets should be marked for identification.

MEDICO-LEGAL AUTOPSY

Objects:

1) To find out the cause of death, whether unviolent or violent.
2) To find out the manner of death, whether accidental, suicidal or homicidal.
3) To find out the time since death.
4) To establish identity when not known.
5) To collect evidence in order to identify the object causing death and to identify the criminal.
6) In newborn infants to determine the question of live birth and viability.

MEDICO-LEGAL AUTOPSY

Rules for Medico-legal Autopsies:

1) The autopsy should be conducted in a mortuary and never in a private room.
2) It should be conducted only when there is an official order from the police or Public Prosecutor.
3) It should be conducted as soon as possible after receiving requisition, without undue delay.

MEDICO-LEGAL AUTOPSY

Reasons of Forensic Autopsy

1. Violent death or marks of suspicion of it.
2. Sudden death with the unascertained diagnosis.
3. The cause of death is unknown.
4. Death of unknown persons.
5. Death in hospital at the unascertained diagnosis and at marks of suspicion on a violent death.
6. Death in hospital at the established diagnosis, but there are complaints on wrong actions of the medical personnel.

MEDICO-LEGAL AUTOPSY

The approach of the forensic pathologist to the investigation of death is different from that of the hospital pathologist.

The hospital pathologist has easy access to relevant information about the history, physical condition and course of the disease leading to death. His main aim is to find morphologic changes explaining signs or symptoms of the disease.

In medico-legal autopsies, often the clinical history is absent, sketchy or doubtful. In some cases, identity may not be known.

MEDICO-LEGAL AUTOPSY

Forensic pathologist has to determine time of death and age of injuries.

He has to carry out careful external examination including clothing, in the determination of the pattern of injuries and their relationship to the object or weapon causing them.

He has also to determine the manner and mechanism of death. The autopsy should be carried out by the doctor, and not left to the mortuary attendant.

DOCUMENTS OF FORENSIC-MEDICAL EXAMINATION

In all cases of forensic-medical examination is made:

1. Conclusion of forensic-medical examination

Structure of conclusion of forensic-medical examination

1. Introduction.
2. Research part.
3. Conclusions.

Thanatology

Thanatos is Greek god of death

Thanatology deals with death in all its aspects.

Three modes of death are:

Coma (Brain)
Asphyxia (Lungs)
Syncope (Heart)

"Tripod of life" are Brain, Lungs and Heart

Thanatology

POSTMORTEM CHANGES

Signs of death appear in the following order:

1. Immediate (somatic death):

a. Insensibility and loss of voluntary power earliest sign at death.

b. Cessation of respiration.

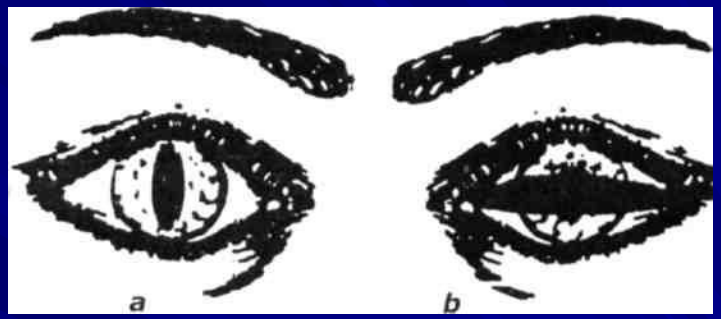
c. Cessation of circulation.

Thanatology

POSTMORTEM CHANGES

2.Early (cellular death):

a. Pallor and loss of elasticity of skin
b. Changes in the eye



The important expert value has *Beloglazov's sign* or the symptom of *"the cat's eye" .* It is established by method of squeezing of an eye there of the pupil gets the oval form. This symptom appears in 10-15 minutes after death.

c. Primary flaccidity of muscles.
d. Cooling of the body
e. Postmortem lividity
f. Rigor mortis

Thanatology

POSTMORTEM CHANGES

3. Late (decomposition and decay):

a. Putrefaction

b. Adipocere formation

c. Mummification

Thanatology

POSTMORTEM CHANGES

LIVOR MORTIS (Postmortem Staining)

Synonyms of postmortem staining are cadaveric or postmortem lividity, hypostasis, or livor mortis.

Cadaveric lividity is an early sign of death.

Postmortem hypostasis is bluish purple or purplish red discoloration, which appears under the skin (rete mucosum) of the dependent part of the body after death due to capillo-venous distention.

Postmortem lividity begins shortly after death, but it may not be visible for about half to one hour after death.

Thanatology

POSTMORTEM CHANGES

LIVOR MORTIS (Postmortem Staining)

- It is usually well developed within 4 hours and reaches a maximum between 6 and 12 hours.
- The postmortem staining gets fixed in 6-7-8-10 hours.
- Postmortem hypostasis persists till it merges with discoloration of putrefaction.
- It is more marked in asphyxia and is less marked in death from hemorrhage, anemia, lobar pneumonia and wasting disease.

Thanatology

POSTMORTEM CHANGES

LIVOR MORTIS (Postmortem Staining)

Location of Postmortem hypostasis

In case of Hanging: **Hypostasis is more marked in lower limbs, external genetalia, lower part of arms and forearms.**

In case of Drowning: **If the body is constantly moving, *postmortem* staining may not develop.**

In a body lying on its back, it first appears in the neck and then spreads over the entire back except parts directly pressed on i.e. shoulder-blades, buttocks, calves and heel.

Thanatology

POSTMORTEM CHANGES

LIVOR MORTIS (Postmortem Staining)

Location of Postmortem hypostasis

Distribution of Livores mortis depends on position of the body after death

Thanatology

POSTMORTEM CHANGES

LIVOR MORTIS (Postmortem Staining)

The hypostatic areas have a distinct colour in certain cases of poisoning - e.g.

- ***In carbon monoxide poisoning - cherry red.***
- ***In hydrocyanic poisoning - bright red,***
- ***In poisoning by nitrites, potassium chlorate, nitrobenzene, aniline (causing methaemoglobinaemia) the colour is red brown or brown.***
- ***In Pottasium Cyanide Poisoning - Deep Blue.***
- ***In Clostridum perfringens infection - Bronze colour.***
- ***Hypothermia – Bright pink***
- ***Opium - Black color***

Thanatology

POSTMORTEM CHANGES: LIVOR MORTIS

Thanatology

POSTMORTEM CHANGES: LIVOR MORTIS

Livor mortis. The livor mortis outlines the decedent's hand. This pattern will not go away since the lividity is fixed.

Thanatology

POSTMORTEM CHANGES: LIVOR MORTIS

Occasionally, livor mortis may appear as an unusual pattern or look like an injury. This man was discovered at the bottom of some stairs.

The pathologist can cut into the area to differentiate between livor mortis and injury.

An incision into the area reveals only the yellow fat and no blood.

This indicates the area is lividity and not an injury.

Thanatology

POSTMORTEM CHANGES: Rigor Mortis

Definition

This is stage of stiffening of muscles with shortening of the fibers. Individual cell death takes place at this stage.

Mechanism

When the ATP is reduced to 85% of the normal, the overlapping portions of myosin and action filaments combine as rigid links of actomyosin , which is viscous and inextensible and causes hardness and rigidity of muscle rigor.

Thanatology

POSTMORTEM CHANGES: Rigor Mortis

The Order of Appearance of Rigor Mortis

- All muscles of the body, both voluntary and involuntary are affected.
- It first appears in involuntary muscles - the *myocardium* becomes rigid in an hour.
- In Voluntary muscle in

Order of onset of rigor mortis is-eyelids-thorax-lower limbs.

Order of disappearance of rigor mortis is-eyelids-thorax-lower extremities.

When rigor is fully developed, the entire body is stiff, the muscles shortened, hard and opaque.

Thanatology

POSTMORTEM CHANGES: Rigor Mortis

Time of Onset

In India, it begins 1 to 2 hours after death and takes further 1 to 2 hours to develop

In, temperature countries, it begins in 3 to 6 hours and takes further 2 to 3 hours to develop.

Duration of Rigor Mortis

Rigor mortis follows *"RULE OF 12"* 12 hours to set in, 12 hours to remain, 12 hours to pass off.

It takes roughly 36 hours for rigor mortis to vanish.

Thanatology

POSTMORTEM CHANGES: Rigor Mortis

This man was found in this position the day after he died. His body was completely stiff. This stiffness (rigor mortis) begins in all muscles 1–2 hours after death.

The body will be in complete rigor in 10–12 hours and remain stiff for another 24–36 hours at the same environmental temperature.

Heat speeds up the process and cold retards it.

Thanatology

POSTMORTEM CHANGES: Rigor Mortis

The man's knee remains bent after he is moved because the rigor mortis is still in a fixed position.

If discovered in this position, the examiner would know the body had been moved.

Thanatology

POSTMORTEM CHANGES: Putrefaction

Putrefaction is the final stage following death, produced mainly by the action of bacterial enzymes, mostly anaerobic organism derived from the bowel.

Enzymes Lecithinase produced by Cl. Welchii is most important.

The characteristic features of putrefaction are:

- Changes in the colour of the tissue.
- Collection of gases in the tissues.
- Liquefaction of tissues.

Thanatology

POSTMORTEM CHANGES: Putrefaction

The first external sign of putrefaction in a body lying in air is a greenish discoloration of skin over caecum i.e. right iliac fossa, then all stomach.

Sulphmethhaemoglobin causes greenish discoloration.

The color appears in 12 to 18 hours if the environmental temperature is high, and 2 to 3 days in temperature about 18-20°.

Thanatology

POSTMORTEM CHANGES: Putrefaction

The marbled appearance is prominent in 36 to 48 hours.

Most bodies turn green during the progression of decomposition. This one did not. The body is swollen (bloated) from bacterial gas formation and there is skin slippage and subcutaneous marbling (the outlines of the blood vessels under the skin).

Thanatology

POSTMORTEM CHANGES: Putrefaction

Due to the presence of gases in the abdomen, the diaphragm is forced upwards resulting in expulsion of blood stained froth/gastric contents from mouth and nostrils—POSTMORTEM PURGE.

Internal pressure occurs on the internal organs when gas develops. Pressure pushes bloody fluid out the nose and mouth (purging). This should not be confused with trauma to the nose and mouth.

Thanatology

POSTMORTEM CHANGES: Putrefaction

After 3 days, the face is so discolored and bloated that identification becomes difficult. The hair becomes loose and is easily pulled out.

This man was 21, thin, and white. He was discovered in a river 4–5 days after he was killed in the summertime.

Decomposition can cause the facial features to change
and the hair to slip off.
Visual identification may be difficult
when such changes occur.

Thanatology

POSTMORTEM CHANGES: Putrefaction

The organs show putrefactive changes in the following order:

1. Larynx and trachea
2. Stomach, intestines, spleen
3. Liver and lungs
4. Brain
5. Uterus,prostate
6. Skin, muscle tendon
7. Bone

In putrefaction, liver has a honey combed or foamy appearance.

Prostate and Non-gravid uterus resist putrefaction for a very long time.

Putrefaction begins above 10°C and optimum 'between 21 °C and 38°C.

Thanatology

POSTMORTEM CHANGES: Mummification

- It is modification of putrefaction, occur when the environmental condition is hot and dry.

- Mummification occurs when body is buried in dry sandy shallow graves.

- Desiccation or Dehydration or Drying and shrinkage of the cadaver occur due to evaporation of water but the natural appearance and features of the body are preserved.

- A mummified body is odorless.

- The time required for complete mummification of a body varies from three months to a year or two.

Thanatology

POSTMORTEM CHANGES: Mummification

The skin dries out and turns leathery. This man's head mummified within two days because his head was next to a heater. His head will not decompose further due to the mummification. His hands had also mummified

Thanatology

Exhumation

- Exhumation is the digging out of an already buried body from the grave.

- There is no time limit for exhumation .

- The body is exhumed only when there is a written order from the first class magistrate.

- It should be conducted in natural light in early morning.

- Average number of sample of earth taken is 6-7.

- Disinfectants should not be sprinkled on the body.

- In suspected mineral poisoning, hair, nails, and long bone e.g. femur should be preserved for chemical analysis.