

Forensic Sciences

Forensic pathology – a specialty of medicine or subspecialty of pathology

Forensic psychiatry

Forensic toxicology

Forensic genetics

Forensic anthropology

Forensic odontology

Criminalistics

Jurisprudence - forensic medicine involves the inter-professional relationship between law and medicine

Forensic medicine - pathology

Living cases

examination of injuries

iatrogenic problems (malpractice)

alcohol intoxication

sexual problems

Examination of the dead

Forensic medicine - psychiatry

Two major areas of criminal evaluations in forensic psychiatry:

Competency to Stand Trial (CST)

Mental State at the Time of the Offence (MSO)

Competency to Stand Trial

determination that a defendant has the mental capacity and is able to understand the charges and assist his attorney

Mental State at the Time of the Offence

evaluation whether a defendant was able to understand what he was doing at the time of the crime.

Forensic toxicology

Chemical examination of biological and non-biological (pill bottles, powders, pill bottles, powders, trace residue and any available chemicals) material to estimate:

which toxic substances are present, in what concentrations and the probable effect of those chemicals on the person.

Forensic odontology

Examination and evaluation of dentition of deceased to estimate:

age (in childhood)

identification of the person to whom the teeth belong - using dental records or ante-mortem (prior to death) photographs,

evaluation of bite marks, left on either the victim (by the attacker), the perpetrator (from the victim of an attack),

civil cases involving malpractice

Forensic anthropology

Application of theory and techniques of anthropology for law purposes

examination of human remains (skeletonized, burned, decomposed, mutilated or fragmented bodies) to estimate:

age, sex, ancestry, stature, muscularity, handedness, habits, occupational activities, disease and injuries,

Forensic entomology

Evaluation which insects lay eggs, when and where and in what order they appear in dead bodies, to estimate:

the time or post mortem interval,

place of the death,

types of necrophagous insects: e.g. flies, beetles, mites, moths, wasps, ants, bees

Forensic genetics

Identification of an individual

Identification of biological evidence

Relationships

Disputed paternity

Criminalistics

fingerprint analysis,

ballistics and explosion analysis,

car accidents analysis,

footwear evidence,

questioned document examination,

EXAMINATION OF THE DEAD

an autopsy, a necropsy, a medico-legal dissection, a post mortem examination.

REQUEST FOR AN AUTOPSY

Hospital autopsy

Forensic autopsy

Private autopsy

Private autopsy

on the request of the relatives of the deceased,

rarely the deceased himself may have expressed a wish either before witnesses or in his will,

extent of autopsy can be limited at request

Hospital and Forensic Autopsy - 1

1. requested by physicians

2. next of kin can object,

3. purposes:

to establish cause of death,

to enable physicians to correlate the clinical diagnosis with autopsy findings
to assess effectiveness of treatment,
as a teaching tool,
allows removing certain organs or tissues for transplantation purposes (Human Tissue Act)
to issue of death certificate.

4. identity of deceased usually known,
5. evidence usually not collected,
6. time of death usually known,
7. medical records are always available prior to autopsy,
8. extent of autopsy may be limited at request, ex. without head
9. external examination less important than internal examination,
10. photos are optional – i.e. for teaching purposes,
11. toxicology usually not helpful – samples are not collected,
12. microscopic examination usually performed

1. requested by prosecution or court, according to actual law,
2. does not require consent of relatives,
3. purposes:
to determine as accurately as possible and document the cause, mechanism and manner of death,
to distinguish death due to natural causes or unnatural ones,
to estimate time of death,
to document injuries,
to document signs of diseases,
to collect, identify and preserve both biological and non-biological material,
to establish as far as possible, the identity of the person or human remains,
4. identity often unknown,
5. evidence collected and preserved for possible use in court proceedings,
6. time of death usually unknown,
7. medical records may not be available prior to autopsy or at all,
8. the rule – complete autopsy is requested without exceptions,
9. external examination often more important than internal one,
10. photos are required very often,
11. toxicology often useful – samples are collected,
12. microscopic examination in selected cases

POST-MORTEM EXAMINATION

request from prosecutor's office to perform the autopsy is necessary (in writing)
every information about circumstances of the death should be available to the pathologist prior to autopsy,
every medical data (records, relatives...) should be available to the pathologist,
pathologist is assisted by a properly trained mortuary attendant and is properly equipped.

Legal authority

questions should be answered,
circumstances of the death or place where body was found,
further additional examinations or tests prosecution desires

deadline to form an opinion,

Questions to the ME

What was the cause of death?

Are there any injuries on the body? What type? What type of tool are they caused with?

Is there any connection between these injuries and cause of death?

When these injuries were caused?

What was the level of alcohol intoxication?

What was the time of death?- optional

EXTERNAL EXAMINATION

clothes describing in detail – unknown person,

gender, height, weight, nourishment,

post mortem changes – early and late,

injuries – recent and old (scars) on every part and aspect of the body,

peculiarities (tattoos, surgical scars, trace of self-inflicted injuries)

EARLY POST MORTEM CHANGES

lividity,

rigidity,

cooling of the body,

desiccation,

POSTMORTEM LIVIDITY

LIVIDITY (livor mortis, post mortem staining, hypostasis)

the reddish-purple, bluish-red discoloration

located on the skin in the lowest parts of the body due to filling vessels with a blood, caused just by the gravity,

blanching – pale areas among lividity due to preventing the filling of the blood vessels, caused by pressing by any object (firm surface, clothes, contacting areas of the body with another),

pink or cherry-red - carbon monoxide intoxication, hypothermia,

dark blue-pink - cyanide poisoning,

brownish-red- methaemoglobinaemia, aniline or chloride poisoning.

The primary hypostasis may either:

- move completely to the new zones after moving the body,

- be partly fixed – it will appear in „new” the lowest areas of the body and will be still visible in „old” areas,

- remain fixed – changing position of the body does not change location of the lividities – upon 12-th hour after death (decomposition)

POSTMORTEM RIGIDITY

MUSCULAR RIGIDITY (rigor mortis) – hardening, shortening and stiffening of the muscle after death with increasing muscular contraction and fixation of the joints (depletion of ATP in muscles, forming of actino-myosin complex)

first – muscles of the highest activity during life (mimic muscles, hands...) – 1-4 hours after death,

next – muscles of big joints – detectable 4-6 after time of death (TOD),

increasing of strength – 6-12 hours after TOD

onset of secondary flaccidity – 24-50 hours after TOD- due to decomposition,

temperature-dependent process – **THE COLDER TEMPERATURE THE SLOWER REACTION and vice versa**

COOLING OF THE BODY

COOLING OF THE BODY (algor mortis) – method to estimate time of death (Henssge).

Forensic assumptions:

I – temperature of the body - at the time of death **37°C** (t. can vary during a day, menstrual cycle, in illness, after exercises etc.)

II – the body is uniform structure – taking one or few t. readings and use it to hole body (each organ cools at its own different time),

III – the body is in thermally – static environment, without changes of conditions (heating/cooling system, open-air area...).

Factors disturbing cooling process:

environmental factors – season of the year, its temperature, type of environment - open-air (still or windy), water (still or flowing), soil (what kind?), humidity,

body factors – clothes (what kind?, wet or dry, how many layers on the body), posture (extended, fetal-position), nourishment (obese, skinny person), mass and surface of the body, body temperature (how many readings, which areas – anus, deep skeletal muscles, liver)

COOLING – Henssge Normogram

Is established for standard conditions – naked extended body lying in open still air

body temperature reading,

air temperature,

body weight, multiplied by corrective factor (above 1,0 to conditions decelerating the speed, below 1,0 to conditions accelerating the heat loss),

draft of the normogram.

DESSICATION

Loosing of water from the body

unijured areas – cornea, mouth, nostrils, ears, skin of scrotum, palmar surface of hands, soles every injury with damaged epidermis – abrasions, edges of wounds...

dry, stiff, dark reddish areas,

can imitate signs of injury (head, scrotum)

LATE POSTMORTEM CHANGES

decomposition of the body - autolysis, bacterial activity, putrefaction

adipocere - adipose = fat, cire = wax

mummification - drying, hardening and shrivelling of the tissues,
invasion by insects

DECOMPOSITION

Destruction of soft tissues of the body

1. wet and warm conditions
2. bacterial enzymes activity,
3. detectable by naked eye from 36-th hour after TOD
4. View of decomposition includes:

dirty greenish discoloration of the skin, first in right iliac fossa,
marbling – linear, dirty red, branching patterns along superficial skin veins (hemolyzed blood
diffuses aside from vessels),
gas formation – distension and bloating of abdomen, genitals, face (tongue is protruding from
mouth, dirty brown liquid is evacuated outside from airways),
forming of sub-skin blisters, full of dirty brownish fluid,
unpleasant smell.

Decomposition causes:

- destruction of signs of diseases, injuries of soft tissues, even its normal view,
- destruction of DNA structure – difficulties in identify
- produce of alcohol due to decomposition.

ADIPOCERE - SAPONIFICATION

Necro-chemical change – transformation body fat into wax-like substance

- wet conditions without access of air,
- pale, rancid, greasy, semi-fluid material with the most unpleasant smell - hydrolysis,
- then more brittle and whiter to became grey, firm, waxy,
- takes weeks or months

MUMIFICATION

complete dessication of the body in dry conditions,
body is dry, brown in color, firm, the body shape is maintained,

POST MORTEM ARTEFACTS

animal-induced
pathologist-induced
clinician-induced

INTERNAL EXAMINATION

In forensic autopsy is mandatory to: dissect head, neck, thorax and abdomen, and skeleton.