

**Ministry of Health of Ukraine
Bohomolets National Medical University
Department of Forensic Medicine and Medical Law**

**MYKHAILYCHENKO B.
BILIAKOV A.
ERGARD N.**



**PRACTICAL TRAININGS
FROM FORENSIC MEDICINE**

Methodologic materials



EDUCATIONAL EDITION

MYKHAILYCHENKO Boris
BILIAKOV Andrii
ERGARD Natalia

PRACTICAL TRAININGS FROM FORENSIC MEDICINE

Methodologic materials

Author's edition

UkrDGRI Publishing House
Rs Series DK № 182 dated September 18, 2000
04114, Kyiv-114, st. Avtozavodskaya, 78

The address of the editorial office and the journalists:
Information and Publishing Department of UkrDGRI
04114, Kyiv-114, st. Avtozavodskaya, 78
Phone: 206-35-18; tel / fax: 430-41-76
E-mail: mru@ukrdgri.gov.ua

Signet in print on 20.01.2021
Format 60*84/8, digital print, chalked paper
Circulation: 50 Order № 100 dated 06.11.2020

Ministry of Health of Ukraine
Bohomolets National Medical University
Department of Forensic Medicine and Medical Law

MYKHAILYCHENKO B.
BILIAKOV A.
ERGARD N.



PRACTICAL TRAININGS FROM FORENSIC MEDICINE



KYIV-2021

Agreed by the department of forensic medicine and medical law of the Bohomolets National Medical University (Protocol № 9 from 14.01.2021).

ДЛЯ ЗАМІТОК

UDC 340.624.6.:616.001.84

Mykhailychenko B., Biliakov A., Ergard N. Practical trainings from forensic medicine. Methodologic materials. K.: UkrSGRI, 2021. 160 p.

These methodologic materials Practical trainings from forensic medicine are designed for students which to study practical skills and for their control on practical classes.

Practical trainings from forensic medicine can be useful for medical professionals, law enforcement agencies, students, scientific and pedagogical staff of medical and legal educational institutions.

UDC 340.624.6.:616.001.84

© Mykhailychenko B., Biliakov A., Ergard N., 2021
© Bohomolets National Medical University, 2021.

5. Green color

33. ABO group consist of such following antigens and antibodies:

1. Antigens A and C
2. Antigens A and B
3. Antibodies alpha only
4. Antibodies alpha and beta
5. Antigens O

Control Questions:

1. General questions that can be solving during examination of blood.
2. Forensic medical examination of blood.
3. Forensic medical examination of hair.
4. Forensic medical examination of semen.
5. Forensic medical examination of particles of human organs, tissues and some secretions.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. Підручник. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
5. Mikchaylichenko B., Erhard N., Biliakov A. Macroreparation of bodily injury for practical training from forensic medicine. *Methodical recommendation*. K: УкрДГПІ, 2019. 32 p.
6. Михайличенко Б.В., Ергард Н.М. Практикум для самостійної підготовки студентів з навчальної дисципліни «Судова медицина». *Метод. рек.* К.: УкрДГПІ, 2017. 44 с.
7. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод.рек.* К.: УкрДГПІ, 2017. 24 с.

CONTENTS

Practical class 1. Procedural and Organizational Basics of Forensic medical Examination.....	4
Practical class 2. Forensic Medical Inspection of a Scene of Incident and Corpse.....	12
Practical class 3. Forensic Medical Thanatology. Examination of a corpse on a scene of death. Forensic Medical Autopsy.....	20
Practical class 4. Forensic Medical Examination of a corpse in case of sudden death. Student Independent Autopsy of a Corpse.....	45
Practical class 5. Forensic Medical Examination of Newborn Corpses.....	57
Practical class 6. Forensic Medical Traumatology. Blunt object injuries.....	63
Practical class 7. Forensic Medical Traumatology. Sharp object injuries.....	80
Practical class 8. Forensic Medical Examination of Living Persons.....	93
Practical class 9. Forensic Medical Examination of a Gunshot Wound.....	116
Practical class 10. Forensic Medical Examination of a Mechanical Asphyxia.....	130
Practical class 11. Forensic Medical Examination of Material Evidence.....	144

PRACTICAL CLASS 1

PROCEDURAL AND ORGANIZATIONAL BASICS OF FORENSIC MEDICAL EXAMINATION

Urgency: In cases when crimes have been committed against life and health of a person some medical or biological questions have to be solved. The doctor of any specialty can be involved in this process. Therefore, the knowledge of organizational bases of forensic medical examination and the procedural regulations of medico-legal expert activity is necessary for the doctor of any specialty.

Aim: to touch the students the organization of medico-legal service in Ukraine, the legal procedures and the normative-legal acts regulating them.

The specific aims:

- To explain procedural and organizational basis of forensic medical examination
- To know the function of structural units of forensic medical bureau.

Equipment:

1. Table “Structure of forensic medical service in Ukraine”.
2. Table “Structure of forensic medical bureau”.
3. Criminal and criminal-procedural code of Ukraine.
4. Law “On the forensic expertise”.
5. Control tests.
6. Control Questions.

Plan of class:

1. Test-control of elementary level of student’s knowledge.
2. Discussion of the key questions.
3. Independent work of students.
4. Control of final level of student’s knowledge

Main questions, which the student should know:

- structure of Medico-Legal Service in Ukraine.
- concepts about Codes, their variety and questions, which are regulated by them.
- number of special articles of Criminal Criminal-Procedural, Civil and Civil-Procedural Codes of Ukraine.
- forms of assignment of Forensic Medical Examination.
- rights, duties, responsibility, and obligations of Forensic Medical Expert.

5. Red color

26. Biological origin of blood means:

1. Origin from human
2. Origin from baby
3. Origin from insects
4. Origin from adult
5. Origin from animal

27. Origin from human is proved using:

1. Immunological reaction
2. Finding of Hemoglobin
3. Reaction of precipitation
4. Microcrystal reaction
5. Finding of Hemoglobin derivatives

28. The solving of question about individual belongings of blood is based on:

1. Immunological reaction
2. Blood group from Leucocytes
3. Blood group from erythrocytes
4. Blood group from Trombocytes
5. DNA from nucleus of blood cells

29. Female Sex origin of blood can be proved using:

1. Examination of erythrocytes
2. Y chromatin
3. Barr bodies in nucleus
4. Examination of Leukocytes
5. Barr bodies near nucleus

30. Male Sex origin of blood can be proved using:

1. Examination of erythrocytes
2. Y chromatin
3. Barr bodies in nucleus
4. Examination of Leukocytes
5. Barr bodies near nucleus

31. Age origin of blood can be found using:

1. Reaction of Precipitation
2. Microcrystal reaction using Teichmann technology
3. Hemoglobin F
4. Microcrystal reaction using Takayama technology
5. Hemoglobin A

32. Time of blood is based on following characteristics:

1. Color after UV lighting
2. Finding of choline esterase
3. Red color
4. Brown color

5. Time of blood

19. On place of incident question about presence of blood can be solve using:

1. Color of spot
2. Finding of Hemoglobin
3. Chemical reactions
4. Finding of Hemoglobin derivatives
5. Color after UV lighting

20. During inspection of place of incident Specialist in FM uses following methods:

1. General
2. Biochemical
3. Preliminary
4. Simple
5. Definitive tests

21. Chemical reactions that can be used on blood are following:

1. with H₂O₂
2. with HCL
3. Red color
4. with Luminol
5. with Chromogenic substrate

22. Chemical reactions that can be used on blood are Preliminary only:

1. Yes
2. No

23. In forensic medical immunological branch the presence of blood can be proved using:

1. Biochemical reaction on Hemoglobin
2. Teichmans Microcrystal reaction
3. Spectral investigation on Hemoglobin
4. Takayama Microcrystal reaction
5. Spectral investigation on Hemoglobin derivatives

24. Microcrystal using Teichmann technology are:

1. Like parallelograms
2. Hemohromogen
3. Brown color
4. Like needles
5. Hemin hydrochloride

25. Microcrystals using Takayama technology are:

1. Like parallelograms
2. Hemohromogen
3. Hemin hydrochloride
4. Like needles

Questions for Out-of-Class Student Self-Preparation:

1. Forensic Medicine as a branch of Medicine.
2. Subject of Forensic Medical Ethics.
3. Structure of Medico-Legal Service in Ukraine.
4. Forms of assignment of Medico-Legal Examination.
5. Rights, Responsibilities and Obligations of Forensic Medical Expert.

Main terminology: Code, Criminal Code (CC), Criminal Procedural Code (CPC), Forensic Examination, Forensic Medical Examination, Forensic Medical Investigation, Examination, Judicial Expert, Forensic Medical (or Medico-legal) Expert, Specialist in the field of Forensic Medicine.

Main information

The Forensic medicine is a branch of medical sciences which helps to solve the medical and biological questions for the purposes of justice and legal procedure. Any physician who specializes in treating the patients may perform the role of specialist in the field of forensic medicine and so they must possess knowledge of forensic medicine.

Now the forensic medicine is an independent medical science studying a certain questions and having research methods. In the course of development of forensic medicine a number of sciences, for example, forensic chemistry, forensic psychiatry, and forensic toxicology branched out from it as independent disciplines.

The forensic medicine is connected with all other medical sciences. As a medical science, it uses many methods of laboratory research.

Such law science as criminalistics, is very close to forensic medicine.

The Forensic Medicine is a branch of medicine and it is subordinate to the Health Ministry of Ukraine. The supreme establishment of forensic medicine is the Main Forensic Medical Examination Bureau of Ukraine that provides scientific, practical and organizational management. In the regional centres of the country there are 25 Bureau of forensic medical examination.

The Bureau of Forensic Medical Examination has such structural units:

- Department of Examination of Corpses (Thanatological Department),
- Departments of Examinations of Living Persons: victims, accused and others,
- Department of Duty Forensic Medical Experts,
- Department of Commission Examinations,
- Department of Forensic medicine examination of material evidences, which has 5 branches: Forensic Medical Histological, Forensic Medical Cytological, Forensic Medical Immunological, Forensic Medical Toxicological, and Medical-Criminalistic.
- Organizational and Methodical Department.

Such objects of forensic medicine investigations as corpse, living persons, biological evidence and medical, criminal, civil case documentation are examined in it.

The aim of forensic medicine expertise is to improve the quality of public health service too.

The procedure of Forensic Medical Examination is defined by the Order # 6 of Health Ministry of Ukraine dated 17.01.95 and a number of special articles of Criminal, Criminal-Procedural, Civil and Civil-Procedural Codes of Ukraine.

Forensic medical examination is necessarily performed in cases stated below:

- Establishment of the causes of death;
- Establishment of gravity and character of physical injuries;
- Establishment of age (as referred to criminal liability);
- Mental condition (Forensic Psychiatric Examination).

In Ukraine, there are two forms of assignment of Forensic Medical Examination – official, and free.

Official examination is performed by a doctor who is a forensic medical expert of the Bureau of Medico-Legal Examination.

Free examination is performed by specialist in the field of forensic medicine, who can work both in bureau and out of it.

There are such kinds of medico-legal examination: Commission and in Complex (Complex Examination).

All rights, duties and responsibilities of the medical-legal expert are given to this person. Every forensic medical expert has the rights, duties and responsibilities for successful performance of the expert task.

Forensic Medical Expert has the RIGHTS

To get acquainted with the case materials and to make notes to draw a conclusion before the beginning of sitting.

To declare a petition for granting additional materials to him or her, if such materials are necessary for drawing the conclusion.

To put questions to court, the defender, the accused, the witnesses.

To consult experts of all medical branches, with highly skilled experts.

With the sanction of the person making inquiry, the investigator, the public prosecutor or court, to be present during interrogation and other investigation actions and, in concern of the subject of examination, to put questions to persons being interrogated.

To receive compensation for expertise services, except for those cases when these services are carried out according to the duty task.

If for judicial sitting several experts are invited, they have the right to confer with each other and produce one conclusion. If their opinions have not coincided, the doctors produce separate conclusions.

The expert, unlike the witness, stays in court room during the whole

12. During inspection of place of incident blood may be find like:

1. Flow mottles
2. Imprints
3. Soakings
4. Stains from pool
5. Strokes

13. During inspection of place of incident we can think about blood using such characteristics as:

1. UV lighting
2. Presence of Hemoglobin
3. Color
4. Spectral analysis
5. Microcrystal reactions

14. Blood on place of incident can have following color:

1. Green
2. Blue
3. Red
4. Yellow
5. Brown

15. Under UV lighting blood traces may have following color:

1. Green
2. Red
3. Brown
4. Yellow
5. Orange

16. All material evidences of biological origin have to send to bureau of forensic medical expertise in:

1. Wet condition
2. Native condition
3. Dried condition

17. Blood sports are sending in such structural subdivisions of bureau like:

1. Laboratory division of bureau
2. Forensic medical cytological branch
3. Department of examination of material evidences
4. Branch of examination of material evidences
5. Forensic medical immunological branch

18. During examination of blood traces from place of incident following questions can be estimated:

1. Biological origin
2. Individual origin (characteristics)
3. Presence of blood
4. Age and sex origin

5. Blood spots, saliva, sperm, hair is investigated in:

1. Forensic Medical immunological department
2. Forensic Medical Laboratory
3. Forensic Medical immunological branch
4. Forensic Medical cytological branch
5. Forensic Medical immunological laboratory

6. Person who take parts in inspection of place of incident is named

as:

1. Expert
2. Specialist in Forensic Medicine
3. Forensic Medical Expert
4. Doctor-expert
5. Forensic Expert

7. Specialist in Forensic Medicine may be like:

1. Doctor-expert
2. Expert
3. Nearest Doctor of any curative spatiality
4. Expert in Forensic Medicine
5. Forensic Medical Expert

8. After coming on place of incident he (she) first of all has to:

1. Find blood spots
2. Find of signs of clinical death on corpse
3. Find signs of biological death on corpse
4. Find biological objects
5. Find material evidences of biological origin

9. Finding of Material evidences is performed during such stage on inspection of place of incident:

1. Dynamic stage
2. Static stage

10. The order of work of Specialist in Forensic medicine during inspection of place of incident is following:

1. Take object
2. Prepare to sending
3. Find material evidences of biological origin
4. Make the description of object
5. Help low investigator to compose special questions for expertise

11. Blood can be presented during inspection of incident like following:

1. Drops
2. Spots from drops
3. Pool
4. Spots from splashes
5. Streaks

period of sitting.

The Forensic Medical Expert is OBLIGED

1. To be on call of the person making inquiry, the investigator, the public prosecutor, and court.

2. To draw the objective conclusion on the questions raised.

3. To carry out the expert research, present the conclusion in written form, and sign it.

4. If the question falls outside the limits of special knowledge of the expert or the materials given to him are insufficient for drawing the conclusion, the expert informs, in written form, the body that has assigned the examination on impossibility to draw the conclusion.

5. As the fiduciary, to keep the data of investigation or inquiry.

Responsibility of the Forensic Medical Expert

Which they have during the assignment of examination:

– Refusal of the expert to perform his or her duties;
– Disclosure of information in the period of pretrial investigation or inquiry

– Obviously false Conclusion.

The **independence of the expert** is guaranteed by the state. The correctness of his or her conclusion is provided by:

1. The order of assignment of the expert;
2. Interdiction of anyone's interference in carrying out the examination;
3. Existence of establishments of the forensic examination separated from the bodies of inquiry and preliminary investigation;
4. The criminal liability of the expert for obviously false testimony;
5. Opportunity of assignment of repeated examination;
6. Presence of the process participants at the examination carried out.

The expert can refuse to carry out the examination.

The reason for refusal can be as follows:

1. If the expert is the victim, the civil claimant, the respondent, the witness, or has participated in the Examination as a interpreter;
2. If the expert is a relative of the victim, the civil claimant, the respondent or his or her legal representative;
3. If the expert is privy in the case, directly or indirectly;
4. If the expert has been a subordinate of the accused, the suffering, the civil claimant or has been in any other dependence on him;
5. If the expert has performed audit on the given case, with the audit materials being the basis for initiation of this criminal case;
6. In cases when the expert has been found incompetent.

The Forensic Medical Examination consists of two consecutive stages:

- the expert research;
– the Conclusion.

After obtaining the laboratory data, the forensic expert fills up an **“Conclusion of Expert”**, which consists of:

I. Introductory part (containing information on the investigator who appointed the examination; data on the forensic expert conducting the examination; data on the corpse; data on the circumstances of the death and questions of the investigator to the expert).

II. The descriptive part (data on external and internal examination of a corpse, data on laboratory tests).

III. Final part (containing forensic diagnosis data and expert's answers to the investigator's questions).

Control tests:

1. The carrying out of forensic medical investigation is based on:

1. Rules
2. Demanding of relatives
3. Codes of Ukraine
4. Instruction of main doctor of hospital
5. Order of hospital

2. Doctor of any specialty can be involved for carrying out of forensic medical examination

- Yes
- No

3. Doctor of any specialty who involved for carrying out of forensic medical examination is named as:

1. Doctor-expert
2. Medico-legal expert
3. Expert
4. Consultant
5. Doctor in law

4. During forensic medical examination medico-legal expert have to:

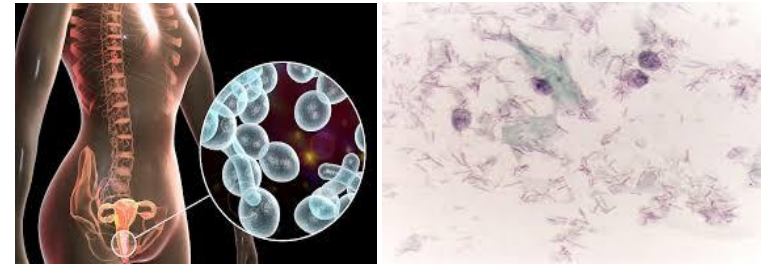
1. To be on call of the person making inquiry, the investigator, and court.
2. To have a consultation from court
3. To draw the objective conclusion on the questions raised to him.
4. To study the criminal code
5. To carry out the expert research, present the conclusion in written form, and sign it.

5. During forensic medical investigation medico-legal expert has such right as:

1. To study the criminal code
2. To know information from case materials
3. To draw the objective conclusion

Saliva is detected when investigating criminal cases. **Stains of saliva** on material evidences are of whitish or yellowish colour, in fluorescent light they produce a white or bluish glow. This analysis is a preliminary test.

Methods include of saliva as evidence: cytological examination and morphological composition:



Control tests:

1. Any object, any substance, any item that prove any event has such name as:

1. Biological object
2. Proving object
3. Material evidence
4. Forensic medical object
5. Material evidence of biological origin

2. Bureau of Forensic Medical expertise consist of:

1. 5 Branches
2. 3 Departments
3. 5 Departments
4. 5 Laboratory branches
5. 4 Departments

3. Department where material evidences are examined has such name as:

1. Department of FM investigation of Material Evidences
2. Research department
3. Forensic Medical laboratory
4. Special Branch of FM examination of Material Evidences
5. Department of FM examination of material evidences

4. Department of Forensic Medical Examination of material evidences has such structural units as:

1. Department of examination of blood
2. Forensic medical histological branch
3. Forensic medical immunological branch
4. Forensic medical cytological branch
5. Forensic medical toxicological branch

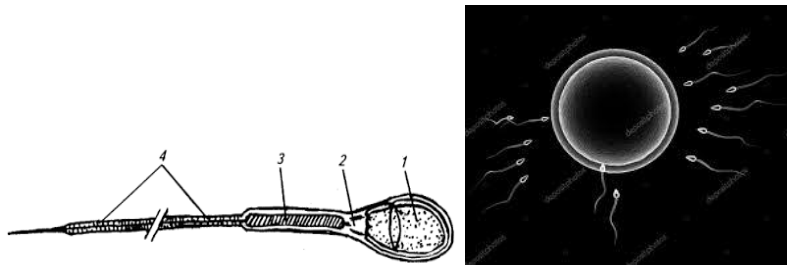
sometimes discontinuous or even absent. Cortex and medulla ratio is 8:1. **Cortex of animal** fur looks like a narrow strip and medulla is much wider, their ratio is 1:8.

When determining **the regional origin**, the found hair is compared with the hair from different parts of a human body. To state whether the hair fell out or was torn out, its bulb is examined. In the hair that fell out the bulb is dry, wrinkled, looks like a flask and has not vaginal tunic. If the hair was torn out, its bulb consists of the cells with different nuclei, it is often deformed and has vaginal tunic whose cells possess nuclei. The torn-out hair can prove fighting or self-defence.

Examination of Semen

Forensic medical examination of semen traces is conducted when investigating sexual crimes. Swipes from the vagina, rectum or oral cavity of victims are also examined. Semen is a medium, whose main specific morphological component is spermatozoon. Most of middle-aged men can ejaculate on average 4 to 5 ml of semen, the lower limit of normal being 1.5 ml.

A spermatozoon consists of three main parts: head, neck and tail. Its mobility is ensured by tail constrictions.



At the locus of an accident semen traces can be found in the form of stains on different objects. With the help of semen examination forensic medical experts must the following questions:

- whether the material evidence contains semen
- what its group identity is
- whether it can belong to a certain person (the suspect person).

Preliminary methods include visual characteristics of semen stains, examination in ultraviolet light, microcrystalline Florence test, reaction with potato juice.

Examination of human organs and tissues and those of animals are examined when investigating traffic accident, if there are pieces of tissues on any parts of the vehicles, and also when animals are stolen and killed, meat or meat products are stolen, when any pieces of tissues are found on the instruments that were used to process the carcass.

4. To know the aim of medico-legal investigation

5. Do not give any information to any people about result of investigation before court

6. During forensic medical investigation medico-legal expert responses for:

1. Refusal on answer on questions from non medical or non biological fields

2. Refusal to perform investigation without reason

3. Disclosure of information in the period of pretrial investigation or inquiry

4. Given of non truthful conclusion

5. Refusal to come to court in a case of summon

7. The carrying out of forensic medical investigation is necessarily in case:

1. To establish kind of violent death

2. To establish of cause of death

3. To establish gravity of injury

4. In case of sex crime

5. To establish age of person

8. Forensic medical expertise subordinates to the Health Ministry of Ukraine:

– Yes

– No

9. The establishment where forensic- medical investigation is performed has name:

1. Forensic Laboratory

2. Forensic polyclinics

3. Bureau of forensic medical expertise

4. Forensic department

5. Medical law department

10. There are such departments in Bureau of forensic medical expertise:

1. Polyclinics

2. Thanatological

3. Departments for Examinations of Living Persons: suffering, accused and others

4. Department of Duty Forensic Medical Experts

5. Department for Forensic medicine examination of material evidences

11. Department for Forensic medical examination of material evidences has such branches:

1. Forensic medical chemical

2. Forensic Medical Cytological

3. Forensic Medical Immunological

4. Forensic Medical Toxicological
5. Forensic Medical Histological

12. The objects of forensic medical examinations are:

1. Animals
2. Living persons
3. Corps
4. Biological evidence
5. Medical, criminal, civil case documentation

13. In Ukraine there is state Forensic Medical Expertise:

- Yes
- No

14. In Ukraine there is official and free form of assignment of Forensic Medical Examination:

- Yes
- No

15. Medico-Legal Examinations can be performed by Commission and Complexly:

- Yes
- No

16. After Medico-Legal Examination expert composes Conclusion of expert:

- Yes
- No

17. Forensic medical expert and doctor of any speciality can fulfill forensic medical expertise:

- Yes
- No

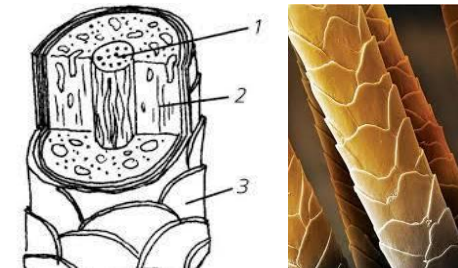
Control Questions:

1. Forensic medicine as science and its significance for public health and justice.
2. The procedural and organizational basis of forensic medical examination.
3. The structure of medical-legal service in Ukraine.
4. Main structural unit of forensic medical bureau.
5. The function of structural units of forensic medical bureau.
6. Judicial expert, forensic medical expert, doctor-expert in the field of forensic medicine.
7. Rights, duties and independence of forensic medical expert
8. The independence of forensic medical expert which is guaranteed by state.
9. Two forms of assignment of Forensic Medical Examination.
10. Kinds of medical-legal examination.
11. Main objects of forensic medicine.

- 7) the group and sex identity of the hair;
- 8) possible origination of the hair from a certain person.

Morphological and biological features of hair are used to answer these questions.

The presence of hair is determined with the help of a microscopic analysis that allows examining its structure and the pattern of cuticle. A hair has a top, shaft and root that ends with a bulb. The shaft can be divided into cuticle, cortex and medulla (core):



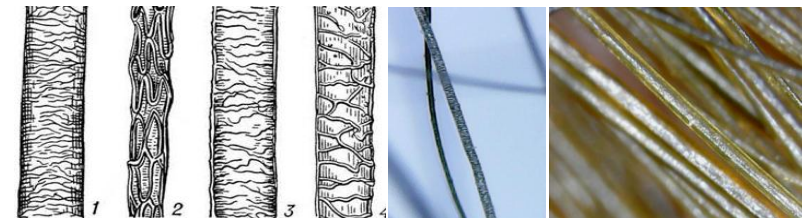
Cuticle consists of a single row of flat and transparent cells without nuclei and pigment (squamas) that are situated in an imbricate way. Free ends of the squamas are directed towards the hair tops. As a result, the optic end of the hair is cogged.

Cortex is made of spindle-shaped keratinized cells and contains a pigment that can be either in a diffused state or in the form of pigment granules.

Medulla (core) consists of tiny keratinized cells of different shape and size. They are firmly against each other.

Determination of the hair identity to species is based on the fact that from the morphological point of view human hair and animal fur have different structures and correlation of layers.

Human hair cuticle is characterized with a complicated pattern and consists of tiny and thin cells firmly against each other, with feebly-marked jaggedness:



Fur cuticle of the majority of animals has a simple pattern. **Human hair cortex** is wide, accounting for the main mass, and medulla is narrow,

Genetic Fingerprinting:

- Theoretically one cell can be used for DNA technology
- But in practice 30 cells (min) – 70 cell (optimum) must be used in

DNA test

DNA contents:

- In one human cell 6-7 pg
- In sex human cell: 3-3,5 pg
- Effective quantity of DNA for test: 0,5 ng
- 0,5 ng of DNA - in 70 cells with nucleus – in 0,01 microliter of blood

DIAGNOSTIC KIT: CODIS - COMBINED DNA INDEX SYSTEM, USA:

CSF1PO	from 2017 year
D3S1358	D1S1656
D5S818	D2S441
D7S820	D2S1338
D8S1179	D10S1248
D13S317	D12S391
D16S539	D19S433
D18S51	D22S1045
D21S11	(n=7)
FGA	
TH01	
TPOX	
vWA	
Amel	
(n=14)	

Examination of Hair:

Hair can be found at the place of an accident, on the instrument of crime, vehicles, clothes or bodies of the victims or accused. Hair is recovered with great care, using a pair of pincers with rubber points to prevent damaging. It is impossible to prove that hair under analysis belongs to a certain person using only its morphological characteristics, however, it can be concluded whether it is similar (or different) in comparison with some specific samples. For this reason during examination the hair found at the locus of an accident is compared with the samples of for comparison.

The detected hair and recovered samples together with an investigator's order are sent to the forensic immunological branch of the bureau of forensic medical examination with view of answering the following questions:

- 1) if the object sent for examination is hair;
- 2) whether the hair belongs to a human or an animal;
- 3) if it is animal, then which species exactly;
- 4) if this is human hair, then from which part of the human body;
- 5) whether the hair fell out or was torn out;
- 6) if the hair was influenced by environmental factors;

12. Forensic medical examination and forensic medical investigation, the difference between them.

13. Documentation for forensic medical investigations.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
- 2 Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВCB «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод. рек.* К.: УкрДГРІ, 2017. 24 с.
5. Кримінальн-процесуальний Кодекс України від 2013 № № 9-10, № 11-12, № 13, ст.88 URL: № 9-10, № 11-12, № 13, ст.88
6. Ергард Н.М. Сучасна лекція. *Методичні рекомендації*. К.: УкрДГРІ, 2018. 24 с.

PRACTICAL CLASS 2

FORENSIC MEDICAL INSPECTION OF A SCENE OF INCIDENT AND CORPSE

Urgency: In cases when crimes have been committed against life and health of a person some medical or biological questions have to be solved. The doctor of any specialty can be involved in this process. Therefore, the knowledge of organizational bases of forensic medical examination and the procedural regulations of medico-legal expert activity is necessary for the doctor of any specialty.

Aim: to acquire the skills of inspection of the body on the place of death, to know legislative position of the specialist in the field of forensic medicine on the scene of the event, to be able to decide the special expert questions.

The specific aims:

- To explain procedural and organizational basis of forensic medical examination
- To know material evidences of biological origin on the scene of event

Equipment:

1. Table “Inspection of the scene of event”.
2. Criminal and criminal-procedural code of Ukraine.
3. Law “On the forensic expertise”.
4. Control tests.
5. Control Questions.

Plan of class:

1. Test-control of elementary level of student’s knowledge.
2. Discussion of the key questions.
3. Independent work of students.
4. Control of final level of student’s knowledge

Main questions, which the student should know:

- the scene of the event, inspection of the scene of event
- inspection of a dead body at the death scene
- material evidences of biological origin on the scene of event

Questions for Out-of-Class Student Self-Preparation:

1. The notion the scene of the event and the inspection of the scene.
2. Tasks of the inspection, tasks of the doctor on the scene of the event.
3. Methods and stages of the inspection.
4. An order of the inspection on the open and closed place.
5. Legislative status of the doctor during investigator's actions.
6. Tasks of the doctor on the scene of death.
7. An order of the inspection of a dead body on the death scene:
8. Revealing of material evidences of biological origin on the scene of

- Oxytocinase – up to 80-100 days

Biological Origin on Blood:

- Chistovich-Uhlenguth precipitation test
- Extract from object (consist of antigens)
- Specific serum against proteins (consist of antibodies)
- They produce precipitates if they have the same belongings (from human only, from dog only etc.)

Sex Origin is Based on Finding of Sex Chromatin in Somatic Cells:

- In female blood – X chromatin (Barrs bodies in leucocytes till 97%)
- In male blood – Y chromatin in nucleus of leucocytes till 97%

Age Origin of Blood:

- Hemoglobin F in new-born
- Hemoglobin A in adult human

In ABO system the content of A and B antigens in erythrocytes allows dividing human blood into four groups: 0 (I), A (II), B (III), AB (IV):

I	0	$\alpha\beta$ (AT, IG M)
II	A	β
III	B	α
IV	AB	-

The more antigens of different systems are detected in blood, the more proofs can be received to make a conclusion concerning individual blood identity.

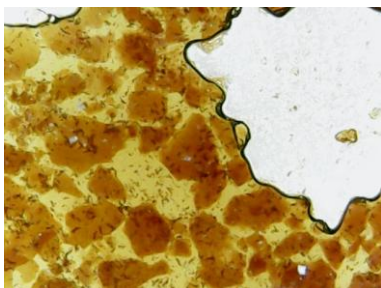
Identification of Individual Origin of Blood:

1. Blood groups – erythrocyte systems, leukocyte systems, platelet systems
2. DNA

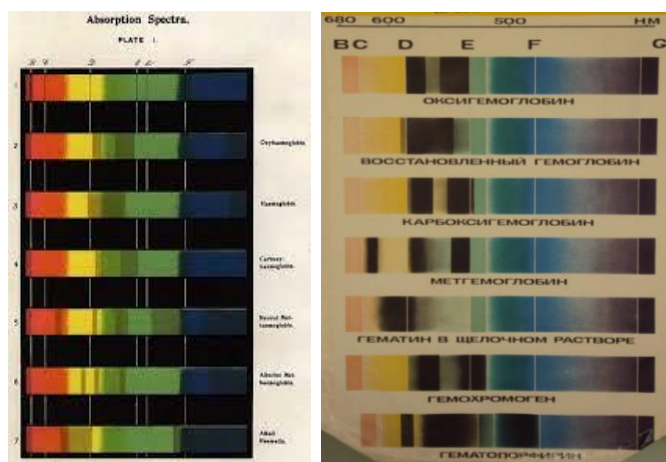


Source for DNA Technology: blood, sperm, saliva, urine, hair, teeth, bones, tissues, cells, histological slides.

– Microcrystal reactions – Teichmann's crystals and Takayama crystals:



Spectrum of Hemoglobin: Oxyhemoglobin in its yellow-green part of the spectrum has two absorption bands between Fraunhofer lines D and E as well as one absorption band in the extreme violet part of the spectrum at the border with ultraviolet area that is impossible to be seen through a usual microscope. Every hemoglobin derivative has its specific absorption bands.



When an object with a scarce amount of blood is investigated, hema-toporphyrin is determined during a micro-luminescent analysis in the form of a purple-red glow.

Time of Blood:

- Colour of spots – red – brown – green.
- UV lighting : brown colour in fresh case and orange colour in old case.
- Some specific enzymes:
- Serum cholinesterase - up to 5-6 months
- Leucine aminopeptidase – up to 50-60 days

event.

9. Classification of blood stains on the scene of the event. Peculiarities of their revealing.

10. Forensic significance of other biological evidences (hair, saliva, urine, vomit mass etc.) around the body.

Main terminology: Code, Criminal Code (CC), Criminal Procedural Code (CPC), Forensic Examination, Forensic Medical Examination, Forensic Medical Investigation, Specialist in the field of Forensic Medicine, Inspection of a Dead Body at the Death Scene the Scene of the Event, Inspection of the Scene of Event, Material Evidences of Biological Origin on the Scene of Event.

Main information

Successful disclosing of events depends on the initial (urgent) investigation actions. The examination of the crime place is one of them and inspection of a corpse on the scene of death is a component part of sin i an examination. According to art. 238 CPC of Ukraine Inspection of the corpse is carried out by the prosecutor for the observational participation of forensic medical expert or a doctor, it's impossible to get a expert at all times.

Thus, every future doctor should know his duties on the place of death perfectly. He should be able to describe (according to certain rules) a dead body on the death scene, to help the inspector with revealing of material evidences. That is why the theme is so actual and important for studying in high medical school.

The concept of the scene of the event and some legal aspects of the inspection.

Scene of event is a place, where an incident occurs, which is a subject of investigator's inspection. A notion «event» doesn't refer that a crime takes place only. Because the cases of accidents or suicides also require the investigation, the inspection of the place is necessary. In criminal situation the place is stated as scene of crime. The fact of the dead body presence at the scene of the event is considered in investigatory practice as the scene of death.

According to the Ukrainian Criminal Procedural Code (art. 237,238,239) an inspection of the scene of death is a component part of an inspection of the scene of the event and concerns urgent investigatory actions. An investigator and prosecutor who are the main figures of the inspection carry it out. The inspection is a very important juridical action and must be objective, systemic and complete.

The doctor involving in the inspection of the scene of death is not a forensic expert legally, therefore he has no expert's rights and duties. He doesn't make up forensic conclusion and he only assists the investigator. Doctor's opinions and explanations on the scene of crime have consultative

meaning and are given to the investigator orally.

Tasks of the inspection of the event scene.

During the inspection, the following tasks must be solved (by a detective):

- Does the event take place as an incident which requires investigatory inspection?
- Does a crime occur at the scene or no?
- When does the crime take place?
- How many criminals take part in the investigated event?
- What is the aim of the offenders?
- How do they arrive to the scene of a crime and leave it?
- How long do the criminals spend at the event scene?
- Which objects or traces are left by the criminals or victim on the scene? Detectives must reveal, describe, withdraw and pack all the material evidences found on the event scene etc.

The arrival of the **doctor-specialist** to the scene of death and in the process of the inspection, the **doctor has the following tasks:**

1. To check whether the victim is alive or dead. If absolute signs of death are absent the doctor must start resuscitation.
2. If a person is dead, to determine age of death (according to the absolute signs of biological death).
3. To fix in the protocol position and the pose of the corpse and the signs of their probable change.
4. To check and to describe the expert's signs of struggle or self-defense on the corpse, its outer clothes and around the body.
5. To find and to describe external injuries, to estimate time of their infliction, to establish the used instruments.
6. To reveal and to describe the objects (gag, knife, pistol, hair etc.) and material evidences of biological origin (blood stains, urine, vomit masses etc.) found on the body and around it.

Methods and stages of the inspection of the scene of a crime.

There are two basic methods of inspection of the scene of a crime: objective and subjective.

The objective method of the inspection – it is the complete and detailed examination of all the objects on the scene of the event.

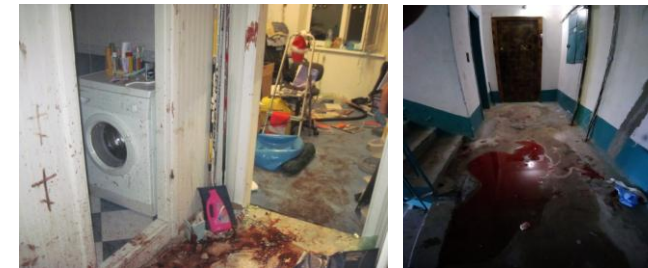
The subjective method of the inspection – is the inspection of the scene based on the visible criminal traces only (trails of blood, splashes of blood, foot imprints etc.) which are left on the scene by the criminals. The additional method used in criminology is termed as the **central method** and can be applied when the scene of event is large and many objects are present. Using this method a detective examines the separate parts of the scene one by one.

The main method of the inspection is the objective method.

4. Soakings appear when liquid blood gets on a absorbing surface, for instance, soil or clothing:



5. Pools of blood prove significant bleeding and appear, if liquid blood is accumulated on a horizontal surface that does not absorb fluid. After the blood gets dry, dryremnants remain:



How Blood Traces can be founded on Place of Incident:

1. Colour of blood traces
2. UV lighting for hidden traces
3. Chemical reactions – Hydrogen peroxide test, Chromogenic substrate test, Luminol test
4. Such tests do not prove presence of blood because of catalase enzymes are wide-spread in nature

Which questions can be Solved in FME of Blood Traces:

- Presence of blood
- Biological origin of blood
- Individual origin of blood
- Age origin of blood
- Sex origin of blood
- Time of blood

How can find Blood in FM Immunological Branchdefinitive Tests only:

- Spectrum of Hemoglobin
- Micro-luminescent of HematoPorphyrin
- Biochemical methods

2. Clothes are recovered completely
3. Is recovered with the object they are on
4. On biological object – (wood) is recovered with the control specimen
5. On snow (ice) put on gauze in watering pot and after melting gauze is soaking with blood
6. Any wet material evidence must be dried before sending to the bureau

Blood traces on Place of Incident:

1. Stains of Drops appear when blood accumulated in an injured part falls down onto a horizontal surface only due to gravity force:



2. Stains of Blood Spatter (splashes) appear when liquid blood is influenced not only by gravity force but also by additional kinetic energy, i.e. acceleration:



3. Streaks are of oblong shape and appear when liquid blood gets on a slanted surface and moves along it due to gravity force:



The process of inspection of the scene of event is divided into two stages: static and dynamic.

The static stage: the position and pose of the deceased, outer garments, their general conditions and all the objects found around are inspected. All the elements of the scene cannot be moved. Investigation fotos are taken.

The dynamic stage: it follows the static stage and is more detailed description of the general data about the body. The objects at the scene of death can be removed and replaced. The cadaveric phenomena and morphological appearances of the external injuries are fixed, postmortem interval is calculated, biological evidences are revealed.

The procedure of the inspection of the scene of death depends on three important aspects:

1. Kind of the place of event (open or closed);
2. Type of the incident (murder, suicide, accident, wanning, vehicular trauma, poisoning).
3. Presence or absence of the corpse.

In closed places the inspection starts from the entrance (state of the door, locks, windows, window panes, glasses etc.); irrelevant smell (of carbon monoxide, alcohol, others) is noted, the order or disorder on the place is checked etc. The inspection of the corpse finishes the inspection of the scene of death.

In the open area the dead body and traces around must be investigated firstly. All the data revealed during the inspection must be properly noted in the «Protocol of Inspection of the Scene of Event».

The procedure of the inspection of the body on the scene of death.

At the scene of death forensic pathologist or doctor describes the dead body according to the following order:

1. The description of a place where a dead body is found.
2. Fixing of its position in relations to immobile surrounding objects.
3. General information about the decedent (sex, age, length, constitution, skin etc.).
4. The position and pose of a deceased.
5. Description of the clothes (outer and underlaying).
6. Investigation of signs of death (at first early, then — late), estimation the age of death. If it's possible, some supravital reactions are checked.
7. Description of the injuries seen on opened parts of the corpse (their location, properties, shapes, features of the edges and ends, walls of the wounds and their bottoms, surrounding tissues etc.) for the establishment of the used traumatic instruments.
8. Examination of deathbed (the surface, on which the decedent was found)
9. Revealing, fixation, description in the protocol, withdrawal and packing of material evidences (traumatic instruments, stains of blood,

seminal spots, hair etc.).

Traces on the scene of death.

At the scene of death the following traces can be found: fingerprints, nail imprints, teeth marks, bootprints, stains of blood, saliva urine, faeces, hair, semen, tire marks etc. Forensic medical expert must promote the inspector in revealing, fixing and withdrawal of the material evidences of biological origin. Stains of blood can be mainly found at the scene of death. They are divided into: drops, splashes, streaks, soakings, flow mottles, blots, pools, washing off waters.

Methodology of the practical activity

Practical activity 1. Students examine two the scene of the event and inspect the body shown in the mock-up. They make up «Protocol of Inspection of the Scene of Event» which includes the special medicolegal aspects: results of the inspection of a dead body, degree of cadaveric changes, morphological features of external injuries, specialties of stains of blood around the corpse etc. Firstly, students write down the place where the body is found (living room, garden, street etc.) and the status of surroundings. An inspection of the corpse must be done afterwards.



Practical activity 2. Students continue their activity started before and specify a place of decedent's location regarding surrounding unmoved objects. They measure the distances of the position of the head and feet according to such objects. General data about the corpse are noted: sex, age, its length, constitution of the body, its stoutness. The position of the body must be described in details all over again. The deceased may be in standing, lying on the back or abdomen, sitting positions. The description of the pose follows then. The pose of the body means a location of the decedent's parts (head, extremities) in relation to each other. For example, the head can be inclined to the right or to the left, rotated, lowered downwards, cast away back. The upper and lower extremities can be located on the right, on the left, back, under the angle, bent or unbent. After it, the clothes are carefully examined and described: material, ordered or

- To make general information about body
- To fix the position of body
- To examine and describe the clothes, especially stains, injuries
- To find out the presence and make decryption of post mortem sings
- To indicate the time of start of they description
- To find material evidence of biological origin, to take them
- To help low investigator to compose Protocol

Stages of Inspection of Place of Incident:

Static stage – all objects untouchable to fix position of every object.

Dynamic stage – all objects can be moved and visually examined.

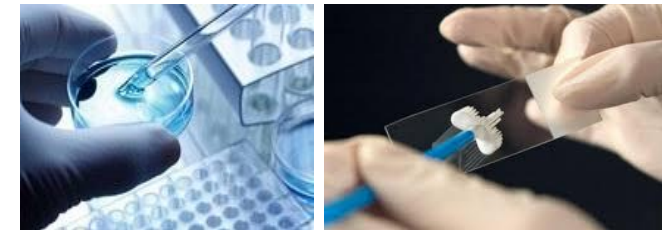
Consists of examination on corpse, finding of material evidence.

Specialist in the field of Forensic Medicine have to:

- find ME
- make description
- take like specimen for further examination
- help low investigator to compose specifical questions for solving
- sign up Protocol of inspection of place of incident

What must be send to Expertise:

1. Material Evidence
2. Protocol of inspection of place of incident
3. Protocol of taking of material evidence
4. Decree to FM Expertise from Low Investigator



Department of FM Examination of Material Evidence:

- forensic medical histological branch
- forensic medical cytological branch
- forensic medical imunological branch
- forensic medical toxicological branch
- forensic medical criminalistical branch

Material Evidence means any item, Object or substance that can prove event and meet the requirements of Procedural Law. Objects of forensic medical examination include traces of biological origin: blood, semen, saliva, sweat, parts of body tissues, hair, human organs and some secretions.

Taking of Blood for Examination:

1. By washing or scraping from the surface

PRACTICAL CLASS 11

FORENSIC MEDICAL EXAMINATION OF MATERIAL EVIDENCE

Urgency: There can be different kinds of material evidence, and for this reason they are examined by experts of different specialties. The forensic medical examination of this material evidence is carried out in forensic immunologic departments of the bureaus of forensic medical examination.

Equipment:

1. Macro- and micropreparates.
2. Tables, slides.
3. Control tests.

Plan:

1. Test-control of a material evidence.
2. Discussion of the key questions.
3. Out – of – class students self – preparation.
4. Control of final level of students knowledge.

Main questions ,which the students should know:

1. Inspection of the scene of incident
2. Objects of forensic medical examination include traces of biological origin
3. Kinds of blood traces that may be founded on a place of incident and their mechanism of formation
4. Additional laboratory researches, which, as a rule, are made at examination of material evidence

Main terminology: blood traces, DNA, material evidence, semen, hair, human organs, some secretions, blood.

Main information

Inspection of Place of Incident:

- It's a place where the corpse was founded
- Inspection of such place is stipulated
- Such place must be inspected by low investigator necessarily
- Includes reveal, detection and fixation of all objects

Who take parts in such Procedure: Specialist in the field of forensic medical expertise will solve medical and biological questions.

Main Rule for Specialist FME:

- Before inspection of place must detects possible death of the victim
- Presence of livores mortis indicates on biological death of victim
- Absence of livores mortis can be connects with the clinical death
- First medical care must be performed

Examination of Body:

- To indicate the place of body

disordered, traces of mud or blood, their shapes, sizes, directions etc. Damages of clothes are noted seriously: locations, shapes, sizes, properties of the margins and ends. The morphological appearances of cadaveric changes are investigated and described very carefully: body's temperature is measured not less than twice, degree of rigor mortis, stage of PML development, decomposition signs and others. Then the open parts of the decedent are described – the head, neck, hands, feet. The external injuries on the corpse are carefully investigated as stated above: location, shape, properties of margins and ends, bottom, traces of blood.

Practical activity 3. It is necessary to find stains of blood or another biological objects on the corpse and around it. Teeth-marks, finger-imprints, traces of saliva can be detected. They should be carefully revealed, fixed and withdrawn. The inspection of the scene of the event and the inspection of the corpse are accompanied by drawing up the scheme with the indication in details the followings: the position and pose of the body, instrument of the event, different traces on surrounding objects etc.

Discussion of theoretical questions and practical activity

At the end of the class all the questions mentioned above are discussed with active participation of all the students of the group.

Exit level of knowledge and abilities It is checked by multiple choice tests.

Control tests:

1. What is the correct definition of the scene of death? It is...

1. a place where a murder occurs
2. a place where a suicide occurs
3. a place where a dead person (body) is found
4. a place where a person is killed
5. all are correct

2. Which methods of the inspection of the scene of crime do you know?

1. Objective
2. Subjective
3. Central
4. All are correct
5. All are wrong

3. Indicate the correct order of the inspection of a dead body at the scene of death at first:

1. Surroundings-position-pose
2. Surroundings-fixation of the position-general description of the body.
3. position-pose-upper clothes
4. upper clothes-changes in the body-evidences
5. evidences-struggle marks-external injuries

4. Choose the correct statement: The inspection of the scene of death refers to:

1. a practical activity of a judge
2. a practical activity of an investigator.
3. a practical activity of a lawyer
4. a practical activity of a forensic pathologist
5. a practical activity of a doctor

5. There are such tasks of a doctor at the scene of death, except:

1. Whether there is a crime?
2. To establish if a person is alive or dead
3. To determine time since death
4. To fix the position and pose of a corpse
5. To find probable marks of struggle or self-defense

6. The following tasks during the inspection must be solved, except:

1. Whether there is a crime?
2. Who is a criminal?
3. When a crime occurs?
4. How long offenders spend at the scene of crime?
5. How they come at the scene of crime?

7. Where should the body's temperature be measured at the scene of death?

1. In axillar region
2. In a mouth
3. In a whisker
4. In a rectum
5. In iliac area

8. The doctor examines the dead driver and establishes that Cadaveric Staining completely disappears under the thumb pressure. Estimate postmortem interval.

1. Not more than 8-10 hours.
2. 14-18 hours.
3. 20-24 hours.
4. 30-36 hours.
5. More than 36 hours.

9. During the inspection of the scene of death it is established that PML does not disappear under the thumb pressure but it becomes pale. Indicate the stage of PML development.

1. The 1 phase of hypostasis
2. The 2 phase of hypostasis
3. Stage of stasis (diffusion)
4. Stage of imbibition
5. Stage of blood coagulation

10. Drowning. Medico-legal diagnostics.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
5. Mikchaylichenko B., Erhard N., Biliakov A. Macropreparation of bodily injury for practical training from forensic medicine. *Methodical recommendation*. К: УкрДГПІ, 2019. 32 p.
6. Михайличенко Б.В., Ергард Н.М. Практикум для самостійної підготовки студентів з навчальної дисципліни «Судова медицина». *Метод. рек.* К.: УкрДГПІ, 2017. 44 с.
7. Ergard N.M. Forensic Examination of a Gunshot Wound. Forensic Examination of a Mechanical Asphyxia. Forensic justification of a mechanism of trauma and the cause of death. *Methodologic materials*. К.: UkrSGRI, 2018. 36 p.
4. Ергард Н.М. Судово-медична експертиза механічної асфіксії. *Метод. розробки*. К.: УкрДГПІ, 2019. 28 с.
4. Ergard N.M. Forensic Examination of a Mechanical Asphyxia. *Methodologic materials*. К.: UkrSGRI, 2019. 20 p.
5. Ергард Н.М. Дослідження проявів стрес-реакції організму під час вмирання від механічної асфіксії через повішення. *Монографія*. К.: УкрДГПІ, 2018. 140 с.

4. Aspiration by vomit

15. Aspiration asphyxia are:

1. Hanging

2. Drowning

3. Airways obstruction by a foreign body

4. Aspiration by vomit

16. The hanging strangulation furrow is always closed?

1. Yes

2. No

17. Obstructive asphyxia due to category and kind of death can be:

1. Murder

2. Suicide

3. Accident

4. Violent death

5. Nonviolent death

18. There are signs of in vivo penetration of a foreign body into the respiratory tract:

1. Foreign body in the airways

2. Hemorrhage in the mucous membrane in the place of foreign body

3. Swelling of the mucous membrane at the site of foreign body

4. Pulmonary emphysema

5. Tardieu's spots

19. Non-lethal aspiration asphyxia is complicated by such diseases:

1. Pneumonia

2. Pulmonary thromboembolism

3. Pulmonary infarction

4. Atelectasis

5. Emphysema

20. Is it possible to return to life at any stage of mechanical asphyxia?

1. Yes

2. No

Control Questions:

1. Definition of asphyxia and its intravital stages and manifestation.

2. Stages of outcome from asphyxia.

3. General signs of asphyxia during autopsy.

4. Mechanical asphyxia and its kinds.

5. Hanging, its signs and causes of death. Particularity of ligature mark in hanging.

6. Death from ligature strangulation. Medico-legal diagnostics.

7. Pressure of the neck by hand. Medico-legal diagnostics.

8. Death from choking. Medico-legal diagnostics.

9. Obstruction of the airways. Medico-legal diagnostics.

10. Rectal temperature of a dead body during the inspection of the scene of death was 22°C (surroundings - 18°C). How many hours have elapsed since death?

1. 3 hours

2. 7 hours

3. 14 hours

4. 18 hours

5. 24 hours

Control Questions:

1. Tasks of the examination of the place of the event and tasks of the doctor on the scene of death.

2. The order of the examination of the scene of the event and the sequence of the examination of the body on the scene of death.

3. The methods and stages of the examination of the scene of the event.

4. Material evidences of biological origin on the scene of death, procedure of their revealing, description, withdrawing and packing.

5. Examine and describe a dead body on the scene of death according to the certain order.

6. Describe various biological traces and marks (of blood, hands, teeth, from action of injuring instruments, etc.) found on the scene of event.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.

2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.

2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».

3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.

4. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод. рек.* К.: УкрДГПІ, 2017. 24 с.

5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>

6. Ергард Н.М. Сучасна лекція. *Методичні рекомендації*. К.: УкрДГПІ, 2018. 24 с.

PRACTICAL CLASS 3

FORENSIC MEDICAL THANATOLOGY. EXAMINATION OF A CORPSE ON A SCENE OF DEATH. FORENSIC MEDICAL AUTOPSY

Urgency: A Doctor of any speciality can be involved into forensic medicine examination of a corpse on the scene of death. Every medical specialist has to know signs of death, procedure of forensic medical examination of a corpse on the scene, to carry out forensic medical investigation of corpse, to determine cause of non violent death in case of sudden cardiac death and write out the Medical death certificate.

Aim: teach the students the forensic medical procedure of examination of corpse on a scene of death, to demonstrate signs of death and forensic medical autopsy.

The specific aims:

- To explain procedural basis of forensic medical investigation of a corpse.
- To be able to determine the time of biological death.
- To be able to carry out the investigation of body in place where it was found.
- To carry out forensic medical investigation of a corpse, to determine the cause of non-violent death and write out medical death certificate.
- To be able to compose the Act of forensic medical investigation of corpse.

Equipment

1. Forms of control tests in forensic medical thanatology.
2. Forensic medicine equipment for autopsy.
3. Order 6 (1996), criminal-procedural code of Ukraine.
4. Corpse of a human who died suddenly.
5. Forensic medical documentation which is needed to investigate the corpse
6. Tasks.

Plan:

1. Test-control of elementary level of student's knowledge.
2. Discussion of the key questions in autopsy room.
3. Forensic medical examination of a corpse.
3. Composition of Conclusion of expert.
4. Independent work of students.
4. Control of final level of student's knowledge.

Main questions, which the Student should know:

- Function of thanatology division.
- Peculiarity of forensic medical autopsy.

2. Amussat's sign
3. Life-threatening severe trauma
4. Tardieu's spots

7. Specific signs of manual strangulation are:

1. Ligature mark is oblique-ascending
2. There are half-moon bruises around the neck
3. Ligature mark is horizontal
4. larynx's cartilages and hyoid have fracture

8. Specific signs of airways obstruction by foreign bodies are:

1. Small hemorrhages on the mucus lining of airways (trachea, bronchi)
2. Walcher's sign
3. Foreign bodies on the mucous layer of airways (trachea, bronchi)
4. Amussat's sign

9. Signs of a body which was in the water:

1. Wet clothes and hair
2. Maceration of skin
3. Diatomic plankton in lungs and in the stomach are
4. There are foam around the mouth

10. Signs of drowning are:

1. Skin's maceration
2. There are foam around the mouth
3. Water in sphenoid sinus
4. Diatom plankton in kidneys and bone marrow

11. Specific signs of chest and abdomen compression are:

1. Ecchymosis mark on upper parts of the body
2. Diatomic plankton in lungs and in the stomach
3. There are foam around the mouth
4. Carmine pulmonary edema

12. How many stages of mechanical asphyxia development has:

1. 2
2. 3
3. 5
4. 6

13. Is it true that «Mechanical Asphyxia – is a condition of severely deficient supply of oxygen to the body and a rapid accumulation of a carbon dioxide, that happens due to an external mechanical barrier for an air flow through airways»:

1. Yes
2. No

14. Obstructive mechanical asphyxia are:

1. Hanging
2. Airways obstruction by a foreign body
3. Drowning

– The tissue of **the lungs** on section is oedematous, shining, of **carmine-red colour**:



– Depending on the mechanism of trauma, other injuries may be found in various other parts of the body.

Control tests:

1. General external asphyxiation signs are:

1. Cyanotic face (blue face)
2. Livor mortis has dark-purple color
3. Right heart chambers are filled with blood
4. Subconjunctival hemorrhage

2. General internal signs of a mechanical asphyxiation are:

1. Dark-red blood is liquid
2. Subconjunctival hemorrhage
3. Right heart chambers are filled with blood
4. Internal organs are plethoric

3. Specific signs of hanging are:

1. Ligature mark is horizontal
2. Made into a full circle
3. Ligature mark is oblique-ascending
4. Rapture of an intima layer of carotid artery

4. Specific signs of ligature strangulation are:

1. Ligature mark is horizontal
2. Made into a full circle
3. Ligature mark is oblique-ascending
4. Placed on the same level or below cricoid cartilage

5. Rapture of an intima layer of carotid artery named as:

1. Walcher's sign
2. Tardieu's spots
3. Amussat's sign
4. A sign of Kreshevsky

6. Hemorrhage into nodding muscles are:

1. Walcher's sign

- Structure of «Conclusion of expert», rules of its composition.
- Technique of forensic medical investigation of corpse.
- Signs of death.
- Rules for specialist in the field of forensic medicine when the examination of corpse is carried out on a scene.
- Structure of Medical death certificate.

Questions for Out-of-Class Student Self-Preparation:

1. Main principles of investigation of a corpse on a scene of death.
2. Basic scientific data of Thanatology.
3. Early Post-Mortem Changes and their Forensic Significance
4. Late Post-Mortem Changes and their Forensic Significance
5. Estimation the time of death.
6. Cases of Medico-Legal Autopsy.
7. Method of Forensic Medicine autopsy.
8. Signs of sudden cardiac death.
9. Structure of «Conclusion of expert».
10. Structure of Medical death certificate.

Main terminology: Forensic Medical Examination of a corpse, Forensic Medical Investigation of a corpse, Medical death certificate, Forensic medicine Thanatology, Stages of dying, clinical death, biological death, "brain death", violent and non-violent death, livores mortis, rigor mortis, cooling of the body, evaporation of liquid from body, autolysis of inner organs, putrefaction, saponification, mummification, peat hardening, postmortem interval, supravital reactions.

Main information

Thanatology deals with death in all its aspects.

Particular thanatology studies the same questions but only in different kinds of death, for example, in death which occur after mechanical asphyxia, after trauma by blunt subjects, after trauma by sharp subjects.

Process of dying can be rapid or long and has such **stages of dying**:

1. Preagonal state.
2. Terminal pause.
3. Agony.
4. Clinical death.
5. Biological death.

Death Causes according to Categories can be **natural** (physiological) and **unnatural**.

The signs of death are subdivided into three groups:

I. Signs of clinical death:

1. Absence of central nervous system's function (Absence of consciousness, insensibility)
2. Cessation of respiration
3. Cessation of blood circulation

Period of clinical death lasts about 5-7 min. Main characteristics of clinical death is a possibility of reanimation of human. Scientific elaboration of clinical death leads to appearance of such kind of medical activity as reanimatology and transplantation of human tissues and inner organs.

Criteria for determining of cerebral death:

- Absence of consciousness
- Atonia of muscles
- Absence of pain, light sensitivity
- Absence of some reflexes
- Absence of independence breathing
- Cessation of brain circulation

The duration of examine of such probable donor is not less 12 hours.

This probable donor needs in instrumental monitoring of vital activity.

Reasoning behind the cadaver forensics examination:

- Violent death;
- Suspected violent death;
- Sudden death;
- Detecting the body of an unknown person or a dismembered body;
- Death, the cause of which has not been established by doctors;
- Death in ambulance during transportation;
- Death in hospital with undetermined diagnosis;
- When suspected of improper treatment that led to death.

Categories of circumstances of death can be **violent and non-violent**.

The violent death occurs due to the action of environmental factors. Manner of violence falls under one of several categories:

- suicidal
- homicidal
- accidental
- undetermined or unexplained origin.

The non-violent death is caused only by the internal reasons that are diseases. As for the manners of death, the non-violent death comprises sudden death (from known and unknown diagnosis) and physiological death.

Stages of the cadaver examination:

1. Familiarizing with supporting documents
2. Conducting an external examination of the corpse
3. Carrying out an internal examination of the corpse
4. Registration of the Medical Certificate of Death
5. Design of the Conclusion of Expert

Stages of an external examination of the corpse:

1. Examination of the corpse for the presence of injuries
2. Inspection of corpse clothing (type of clothing, style, color, material, detection of damage to clothing)

Additional medicolegal diagnostic methods used in cases of Drowning. The following laboratory tests are usually used in forensic diagnostics of drowning: 1. Chemical analysis. Chemical analysis of the blood on the right and left chambers of the heart are applied to detect electrolyte changes in both fresh and sea water drowning. Sodium, chloride and magnesium have been used. 2. Histological examination: One central and one peripheral pieces of each lobe should be taken for detailed microscopic examination. Debris and chemical contaminants present in liquid recovered from the lungs and stomach must be compared with samples of water from the place of event. 3. Diatoms. This is a class of microscopic, unicellular algae, suspended in water. Alive person only can transport diatoms with a blood circulation. Therefore they may be revealed in the brain and bones.

CHEST AND ABDOMEN COMPRESSION

The face and neck of the victim are deeply cyanosed – almost black, the eyes blood-shot, and numerous petechiae are found over scalp, face, neck, and shoulders ("ecchymosed mask") because compression of the chest displaces blood from the superior vena cava and subclavian veins into the veins and capillaries of the head and neck.

The arrow points to the only mark on this man's body after he was discovered compressed between the cab of his truck and the ground after an accident.

Signs of Chest and abdomen compression:

– The face and neck of the victim are deeply cyanosed – almost black, the eyes blood-shot, and numerous petechiae are found over scalp, face, neck, and shoulders ("**ecchymosed mask**") because compression of the chest displaces blood from the superior vena cava and subclavian veins into the veins and capillaries of the head and neck:



– The level of compression is indicated by a well-defined line of demarcation between the discoloured upper portion of body and the lower normally coloured part.

Signs of drowning:

1. **Foam** in the airways: externally a fine white froth or foam is seen exuding from the mouth and nostrils (Krushevsky's sign):



2. **Subpleural petechiae** are rare but larger ecchymoses are sometimes seen most often in the interlobar surfaces of the lower lobes (Paultauf's haemorrhages):



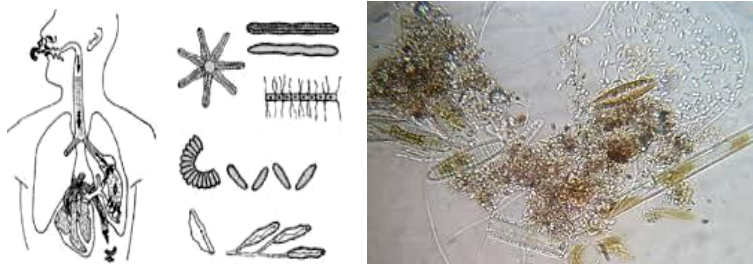
3. **Water** in stomach and intestine.

4. **Oedema** of the gallbladder's bed, of the brain.

5. **Increased transudation** of liquid in serous cavities is marked.

6. In the bladder the **large volume** of **urine** is marked.

Diatoms: most natural waters contain diatoms, a class of microscopic, unicellular algae, suspended in water:



3. Searching for reliable/distinctive signs of death

II. Early signs of death include:

1. Postmortem lividity (dead spots, livor mortis)

2. Body drying

3. Temperature decrease

4. Postmortem rigidity

5. Corpse autolysis

POSTMORTEM LIVIDITY – a clear sign of biological death, in which blood shines through the skin in the form of blue-purple spots.

Occurrence mechanism of death spots is connected to:

– loss of tone of the vascular wall;

– passive movement of blood by vessels under the influence of gravity and its concentration in the located below the body.

Stages of development of death spots:

1. **Hypostasis** - is characterized by the movement of blood through the vessels and lasts from 2 to 12 hours after the onset of death.

When you click on a cadaveric stain at this stage, it completely changes its color (pales).

Hypostasis phases:

– the first phase lasts up to 6 hours (death spot restores its color in 1-2 minutes);

– the second phase, which lasts from 6 to 12 hours (death spot restores its color in 3-5 minutes).

DEATH SPOT AFTER PRESSING ON TOP OF IT (HYPOSTASIS STAGES)



Death spot



2 sec after pressing



36 sec after pressing



54 sec after pressing

2. Stasis – is characterized by the constant release of plasma into the perivascular space and blood clotting and lasts from 12 to 48 hours after the onset of death.

When you press on a death spot on this stage, it partially changes its color (partly paler).

Stages of stasis:

- the first phase lasts from 12 to 24 hours (the death spot restores its coloration after 15-30 minutes);
- the second phase, which lasts from 24 to 48 hours (the death spot restores its coloration to 1 hour).

3. Imbibition - characterized by hemolysis of erythrocytes, diffusion of hemoglobin into the vessel wall, leaving it beyond and impregnation of the surrounding tissue and lasting more than 48 hours after the onset of death.

When you press on a death spot at this stage, it does not change its color; when you change the position of the body at this stage, the movement of death spots is not observed.

Medico-Legal Importance of livores mortis is:

- It is an absolute sign of death.
- The changes after the death help in estimating the time of death.
- It indicates the posture of the body at the time of death.
- It may indicate the moving of the body to another position some time after death.
- Sometimes its colour may indicate the cause of death.



Body drying – evaporation of moisture from the surface of the mucous membranes of the lips, cornea and conjunctiva of the eyes, scrotal skin, penis head and vaginal mucosa).

Characteristics of the eye mucosa body drying:

- corneal opacity (2-3 hours after death)
- injured parts of skin characteristics in mummification (dense, reminiscent of parchment ("Larcher spots") and becomes yellow-brown in color).

drowning are subdivided into two groups: external findings and internal findings.

Medicolegal aspects of drowning: Homicidal drowning is not uncommon because the victim's body remains concealed for some time. A suicide by drowning is fairly common especially among women. Accidental drowning is quite common and seen in drowning of children, bathers, fishermen etc.

Generally, the diagnosis of drowning tends to be one of exclusion. Other than some work with diatoms, there are no good drowning tests to prove a person drowned; the autopsy is usually negative. To make the diagnosis, the body is usually wet, or is found in water. There may be injuries from being in the water, such as tears and scrapes of the skin from impacts against boats or bridges. Occasionally, marine life, more often in salt water, may feed the skin of the face, especially around the mouth, nose, and ears. Abrasions may be found on the forehead, knees, and backs of hands from a body scraping against the bottom of the lake or pool. There may be no external signs of a trauma. Froth in the nose and mouth may be present. Wrinkling of the skin on the hands and feet is typical. Injuries to the body may occur from removing the body from the water. Internally, there may be heavy, wet lungs in those individuals who drown in salt water, but this is not always the case in fresh water drowning.

It is necessary to distinguish 4 main types of drowning in water:

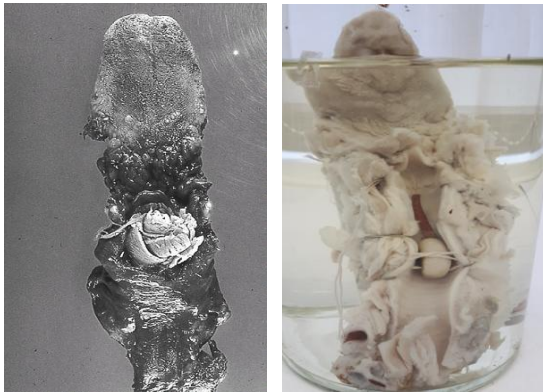
- The aspirate type
- The spastic (asphyxial) type
- The reflex (syncopal) type
- The mixed type

Signs of a body that been in the water:

1. Wet clothes.
2. Wet hair.
4. Diatomic plankton in lungs and in the stomach.
3. Skin maceration (The skin of the fingers, palms, and later the soles of the feet may be wrinkled, bleached, and sodden. It is not a sign of death from drowning but may give some indication of the time that the body has been in water):



- Infants usually regurgitate clotted milk after a meal, and this may fall into the larynx.
- Impaction of solid bodies, such as a large bolus of food, seeds, piece of meat, live fish, mud, leaves, or a set of false teeth may cause asphyxia, and etc.
- Gauze packs inserted during an operation can be inhaled and cause death.
- Children often place objects like coins, rubber balloons and etc. in their mouths, which may pass into larynx or trachea during a sudden deep inspiration.
- Choking due to regurgitation of food may occur in alcoholic intoxication (usually during a sleep).



DROWNING is a form of asphyxial death in which access of air to the lungs is prevented by submersion of the body in fluid medium (typically the entire body). The liquid is most commonly water but drowning can occur in any liquid, e.g., beer, wine, gasoline, bitumen, paint or some other chemical solution.

Typical drowning. An obstruction of air passages and lungs by inhalation of fluid is known as typical (wet) drowning. Mechanism of the development: Large quantities of fluid (water) cross the alveolar membranes → enter circulation → results in hypervolemia → RBCs swell or burst (hemolysis) → hemodilution, hypercaliemia → ventricular fibrillation → death in 4-5 min.

Atypical drowning. This indicates a condition in which there is a little or no water enters the air ways or lungs. Mechanism of the development: water enters nasopharynx or larynx → it triggers sustained laryngeal spasm → little or no water therefore enters the air passages or lungs → asphyxia → death.

Postmortem appearances of drowning. Medicolegal signs of



TEMPERATURE DECREASE (Algor mortis) – termination of the processes of heat exchange in a dead body leads to its cooling under the influence of a lower ambient temperature. There are measuring of rectal temperature and deep inner organs (liver) which are used in forensic medicine.

Temperature decrease characteristics:

- decrease in body temperature by 1-1,5°C from environment's temperature;
- the rate of cooling of the body is affected by the weather season, ambient temperature and corpse clothing.

Medical-Legal Importance of cooling of the body are:

- It is an absolute sign of death.
- It helps in estimation of time of death.
- It helps in estimation of the coise of death.

POSTMORTEM RIGIDITY (Rigor mortis) – is one of the signs of death due to chemical changes in muscle tissue. We can find after 2-3 hours after death firstly in chewing muscles on face and in other muscles of body (descending-like manner). There are usual rigor mortis and cataleptic rigor mortis which fixes the position of body in moment of death.

Postmortem rigidity characteristics:

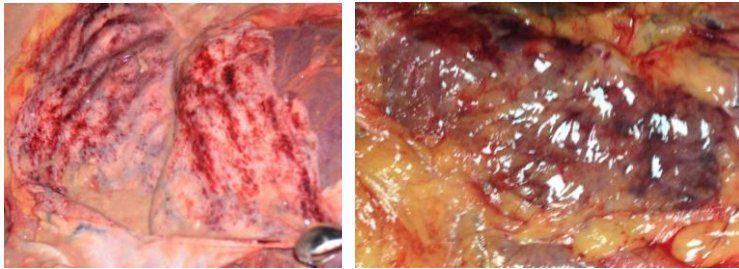
- muscle compaction, which is associated with the disappearance of adenosine triphosphoric acid (ATP) from the muscles;
- accumulation of the lactic acid muscles.



Medical-Legal Importance of rigor mortis is:

- It is an absolute sign of death.
- The dynamics of appearance helps in estimating the time and cause of death.
- It indicates the position of the body at the time of death.

CADAVER AUTOLYSIS – is a process of self-digestion of tissues caused by the action of proteolytic enzymes, without the participation of microorganisms. The internal organs under the action of enzymes are impregnated with blood plasma till it comes red. Firstly its signs appear on the surface of stomach (pic. 1), pancreas (pic. 2), intestines and in adrenal glands.

**Medico-Legal Importance of autolysis is:**

- Autolysis has negative value, simulating ante-mortem pathological processes.

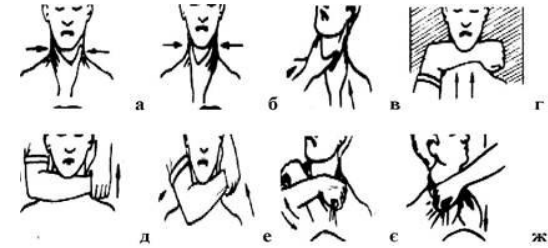
III. Late signs of biological death:

1. Decomposition (putrefaction)
2. Adipocere (saponification)
3. Mummification
4. Peat-like hardening (peat tannage)
5. Damage to the corpse by insects, animals, etc.

CORPSE DECOMPOSITION – is a complex microbiological process, with microorganisms' participation, which leads to decomposition occurrence of organic nitrogenous, mainly protein-like substances.

The first signs of decay are manifested on the 2-3-rd day, when the skin in the iliac region becomes dirty green in color.

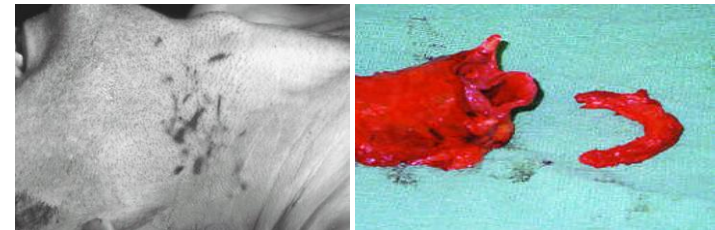
Due to the penetration of gut hydrogen sulfide and combining it with iron in blood hemoglobin and formation of iron sulfide:



The bruises are produced by the tips or the pads of the fingers. Their shape may be oval or round and of the size of the digits, but continued bleeding into the contused area usually increases the size.

The usual diagnostic signs of death due to manual strangulation are:

- Nail marks on and bruising of neck due to thumb and fingers.
- Congestion of tissues at and above the level of compression.
- Extensive bruising with or without rupture of the neck muscles.
- Fracture of the larynx, thyroid cartilage, and hyoid bone.
- Cricoid cartilage is almost exclusively fractured in throttling.
- General signs of asphyxia.
- Signs of a struggle.



The hand position of the assailant on this model suggests one method of how people are strangled. Most people die from the pressure on the blood vessels and not from collapsing the larynx and trachea.

This man was manually strangled. There are contusions on the lower part of the neck and fingernail marks (arrow) above the contusions. There were numerous soft tissue hemorrhages and petechiae of the eyes.

CHOKING is a form of asphyxia caused by an obstruction (occlusion) within the air-passages by a foreign object.

Specific signs:

- Choking commonly occurs during a meal when food is accidentally inhaled, especially when the victim is laughing or crying.
- Vomited masses may be inhaled by a person under the influence of drink or of an anaesthetic, during a fit of epilepsy, or while in a state of insensibility from other causes.

Ligature mark:

- does **not completely encircle** the neck (except for the place where the knot was located) - not uniform;
- usually seen **at high up** of the neck between the chin and larynx (above the level of thyroid cartilage);
- in partial hanging, a horizontal ligature mark may be seen.



LIGATURE STRANGULATION (suffocation by a loop) its form of mechanical asphyxia, which is caused from constriction of the neck by a ligature without suspending the body. Usually, in such cases, it is necessary to **differentiate ligature marks** at hanging and strangulation.

Signs of ligature strangulation:**1. General signs of asphyxiation****2. Specific signs:**

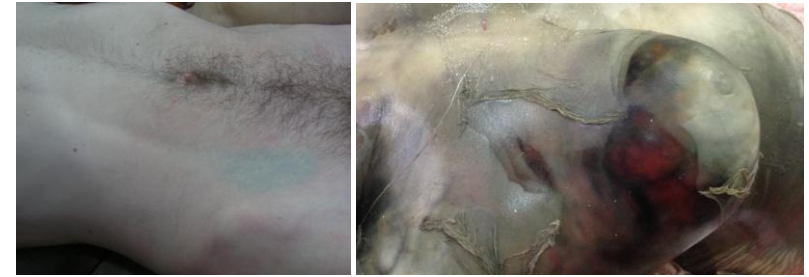
- horizontal ligature mark,
- made into a full circle,
- placed on the same level or below cricoid cartilage

Ligature mark:

- the ligature mark is situated **at the level** of thyroid cartilage or **below** (or at any level of the neck);
- it is almost **horizontal** (transverse);
- **completely encircling** the neck;
- **uniform**.



Asphyxia produced by compression of the neck by human hands is called **STRANGULATION BY HANDS**, or extremities (syn.: throttling, manual strangulation).



This process usually first happens on the abdominal wall where its colour becomes green by the first twenty four hours. Further the superficial veins become outlined in green causing so-called marbled appearance. The body begins to swell with gas formation in tissues with progressive bloating. The skin becomes blistered as epidermis separates and peels off, with large bullae. Bloody fluid is squeezed up from opening of body. There is specific smell. Gradually all tissues become liquid and skeletalization occurs.

Medical-Legal Importance of putrefaction is:

- Putrefaction leads to skeletalization of body and all individual signs of human, all injuries disappear.

ADIPOCERE (SAPONIFICATION) – saponification of the corpse, resulting in the fat is broken down into glycerol and fatty acids (oleic, palmitic and stearic). Saponification occurs if the body after death is positioned in damp surrounding without oxygen for at least 2 month and more.

Body in a state of Saponification it looks like a grainy mass grayish-white, which resembles a mixture of fat with sebaceous wax the brilliance and characteristic smell of rancid cheese:

**Medical-Legal Importance of Saponification:**

- When the process involves the face, the features are well-preserved, what helps to establish the identity.

- The cause of death can be determined, because injuries are recognized.

- The time since death can be estimated.

- It indicates the place – water or moist ground, from which the body has been taken.

MUMMIFICATION – partial or complete dehydration of the corpse, resulting in the tissue of the corpse, losing moisture, gradually exposed to drying, wrinkle, become dark brown in color, and become dense. Mummification occurs if the body after the death is positioned in a hot, well ventilated and wet surroundings. It depends on the temperature climate.

Adult body mummification under favorable conditions can occur no earlier than 6-12 months, and in children corpses – it takes less time



Medical-Legal Importance of Mummification:

- It is the same as that of Adipocere, and it also indicates the place – hot, dry area, from which the body has been taken.

PEAT TANNAGE – a kind of dehydration that occurs in the corpse when it enters the peat swamps and soils that contain humic acids while the skin of the corpse becomes darker, internal organs and muscles become smaller in volume, bones become elastic and soft:

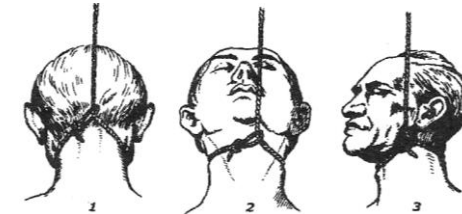


DAMAGE TO THE CORPSE BY INSECTS, ANIMALS:

Flies lay eggs in the openings of the nose, mouth, in the eye slits, in the openings of the ears. After 24-48 hours the larvae emerge from the eggs, after a week the larvae turn into pupae and after 2 weeks flies fly out of the pupae. The entire life-cycle of flies is takes around 3 weeks:

HANGING – is a type of a mechanical asphyxia, when a person is suspended by ligature around the neck getting tighter under the weight of a full body or a part of a body of a person.

The position of a ligature on the neck can be **typical** (1), when the knot is located from behind (usually in occipital area) and **atypical** - at location of knot in front (2), more often above the thyroid cartilage, or sideways, on the right or left side of the neck (3).



Mechanism of death in hanging:

- Trachea's lumen blockage by tongue's root.
- Jugular veins compression by the ligature.
- Vague nerve trunk's compression which creates a reflex and heart stops.
- Disruption of a spinal cord in neck vertebrae.

Signs of hanging:

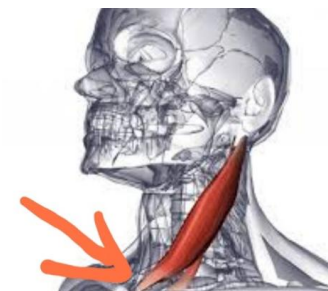
1. General signs of asphyxiation.

2. Specific signs of hanging:

- oblique-ascending ligature mark
- Rapture of an intima layer of carotid artery (**Amussat's sign**):



- Hemorrhage into nodding muscles (**Walcher's sign**):





- The tongue is protruded in most cases, and frothy and bloody mucus escapes from the mouth and nostrils.
- The eyes are prominent, the conjunctivae are congested and the pupils are dilated.
- Petechial haemorrhages are frequently seen in the conjunctivae:



- Involuntary discharge of faeces, urine and seminal fluid.

2. Internal signs:

- The blood is fluid and dark because of increased amount of CO₂.
- The large veins are full of blood.
- Venous congestion of inner organs, except the spleen.
- Overflow by blood of the right part of the heart and at the system of superior vena cava.
- Petechial haemorrhages (**Tardieu's spots**):



Forensic medical examination of a corpse on the scene

This procedure is regulated by the corresponding articles of CPC and rules of forensic medical experts.

The specialist in the field of forensic medicine (who works as forensic medical expert in a state establishment or doctor of any curative speciality) takes part in the examination of a corpse on the scene. There are some kinds of performing it scene. The main assignment for a specialist in the field of forensic medicine is to determine the fact of death only by the signs of biological death. If such signs are absent, the specialist in the field of forensic medicine must render the first medical aid when the consequences are showed – the livores mortis has occurred or body is alive.

If the body died, specialist in the field of forensic medicine has to perform the forensic medical investigation – to describe the position of the corpse, signs of biological death, clothes, injuries, damages and signs of extraneous substances on clothes.

The Specialist in the field of forensic medicine composes the medical part of the document which is called the Protocol of examination of a scene.

FORENSIC MEDICAL AUTOPSY

The reasons for forensic autopsy are:

1. Violent death or suspected violent death.
2. Sudden death with the unascertained diagnosis.
3. Death of unknown persons.
4. Death of a newborn out of a hospital.
5. Death in hospital at the unascertained diagnosis and at suspected violent death.
6. Death in hospital at the established diagnosis, but there are complaints on wrong actions of the medical staff.

Rules of Forensic Autopsy

1. Autopsy should be conducted in a mortuary and never in a private organization.
2. It should be conducted only when there is an official order from the

investigator.

3. It should be performed as soon as possible after receiving decree.

4. Forensic medical expert should first read the investigator decree carefully, and find out the apparent cause of death and obtain all the available details of the case materials.

5. The examination should be conducted in daylight as far as possible.

6. The body must be identified by the government investigator who accompanies it.

7. No unauthorized person should be present at autopsy. The government investigator (or investigating police officer) may be present.

8. In every case the autopsy must be complete, and every organ must be examined in spite of decomposition of body.

Stages of Autopsy

– Studying of circumstances of case (studying of the presented documentation).

– External Examination of corpse.

– Internal Examination of corpse.

– Collection of the biological material for the laboratory analyses.

– Drawing up of Conclusion of Expert (throughout the month).

– Write out the Medical death certificate.

Medical Death Certificate

The Medical Death Certificate is divided into two parts, the first (Part I) being the condition which led directly to the death and the second (Part II) being the other conditions, not related to Part I, but which also contributed to the death.

Part (I) is further divided into three subsections a), b) and c), which are causally related to one another, in that:

a) Immediate cause of death

b) Manifestations of pathology (trauma)

c) Cause of death (injury, illness).

In addition, code of the cause of death must be indicated too as the World Health Organization classifies in book International Classification of Disease.

The medical-legal document as a result of autopsy

The medical-legal document:

– “Conclusion of the Expert”

– “Medical Death Certificate”.

After obtaining the laboratory data, the forensic expert fills up “Conclusion of the Expert”, which consists of:

I. Introductory part (containing information on the investigator who appointed the examination; data on the forensic expert conducting the examination; data on the corpse; data on the circumstances of the death and questions of the investigator to the expert).

oxygen, retention of carbondioxide and stagnation of deoxygenated blood in veins and capillaries develop in the *expiratory dyspnea* period (up to 1 min.). A short respiratory standstill caused by depression of functions of the respiratory centre commonly occurs in the *terminal pause stage* (within 8-10 sec. to 1-2 min). The *period of terminal breath* begins when a deep depression of the respiratory centre takes place (not more than 1-3 min). The *stage of respiratory paralysis* is characterized by paralysis of the respiratory centre. Generally, approximate duration of all the period of dying in cases of mechanical asphyxia is from 3-4 min. up to 10-15 min.

Types of mechanical asphyxia:

I. Strangulation:

Closure of the air-passage by external pressure on the neck, as in:

– Hanging;

– Ligature strangulation;

– Strangulation by hands (extremities).

II. Obstruction of the external respiratory orifices and airways:

– Closure of the external respiratory orifices, as in **smothering**.

– Closure of the airways by the impaction of foreign bodies in the larynx or pharynx, as in **choking**.

– Closure of the airways by fluid, as in **drowning**.

III. External compression of the chest and/or abdomen (**compressive asphyxia**) interfering with respiratory movements.

IV. Insufficiency of oxygen in the inspired air, e.g., in enclosed places.

This type of mechanical asphyxia may relate to **environmental asphyxia**.

Morphological signs of asphyxia are formed due to pathological changes resulting from anoxia. The effect of anoxia on tissues is mainly twofold: **general effects** and **specific effects**.

1. General asphyxiation signs of a mechanical asphyxia

1. External signs

2. Internal signs

1. External signs:

– Livores mortis is well developed:



– The face is often cyanosed and purple, and sometimes swollen and oedematous:

PRACTICAL CLASS 10

FORENSIC MEDICAL EXAMINATION OF A MECHANICAL ASPHYXIA

Urgency: Every year there is an increase in number of criminal offence against human life and health which is caused in an increase of crime rates in Ukraine. Worsening of criminogenic environment in Ukraine demands to use all the power of its legislation in the fight against crime. A big toll in this process not only lays on law enforcement agencies but also on forensic experts. A number of forensic investigation conducted increases each year and core factors that stimulate it are: legislative awareness of population and active layers community. As a result of a forensic examination issues like presence of physical injury, their location, mechanism and type of injury, severity and time of onset to be resolved, as well as to state the cause of death etc.

Equipment:

1. Macro- and micropreparates.
2. Tables, slides.
3. Control tests.

Plan:

1. Control test of a Mechanical Asphyxia.
2. Discussion of the key questions.
3. Out of class students self preparation.
4. Control of final level of students knowledge.

Main questions ,which the students should know:

1. Forensic medical diagnosis of mechanical asphyxia
2. General asphyctic signs and specific signs
3. Additional investigation methods

Main terminology: mechanical asphyxia, hanging, ligature mark, ligature strangulation, manual strangulation, choking, drowning, chest and abdomen compression.

Main information

Mechanical Asphyxia – is a condition of severely deficient supply of oxygen to the body and a rapid accumulation of a carbon dioxide, that happens due to an external mechanical barrier for an air flow through airways. In intravital development of mechanical asphyxia there are 2 periods lasting 5-7 minutes.

Stages of mechanical asphyxia development:

In the *preasphyxial period* a delay of breath only occurs. It persists in a victim within about 30-40 sec. The stage of *inspiratory dyspnea* is characterized by signs of physiological reactions to the decreasing oxygen saturation of the blood. Duration of this stage is about 1 min. Lack of

II. The main part (data on external and internal examination of a corpse, data on laboratory tests).

III. Final part (containing forensic diagnosis data and expert's answers to the investigator's questions).

After the autopsy is completed, the forensic expert **fills up “Medical death certificate»:**

I. Main cause of death (injury or illness of which death occurred)

II. Other conditions:

- **Competing diseases (damage that could also lead to death)**
- **Comorbidity** (they are non-lethal, but developed at the same time and together might lead to death)
- **Pre-existing conditions/diseases** (it is not associated with the underlying disease, which was the cause of death but may exacerbate its course)

THE SCHEME OF FORENSIC AUTOPSY:

I. The data stated in the title:

- Time (date and hour) of examination.
- The conditions important for expert examination (light, temperature of air, etc.).
- The reason of autopsy (decree, court's decision).
- Place of examination.
- Name of the expert, his post, education, speciality and the experience of work, qualifying category, academic degree.
- Name of dead person and his age (year of birth). The persons, who are present on examination.

The data stated on the subsequent sheets of "Expert conclusion":

The list of the questions to examination. Circumstances of case (preliminary data), which include:

- place of detection of a corpse;
- position (pose) of a corpse;
- condition of clothes;
- character of post-mortem changes;
- data about damages on a corpse;
- character of material evidences;
- conditions of approach of death (from documents).

II. Research Part:

External examination (*see also above*):

1. The description of clothes: kind, colour, quality, a degree of deterioration, contents of pockets, traces of extraneous substances (dust, dirt, stains) and their location, form, sizes; damages and location, character, sizes, and other features.

2. Sex, age, length of the body (in centimetres), constitution, degree of fat.

3. Common colour of an integument (deathly pale, pale-grey, swarthy, etc.), its elasticity, maceration, "goose skin", dirtying of the skin (blood stains, traces of vomit masses, traces of sand, ground, etc.).

4. Temperature of corpse at palpation (warm, tepid, cold) in various areas of the body – opened and covered by clothes, on the sites of a body adjoining with each other (axillary's areas, internal surface of thighs). Temperature in rectum.

5. Post-mortem Lividity - location, prevalence (poured, in the form of separate stains), colour. Change of post-mortem Lividity at pressing and time of its restoration.

6. Rigor mortis.

7. Putrefactive changes (if they are available).

8. Hair of the Head - length, colour, condition.

9. Face - puffy, colour of skin, haemorrhages.

10. Eyes - closed, opened; colour, haemorrhages; corneas - transparent, muddy; pupils – the form and diameter (in centimetres); presence of spots.

11. Condition of Bones of face skeleton at palpation. Contents of nasal ducts.

12. Mouth - opened; presence of foams at an orifice of the mouth, condition and colour of lips and a mucous membrane.

13. Condition of Teeth – denture (teeth are described under the stomatological scheme). Position of the tongue concerning the teeth. Condition and colour of mucous membrane of lips and gums. Damages of teeth, gums, presence or absence of haemorrhages.

14. Ears – condition of auricles (colour, damages), external acoustic ducts (dirtying, discharges, etc.).

15. Neck – long, short, damages (scatches, bruises, wounds, etc.).

16. Thorax - form (cylindrical, conic, barrel [emphysematous] chest), symmetry of its structure, integrity of ribs at palpation.

17. Mammary Glands – size, form, consistence; colour and condition of nipples; nipple discharge – colour, character, amount.

18. Abdomen – form (equal, involved), colour of the skin of abdomen, hernia of white line, umbilical, inguinal, its sizes, features.

19. External Genitals – degree and type of hair distribution, correctness of development of external genitals, damages. At corpses of men – discharge of sperm and urine from urethra, parchment spots on the skin of scrotum; at corpses of women - discharge from vagina, colour of mucous membrane of vagina, condition of hymen, urethra.

20. Anus – gaping, closeness, condition of surrounding skin (clean or dirty), haemorrhoid (if are available).

21. Back – condition of an integument, curvature of backbone, integrity of bones at palpation.

22. Upper and Lower Extremities – correctness of development,

6. Close shot and it sings.

7. Distant shot and it signs.

8. Differences between entrance and exit wounds.

9. Wound canal in tissue and bone.

10. Injuries causes hunting weapon. Parts of shotgun cartridge.

11. Laboratorial methods which used for research of a sign of gunshot injury.

12. Diagnostics criteria of a gunshot, which was inflicted by own hand (suicide).

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.

2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.

3. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».

4. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.

5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>

6. Mikchaylichenko B., Erhard N., Biliakov A. Macroreparation of bodily injury for practical training from forensic medicine. *Methodical recommendation*. К: УкрДГПІ, 2019. 32 p.

7. Михайличенко Б.В., Ергард Н.М. Практикум для самостійної підготовки студентів з навчальної дисципліни «Судова медицина». *Метод. рек.* К.: УкрДГПІ, 2017. 44 с.

8. Ergard N.M. Forensic Examination of a Gunshot Wound. Forensic Examination of a Mechanical Asphyxia. Forensic justification of a mechanism of trauma and the cause of death. *Methodologic materials*. К.: UkrSGRI, 2018. 36 p.

9. Ергард Н.М. Судово-медична експертиза вогнепальної травми. *Метод. розробки*. К.: УкрДГПІ, 2019. 24 с.

10. Ergard N.M. Forensic Examination of a Gunshot Wound. *Methodologic materials*. К.: UkrSGRI, 2019. 16 p.

5. Red (pink) color of tissues in wound canal

17. Red (pink) color of tissues in wound canal is a result of:

1. Because of red color of blood
2. Presence of accompanying component of shot
3. Carbon monoxide (CO) due to burning of powder in lack of oxygen
4. Oxygenation of damaged tissues in wound canal
5. Hermetic contact with barrel

18. Close range from weapon is characterized by following signs:

1. Presence of metallization like an accompanying component of shot around the entrance wound
2. Tissue defect (minus-tissue)
3. Shot from 5 mm till 2 meters generally
4. Presence of soot like an accompanying component of shot around the entrance wound
5. Presence of particles of gunpowder like an accompanying component of shot around the entrance wound

19. The “schantz-mark” is a result of contact between muzzle and skin

1. Yes
2. No

20. Bullet exit wound is characterized by following signs:

1. Defect of “minus-tissue” may be present but less than in entrance wound
2. Irregular shape
3. Absence of an accompanying component of shot around the wound
4. Presence of “schantz-mark”
5. Absence of defect of “minus-tissue”

21. Suicide with the use of firearms is characterized by following signs:

1. One shot only
2. Contact range of shot
3. Shot into mouth, temporal area of head, heart
4. Direction of shot and wound canal correspond to comfortable position of the arm
5. Presence of an accompanying component of shot on arm that kept the firearm

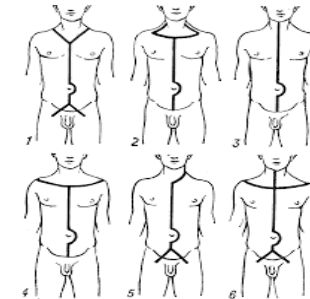
Control Questions:

1. Definition of gunshot injuries. Classification of firearms. Parts of rifled weapon cartridge.
2. Mechanism of a shot. Accompanying components of a shot.
3. Kinds of action of a bullet.
4. Estimation of the distances of a shot.
5. Contact shot and its signs.

integrity of bones, the form of fingers of hands, nails, changes of the skin, etc.

In case of detection of injuries it is necessary to describe under the standard scheme (see above). The description of injuries can be made on a course of the description of body parts or allocated in a separate subitem in the end of "External examination".

Internal examination:



1. Soft tissues of the Head – colour, haemorrhages (localization, sizes and colour).

2. Bones of the Skull – its integrity, thickness of bones (frontal, temporal, occipital), an index of a skull (the cross-section and longitudinal sizes), and fractures of bones.

3. Dura mater – its integrity, colour, degree of filling of vessels, contents and a degree of blood filling of venous sinus of dura mater, condition of blood in it (liquid, clots):



4. Soft Cerebral Membranes – transparency, humidity, shining, thickness, degree of blood filling of the vessels, haemorrhages – localization, character.

5. Brain – weight, symmetry of hemispheres, condition of convolutions and sulci, consistence of brain tissue. Condition of cerebral circulation (vessels of the brain basis). Contents of brain ventricles, colour of liquid, its amount, vascular textures, blood filling and colour. A kind of white and grey matter on section, figure of a structure, clearness of border between white and grey matter, shine, humidity, blood drops and strips, its amount. Condition of IV ventricle, cerebellum, medulla. Focal changes of brain – softening, tumours, haemorrhages (localization, sizes, type, and colour).



6. Hypophysis – size, density, colour.
7. Sinuses of Sphenoid, Frontal Bones, contents of cavities.
8. Presence or absence of haemorrhages in soft tissues of the Neck, Chest and Abdomen; blood filling of venous vessels of the Neck.
9. The thickness of fatty tissue in the areas of Chest and Abdomen, its colour.
10. Muscles, degree of development, colour, shining.
11. Level of standing of the Diaphragm.
12. Location of internal organs (normal, abnormal).
13. Contents of Pleural cavities – pleural adhesions, congestion of a liquid, its volume and character.
14. Pericardium – contents (volume and colour of liquid) and character.
15. Condition of Peritoneum – humidity, colour, shining, colour of

5. Shot till 1 m

11. Main signs of shot from distant range are following:

1. Tissue defect (minus-tissue) may be manifested if the bullet action is penetrative
2. Absence of accompanies component of shot around the entrance wound
3. Presence of tissue defect (minus-tissue) in all cases
4. Rim of abrasion around the entrance wound
5. Tissue defect (minus-tissue) can not be present if the bullet action is wedge-shaped

12. Generally the distant range of shot is:

1. Over 1 meter
2. Over 5 mm
3. Over 2 meters
4. From 1 till 2 meters
5. About 2 meters

13. Rim of abrasion around the entrance wound is a result of such contact between bullet and skin as:

1. Blow
2. Cutting
3. Friction
4. Pressing
5. Stretching

14. Contaminating ring around the entrance wound in case on shot from distant shot is a result of:

1. Blow of bullet on skin
2. Accumulation of accompanies component of shot around the entrance wound
3. Contact between bullet and skin during passing of bullet
4. “Schantz-mark”
5. Contact between barrel and skin

15. Contact range of shot can be like:

1. Partially at an acute angle
2. Non-hermetic if the distance between barrel and skin is more 5 mm
3. Yermetic
4. Non-hermetic if the distance between barrel and skin is not more 5 mm
5. Non hermetic if the gun point located about 5 mm before skin

16. Contact range of shot has following sings:

1. Presence of accompanies component of shot in wound canal
2. Cross-shaped injury
3. Presence of “schantz-mark”
4. Absence of accompanies component of shot in wound canal

4. According to the length of barrel the firearms can be following:

1. Middle-barreled (length is about 200-500 mm)
2. Short-barreled (length is about up to 500 mm)
3. Short-barreled (length is about up to 200 mm)
4. Long-barreled (length is 200-500 mm)
5. Long-barreled (length is more 500 mm)

5. Firearms can have different caliber:

1. Large-caliber (over 9 mm)
2. Middle-caliber (4-9 mm)
3. Small-caliber (less 9 mm)
4. Middle-caliber (7-9 mm)
5. Small-caliber (4-6 mm)

6. Firearms cartridge consists of:

1. Firearms case
2. Capsule
3. Cartridge case
4. Gunpowder
5. Bullet

7. Depending of kinetic energy the bullet can demonstrates different type of action:

1. Tangent
2. Explosive
3. Contusion
4. Penetrative
5. Wedge-shaped

8. Hydrodynamic action of bullet is:

1. Ruptures of some inner organs that have rich in fluid
2. Contusion of surrounding tissues
3. Ruptures of some inner organs –that do not have liquid content
4. Ruptures of all inner organs
5. Ruptures of inner organs that have liquid content only

9. Such morphological signs indicate on a gunshot wound origin:

1. Presence of accompanies component of shot around the entrance wound
2. Presence of weapon near the body
3. Tissue defect (minus-tissue)
4. Presence the bullet near the body
5. Rim of abrasion around the entrance wound

10. Shot from weapon can be produced from such following ranges:

1. Shot from close range
2. Shot from 2 m
3. Shot from contact range
4. Shot from distant range

serous membranes of Intestine; contents of abdominal cavity (volume, colour, transparency); condition of Intestines (swelling, collapse). Condition of ventral Mesentery, Lymph Nodes, vessels of ventral Mesentery, necrosis and haemorrhages in Mesentery. Condition of Appendix, Mesocolon.

16. Tongue – colour of the mucous membrane; edge, tip, prints of teeth (bites), patch, lingual papilla, haemorrhages in muscles (on sections).

17. The sizes of Tonsils, its surface, density, colour on section.

18. Condition of entrance in Larynx and Oesophagus (free, not free), condition of the mucous membrane of Pharynx.

19. Hyoid Bone and Laryngeal Cartilages – integrity, fractures and haemorrhages.

20. Thyroid Gland – size of each lobe (three sizes), density, colour, condition of surface.

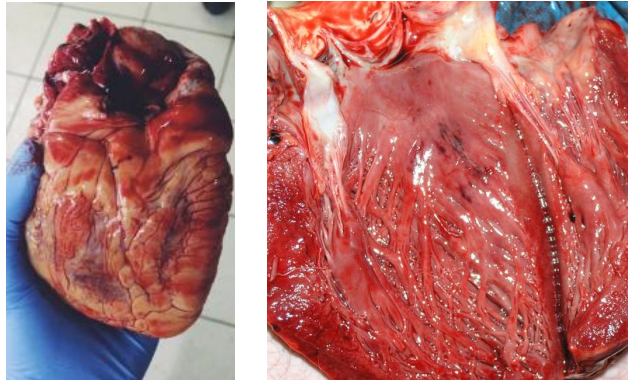
21. Thymus – the sizes, weight, consistence, colour on section.

22. Contents of Respiratory Tracts (colour, viscosity, and foam), colour of a mucous membrane of the Throat, Trachea and Bronchi, presence of haemorrhages, shining.

23. Paratracheal and Bronchial Lymph Nodes – size, density, colour.

24. Lungs – colour of the surface; condition of the pleura – transparency, smoothness, thickenings, haemorrhages under the pleura (Tardieu spots, etc.); air filling of tissues at palpation, crunch at pressing. Colour of Lungs on section, size and character of dense foci. Volume and character of blood and liquid flowing down from surface of sections (foamy liquid, blood, mucus, pus, contents of stomach, etc.), weight of Lungs.

25. Heart – sizes, cross-section and longitudinal circles, form, fat on surface and it thickness. Density of muscles of Heart at palpation. Haemorrhages under Epicardium (Tardieu spots, etc.). Contents of Cardiac Cavities (liquid blood, blood clots, thrombi etc.), condition of all Cardiac Valves and Large Vessels (transparency, thickenings, colour); Papillary Muscles; Tendinous Cords. Character of Endocardium (transparency, smoothness, presence of haemorrhages – Minakov's spots, etc.). Thickness of right and left Ventricles. Condition of Cardiac Muscle on section – colour, shine, presence of connective tissue and scars. Condition of Coronal Arteries (narrowed, dilated), presence or absence of atherosclerotic plaques in internal membrane of vessels; area of lesions; degree of narrowing of vessels (in percentage). Weight of Heart, weight of right and left Ventricles, Ventricular Index.



26. Aorta – colour and smoothness of internal membrane, circle of Aorta above Valves, character of atherosclerotic plaques.

27. Spleen – sizes, weight, character of capsule (wrinkled, strained, thick); consistence at palpation, colour on section, character and volume of a scrape.

28. Adrenal Glands – sizes, colour of cortical and medullar substance on section, clearness of its borders.

29. Kidneys – sizes, weight (right and left separately), capsule is hardly or easy removed from the Kidneys, surface of Kidneys (smooth, granular, lobular), its colour and character on section, character of border between cortical and medullar substance, its thickness and colour. Colour of mucous membrane of Pelvis, its contents.

30. Ureteral patency, width of its lumen.

31. Degree of filling of the Urinary Bladder, volume of urine (in millilitres), colour, transparency, colour of the mucous membrane, haemorrhages.

32. Prostate Gland – size, density, colour, surface on section.

33. Testicles – size, consistence, colour on section, condition and colour of membranes.

Condition and colour of the mucous membrane of Vagina, damages.

34. Uterus – sizes (length, width and thickness of Uteri Body), contents of Uterus cavity, colour of the mucous membrane of the Body and Cervix of the Uterus.

35. Ovaries – size, form, colour on section, condition of follicular and stromal compartment.

36. Oesophagus – contents, colour, condition of mucous membrane.

37. Stomach – contents, colour, condition of mucous membrane.

38. Gallbladder – size, condition of Biliary Ways, volume of bile, its colour and density, condition of the mucous membrane.

39. Liver – 4 data on the size (length, width of the right and left lobes,

Direction of the bullet's flight: the direction of the track depends upon the posture of the body at the time of firing. The direction of fire may be determined from the position of entrance and exit wounds and the track, bearing in mind the possibility of deflection of the bullet and the different relationships of the parts of the victim in movement.

If the bullet strikes the body at the right angle, the abrasion collar is circular and uniform because the scraping by the bullet is equal to all the sides of the wound. If a shell enters the body at an angle, the wound itself is round, but the marginal abrasion is oval or elliptical, due to increased width on the side of the entry according to the bullet moving across a wider surface of the skin on that side. Therefore, the direction of the bullet is from the wide to the narrow side. When the bullet enters the body from an oblique angle, one edge of the wound is shelved or undercut, which indicates the direction from which the bullet entered.

At examination of injuries of a body and clothes of victims the following methods of research are used:

- photographic methods
- research in infra-red and ultra-violet rays
- X-ray examination
- stereomicroscopy
- application of colour prints for revealing metals of a shot
- histological methods
- micro-chemical analysis and other chemical-analytical methods

Control tests:

1. Gun shot injury is injury on human body due to bullet or part of bullet that receives energy to moving from chemical energy of gunpowder.

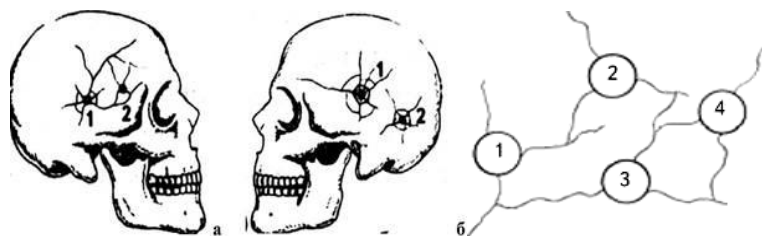
1. Yes
2. No

2. According to purposes of using the firearms can be following:

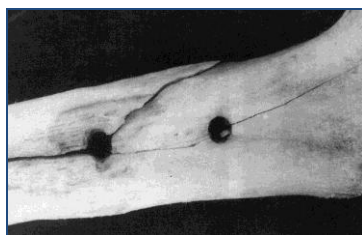
1. Homemade
2. Sport (sport pistols)
3. Battle (pistols, revolvers, carbines ect.)
4. Special (signal or start pistols)
5. Hunting (hunting carbines)

3. According to the peculiarities of barrel canal the firearms can be following:

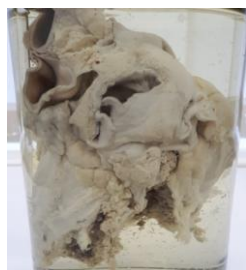
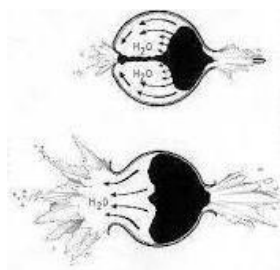
1. Battle
2. Factory-made
3. Rifled
4. Homemade
5. Smooth-bore



At damage of the **tubular bones** the bullet forms the perforated-splintered fracture. On entrance of a bullet the spherical or oval aperture with radial fractures is formed. On the opposite party there is a big zone of fragmentation destruction: fracture looks like plural, mainly longitudinal cracks, which are crossed with short, cross cracks.



The bullet reaching the organ containing fluid (heart in diastole stage, urinary bladder filled with urine, stomach with liquid content) or the organ rich in fluid (brain, liver) reveals its **hydrodynamic action** resulting in ruptures.



height), character of edges, surface (smooth, rough), capsule, colour of surface and on section, weight of Liver.

40. Pancreas – size (length, width, thicknesses), colour, structure, density, weight.

41. Small Intestine – contents, colour, condition of mucous membrane.

42. Large Intestine – contents, colour, condition of mucous membrane.

43. Bones of the Skeleton.

44. Presence of smell from cavities and organs of the corpse.

45. The list of organs, referring to laboratory examination (toxicological, histological, etc.).

46. The list of organs or their parts, which were withdrawn for scientific, educational, medical and other purposes.

47. The list of Material Evidences revealed during examination.

48. The Signature of Forensic Medical Expert

III. Results of Laboratory Researches.

IV. Forensic Medical Diagnosis:

I. Basic Injury, or Disease with the list of the attributes confirming the given diagnosis.

II. Complications of the Basic Injury, or Disease causally connected with approach of death.

III. Accompanying changes – Injuries and Diseases, which do not pertain to causes of death.

No	Forensic diagnosis	«Medical Death Certificate»
1.	Chronic coronary heart disease. Scar of anterior-lateral wall of the left ventricle. Fresh transmural myocardial infarction. The plethora of internal organs. Blood clots and liquid blood in the cavities of the heart.	I. a) Acute heart failure 6) Fresh myocardial infarction b) Chronic coronary heart disease
2.	Mechanical asphyxia from compression of neck organs by a loop. Horizontal strangulation furrow; liquid dark red blood in the cavity of the heart and main vessels; plethora of the lungs, liver, kidneys, petechial hemorrhages under the pleura and into the lung tissue.	I. a) Mechanical asphyxia due to compression of the neck organs by a loop

V. Conclusion:

The conclusion as to the cause of death must be given, based on the post-mortem findings. This is followed by the signature and qualifications of the Forensic medical expert. Conclusions are made according to the questions of investigating agencies.

Forensic Medical Expert _____ **(Signature)**

Appendix (photos, schemes, etc.).

After the practical class the students compose the Expert conclusion of corpse.

Control tests:

1. Early absolute signs of biological death are:

1. rigor mortis
2. cadaveric drying
3. livores mortis
4. putrefaction
5. cooling of body

2. Livores mortis are a result of:

1. postmortem clots formation
2. postmortem hypercoagulation of blood
3. postmortem accumulation of blood in bottom places of a body
4. cooling of the body
5. postmortem action of surroundings

3. In development of livores mortis consistently distinguish stages as follow:

1. initial
2. hypostasis
3. finally
4. stasis
5. imbibition

4. The hypostasis is characterized by the following peculiarities:

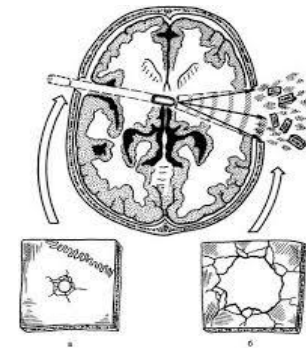
1. lasts only first hours
2. livores mortis have violet colour
3. blood in vessels is liquid
4. lasts first 12 hours
5. livores mortis can move if a position of a body was changed

5. At hypostasis after pressing livores mortis become:

1. disappear
2. painted in red color
3. reappear in 1-2 minutes again
4. turn pale on periphery
5. reappear in 3-5 minutes again

Firearm injuries of bones. Morphological manifestations of such injuries depend on type of damaged bones. Thus, in *flat bones* (skull, sternum, pelvis, scapula) the wound of entrance shows a punched-in (clean) hole in the outer table. The inner table is unsupported and a cone-shaped piece of bone is detached forming a crater that is larger than the hole on the outer table, and shows sloping surface. Fissured fractures often radiate from the defect. Generally, a perforating fracture is formed and a bullet track looks like a truncated cone dilating aside of a bullet's flight. In *tubular bones* the missile punches a hole and a perforated-splintered fracture is formed. Commonly, the round or oval aperture with numerous radial fractures can be revealed on the entrance of a bullet. The large zone of fragmentation and destruction can be seen on the opposite side.

For **flat bones** (skull, scapula, etc.) the most typical is a perforating fracture. Wound canal in such bones looks like funnel or the truncated cone dilating aside of flight of a bullet.



The fissures, which were produced by the next shot, do not cross those ones, which were produced by the previous shot (**Shaviny's phenomenon**).

Entry (entrance) wound: a typical fire injury is composed of an entry wound (hole), wound canal and an exit wound (hole). Medicolegally, it must be perfectly determined where the projectile enters the body and where it comes out. It may establish on the base of morphological features of entry and exit wounds.

Thus, the following characteristics are typical for entrance fire wounds: Their *shape* is usually round or oval which depends on the angle of discharge (right or acute). *Size* is commonly slightly smaller than the diameter of the missile due to elasticity of the skin. One of the most important features of an entry wound is «*tissue defect*» («*minus-tissue*») that was firstly described by famous Russian surgeon Nikolai Pirogov in 1849. This is due to own penetrating action, a bullet punches a hole in the skin and drives away inside the wound canal some pieces of punched tissues. That's why it is impossible to pull together margins of the wound without formation of the skin pleats. Very commonly, there are 4 so-called «rims» (rings, collars) in entrance wounds. They are «*abrasion rim*», «*desiccation rim*», «*dirt rim*» and «*metallization rim*».

An «*abrasion rim*» is seen around the hole and it is caused by the friction of the missile when it indents the skin during penetration. It is so narrow, not more than 1-2 mm. in width. A «*desiccation rim*» can be found upon the margins of the wound since 12-24 hours after death as a dark yellowish collar. When a bullet penetrates the skin a dirt effect of the projectile takes place and a «*dirt rim*» is formed upon the edges too. It can be revealed as a black or dark thin ring in an entry hole. The friction and heating effect of the missile are accompanied by the formation of a «*metallization rim*» too. The other diagnostic signs of entry wounds are: *regular, circular and inverted margins*, additional factors of a shot (*tattooing, burning, blackening*) may be seen, they are *smaller than exit wounds*.

Exit wounds: they vary in shape and size. Exit wounds may be stellate, cruciate, linear. They are bigger than entry wounds. The edges are irregular, serrated and everted because the missile forces its way out. Abrasion, desiccation, dirt and metallization rims are usually absent. All accompanying components of a shot are absent too. Clothing is turned out.



6. The second stage in development of livores mortis is characterized by such attributes:

1. appear in 12 hours after death
2. there is a diffusion of plasma in blood vessels
3. blood is coagulated in vessels
4. at pressing the colour of livores mortis become light in comparison with surrounding area
5. last 12-48 hours

7. At pressing on a livores mortis in a stasis it is characterized by such attributes:

1. colouring is reappear in 10-15 minutes only
2. disappear completely
3. turn pale
4. does not disappear
5. colouring is restored in 30-60 minutes

8. At change of position of a body of a corpse in a stage stasis cadaveric a stain:

1. remain on former places
2. paint in red color
3. move on new underlying sites of a body
4. do not change the colouring
5. turn pale

9. At change of position of a body of a corpse in a stage hypostasis cadaveric a stain:

1. move on new underlying sites of a body
2. do not change the colouring
3. disappear from former places
4. turn pale
5. paint in bright red color

10. At change of position of a body of a corpse in a stage of imbibition cadaveric a stain:

1. remain on former places
2. disappear
3. move on new places
4. turn pale
5. become brightly red color

11. The third stage of development of cadaveric spots is characterized by the following attributes:

1. come in 48 hours after death
2. comes in 16-24 hours after death
3. the 3-liquid part of blood impregnates fabrics
4. at pressing colouring of a stain turns pale
5. at pressing colouring of a stain does not change

12. Terms of occurrence and development of cadaveric spots depend from

1. character of death
2. time of day
3. duration of dying
4. damages epidermis
5. ambient temperatures

13. Value of cadaveric spots will be, that they are:

1. an early absolute attribute of death
2. a parameter of time of approach of death
3. specify the fact of approach of death
4. specify position of a corpse after death
5. allow to assume the possible(probable) reason of death

14. If a leather(skin) in the field of a cadaveric stain to cut, it is possible to find out:

1. liquid blood
2. convolutions of blood
3. impregnation blood of fabrics
4. absence of blood
5. clot of blood

15. Cadaveric rigor mortis develops in the following order:

1. muscles of finitenesses of the left half of trunk
2. chewing muscles
3. muscles of finitenesses of the right half of trunk
4. muscles of the top finiteness
5. muscles of the bottom finiteness

16. Most frequently cadaveric rigor mortis on the average begins after approach of death:

1. in 12-24 hours
2. in 6-16 hours
3. in 1-2 hours
4. in 3-5 days
5. in 2-3 days

17. Cadaveric rigor mortis develops in the order from below - upwards

1. Yes
2. No

18. Development cadaveric rigor mortis depends on such factors as:

1. reason of death
2. constitution
3. environment
4. feed of the person

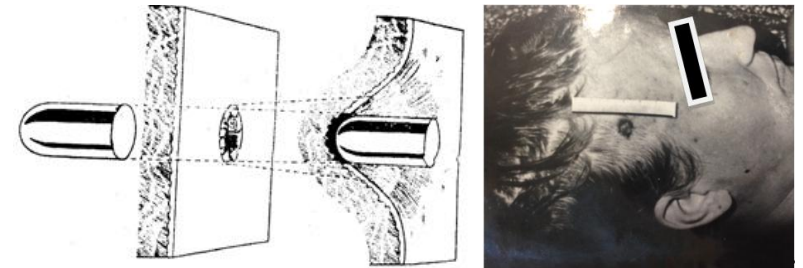
Signs of a Contact close (Near-contact wound):

- Presence of additional signs of a shot around an entrance wound
- Location of additional signs of a gunshot alongside the wound tract

Scheme of the action accompanying components of a shot:

- a – zone of action of powder gases (about 15-20 cm from muzzle);
- b – zone of action of soot black (about 20-40 cm from muzzle);
- c – zone of action of unburnt and partially burnt powder grains (to 1m).

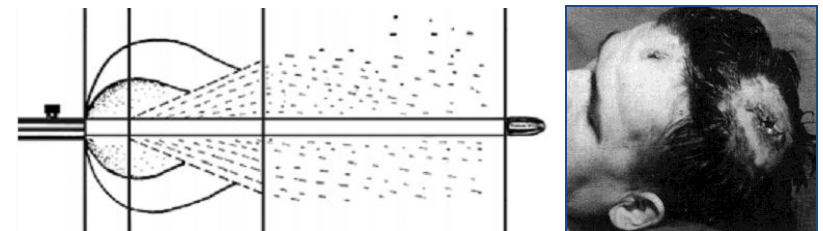
DISTANT (LONG) SHOT: the entrance wound is smaller than the bullet due to the elasticity of the skin, circular, and margins are inverted. There is no burning, no blackening and no tattooing. Defect of a tissue, abraded collar and grease or dirt collar are present. At a remote distance formation of firearm damage is caused **only by action of the bullet** due to what such distance of a shot is still named "a shot within action of accompanying components". For the hand battle weapon such distance will already begin outside 1 meter. Concrete definition of a distance of a shot in such cases is impossible.



Signs of a Long-range shot:

- Presence of dust tattooing around the entrance wound.
- Absence of additional signs of a shot around entrance wound and inside the wound tract.

The most important singsof the bullet **entrance wound** is «minus-tissue» defect with sufficient kinetic energy. Bullet **exit wound** is formed by the bullet in the moment it leaves the body. The mechanism of its formation is different from the bullet entrance wound one, and it is connected with the fact that the bullet passing through the tissues loses its energy.



follow the projectile immediately during discharge. They are called in forensic ballistics as accompanying components (additional factors) of a shot.

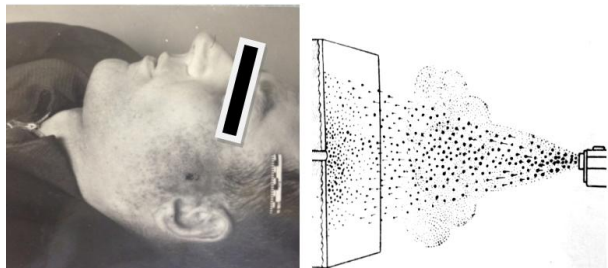
Flame of a shot is formed due to combustion of propellant and results in burning of outer clothes or around the entry wound. Intensity of burning depends on the type of powder: it is more if black powder is used and less if the cartridge is equipped with smokeless powder. The distance (from the muzzle to the target), when appearances of flame may be found, varies between 3-5 cm. to 15-20 cm. in military weapons and up to 0,8-1 m. in hunting guns.

Powder gases can have mechanical (contusing), chemical and thermal actions in the area of entry wound. Contusing action of gases is manifested in splitting of the skin in an entry wound. Formation of parchment spots can be revealed too. Chemical action of powder gases causes bright red color of surrounding tissues in an entry wound due to formation of carboxihaemoglobin and carboximyoglobin. Thermal action of gases is not considerable and is reflected by scorching. An average range of gases action is near 15-20 cm. from the muzzle and depends upon both the gun and ammunition used.

The **soot** is mainly composed by a discharged primer. It can be seen as deposition of smoke around the entrance wound and is termed in forensic ballistics as blackening. This may be round or oval shaped (depends on the angle of shooting) and suggests (if present) the range of a shot up to 20-30 cm. from the muzzle.

When the gun is fired, propellant is not discharged completely. Therefore **burnt, unburnt or partially unburnt grains of powder** are formed. They are usually driven into the skin, can be easily revealed around entrance wound and are called as tattooing. Tattooing can not be wiped off. The grains of gunpowder fly furthest.

Particles of metals follow the bullet or pellets together with propellant gases and can be deposited on a target. Specific investigating methods are usually used for identification of irritants: X-ray examination, thin-layer chromatography, spectroscopy, application of color prints etc.



5. age of the person

19. A molecular basis of development cadaveric rigor is:

1. absence of regulating influence of nervous system
2. sharp downturn of a body temperature which conducts to blockade of exchange processes
3. absence ATF that results in preservation of impossibility of break of cross communications(connections) between miasine
4. accumulation of carbonic acid
5. accumulation underoxidized products of an exchange, basically, ammonia

20. Paradoxical cadaveric rigor it is characterized by the following attributes:

1. develops in the order from below upwards
2. arises at a trauma of an oblong brain
3. arises from action of high temperature
4. fixes position of a body at the moment of death
5. it happens at a trauma of a cervical part of a spinal cord

21. At room temperature cooling of a corpse occurs at temperature drop of a body for 1 hour:

1. on 5 degrees
2. on 3 degrees
3. on 1 degree
4. on 10 degrees
5. on 5 degrees

22. At quickly come(steppe) death rotting of a corpse begins:

1. at once on all surface of a body
2. from a head
3. from area of a stomach
4. from cadaveric spots
5. from blood vessels with formation of a putrefactive venous network

23. Rotting a corpse of the deadborn child begins:

1. at once on all surface of a corpse
2. β heads
3. β the most damp sites of a corpse
4. β the bottom finitenesses
5. from belly covers

24. Kinds of natural preservation of corpses are:

1. mummification
2. rotting
3. peat tanning
4. cataleptic cadaveric rigor
5. saponification

25. Mummification comes at:

1. good arining premises(rooms)
2. presence of a moisture
3. high ambient temperatures
4. absence of oxygen
5. dry ground

26. Conditions which promote development saponification, are:

1. absence of air
2. presence humic acids
3. presence of a corpse in an alkaline turbary
4. dry ground
5. enough of a moisture

27. By the chemical nature saponification represents:

1. process Formations(educations) of fats
2. process of loss of a moisture by fabrics of a corpse
3. saponification of fats
4. process of cooling of a corpse
5. process of formation(education) of wax

28. Conditions at which develops peat tannins, are:

1. presence of a corpse in the environment without oxygen
2. presence of a corpse in an alkaline turbary
3. presence of a corpse in sourturbaries
4. presence of a corpse in alkaline ground
5. presence of a corpse in the damp environment

29. Late absolute attributes of death are:

1. mummification
2. cadaveric rotting
3. saponification
4. cadaveric emphysema
5. peat tannins

30. The prescription of approach of death is that time interval which has passed from the moment of death before research of a corpse:

1. Yes
2. No

31. Definition of prescription of approach of death can be lead(be carried out) on cadaveric changes to which carry:

1. cooling of a corpse
2. cadaveric drying
3. cadaveric a stain
4. rotting of a corpse
5. cadaveric rigor mortis

star-like. Soot is frequently deposited on the underlying bone.



Signs of a Contact shot:

- Presence of a muzzle imprint around entrance wound (“schantz-mark“).
- Location of additional signs of a gunshot alongside the wound tract.
- Bright red colour of soft tissues in the area of an entrance wound due to formation of carboxihaemoglobin and carboximyoglobin.
- Absence of accompanying components of a shot around of an entrance wound and their presence on a course of wound canal.

The **CLOSE DISTANCE** of a shot is understood as such distance between muzzle of barrel and a surface of an injured body when accompanying components of a shot take place. In other words, this is a distance of a shot when mechanical action of powder gases is still seen around the entrance hole.

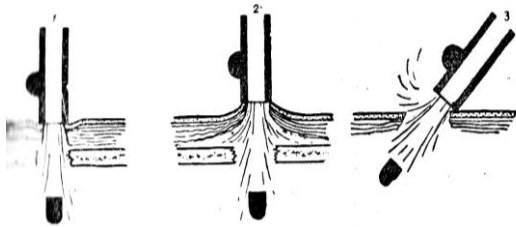


Accompanying components of a shot:

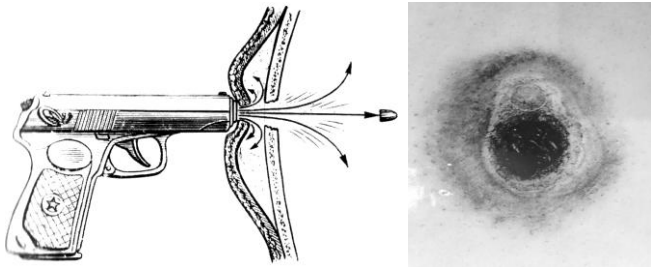
- Flame
- Powder gases
- Soot black
- Unburnt and partially burnt powder grains
- Small metallic particles
- Weapon greasing

When a weapon is fired, smoke, flame, burnt, particles of metals and the gases of combustion leave the barrel together with the portions of burnt, unburnt or partially unburnt grains of powder. These contaminants usually

- incomplete
- lateral (angled)



A **CONTACT SHOT** refers to a situation when a firing gun becomes into a full contact with the target therefore it is also called as a discharge without distance. A bullet track in a contact range shot is continuation of a barrel.



Two main expert signs may be revealed around entry wound: imprint of the muzzle (so called «**schtanz-mark**») upon the skin and appearances of all accompanying factors of a shot (burning, blackening, tattooing) are mainly present inside the wound canal. The muscles around a bullet track are bright pink due to formation of carboxyhaemoglobin. The entry wound itself may be small and regular or large and irregular, depending upon the underlying structures. As, for example, the skin wound is large and ragged in head wounds where the gases may expand between the scalp and skull resulting in undermined, irregular and everted margins. They are usually

32. Definition of prescription of approach of death can be lead (be carried out):

1. on supravital to reactions
2. on contents of a gastroenteric path
3. on the external phenomena (changes) of a body of a corpse
4. on a degree of filling of a bladder
5. on etnomo fauna a corpse

33. The medical certificate on death can be given by the doctor on the basis:

1. stories of relatives
2. records in the medical documentation
3. survey of a corpse
4. previous supervision
5. openings of a corpse

34. At drawing up of the medical certificate on death the doctor should be consistently determined and written down:

1. quantity of alcohol in blood
2. basic diseases (damage)
3. a condition which has resulted the important pathological conditions which promoted in the direct reason of death
4. to approach of death, but are not connected to illness or a trauma
5. what illness or pathological condition, including caused by action of factors of an environment, have directly resulted in death

Control Questions:

1. Definition of Thanatology and its kinds.
2. Conceptions of death: death of cells and death of organism.
3. Forensic medical classification of death. Violent and non-violent (sudden) death.
4. Dying and its stages.
5. Clinical and biological death. Brain death.
6. Signs, which indicate the death.
7. Livores mortis and its significance.
8. Muscular changes and its significance.
9. Cooling of the body and its significance.
10. Autolysis and its significance.
11. Putrefaction and its significance.
12. Saponification and its significance.
13. Mummification and its significance.
14. Forensic medical estimation of post-mortem interval. Supravital reactions.
15. Examination of a corpse on the scene of death, its law regulation and the role of specialist in the field of forensic medicine. Statical and

dynamical stages of the examination. The Document which are composed during examination of the corpse.

16. Forensic medical examination of a corpse. Kinds of corpses, which are examined by forensic medical experts. Main questions, which are solved during examination of corpse.

17. Peculiarity of forensic medical autopsy of a corpse of unknown person.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.
3. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод.рек.* К.: УкрДГПІ, 2017. 24 с.
5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
6. Mykhailychenko B., Erhard N., Kubalya S. Early signs of death and late signs of death *Atlas*. К.: UkrSGRI, 2020. 38 p.

Classification of firearms:

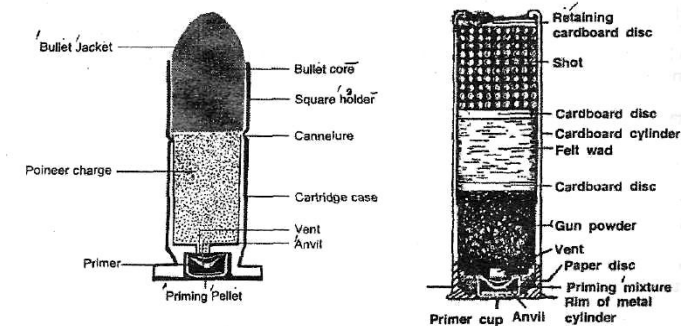
1. According to calibre (diameter):

- Small-calibre (4-6 mm)
- Medium-calibre (7-9 mm)
- Large-calibre (more than 9 mm)

2. According to the mechanism of a shot:

- Automatic (machine guns)
- Semi-automatic (pistols, carbines)
- Non-automatic (hunting rifles)

Parts of a rifled and shotgun cartridges



Mechanism of discharge of projectile

1. Trigger releases a pin or hammer whose tip strikes the percussion cap.
2. Primer is detonated.
3. Detonation of the primer ignites the main propellant charge.
4. Ignition results in an explosive formation of hot gases.
5. The pressure of these gases forces the missile out of the barrel with substantial velocity.

Firing (Operating) mechanism. Mechanism of discharge of projectile in firearm is the following: a trigger is pulled → firing pin strikes the percussion cap of the projectile → detonation of the primer → ignition of main propellant charge → rapid formation of expanding hot gases at very high pressure → missile is propelled out of the barrel giving it the necessary muzzle velocity.

Shooting distance:

1. Contact range
2. Close range
3. Distant range

Types of contact shot:

- complete (hermetic)

PRACTICAL CLASS 9

FORENSIC MEDICAL EXAMINATION OF A GUNSHOT WOUND

Urgency: Every year there is an increase in number of criminal offence against human life and health which is caused in an increase of crime rates in Ukraine. Worsening of criminogenic environment in Ukraine demands to use all the power of its legislation in the fight against crime. A big toll in this process not only lays on law enforcement agencies but also on forensic experts. A number of forensic investigation conducted increases each year and core factors that stimulate it are: legislative awareness of population and active layers community. As a result of a forensic examination issues like presence of physical injury, their location, mechanism and type of injury, severity and time of onset to be resolved, as well as to state the cause of death etc.

Equipment:

1. Macro- and micropreparates.
2. Tables, slides.
3. Control tests.

Plan:

1. Control test of a gunshot wound.
2. Discussion of the key questions.
3. Out of class students self preparation.
4. Control of final level of students knowledge.

Main questions ,which the students should know:

1. Firearm injuries and the mechanism of shot
2. Bullet entrance wound due to the shot from a distant range
3. Bullet exit wound
4. Firearm wound canal
5. Laboratory methods of examination in case of gunshot wounds

Main terminology: firearm, firearm injuries, mechanism of a shot, contact range, close range, distant range, flame, powder gases, soot black, unburnt and partially burnt powder grains, small metallic particles, weapon greasing, entrance wound, exit wound, hydrodynamic action.

Main information

A **firearm** is a specialized device designed to propel a projectile (shot/bullet missile) by the expansive force of gases generated as a result of combustion of the propellant (powder) at its base in a closed space.

This combustion results in building up of optimum pressure, which forces the missile out of the muzzle (mouth of a firearm) with sufficient velocity resulting in firearm injury.

Firearm injuries are wounds caused to the body tissues due to impact, entry, and passage of a missile discharged from a firearm.

PRACTICAL CLASS 4

FORENSIC MEDICAL EXAMINATION OF CORPSE IN CASE OF SUDDEN DEATH. STUDENT INDEPENDENT AUTOPSY OF A CORPSE

Urgency: nowadays sudden death is a main problem in public health. Every medical specialist have to know signs of sudden death to determine it cause.

Aim of class: to touch the students with the forensic medical signs of sudden death and peculiarity of procedure of examination of corpse in such cases, to acquaint with morphological signs of cardiac sudden death.

The specific aims:

- To explain procedural basis of forensic medical investigation of a corpse in case of sudden death.
- To be able to determine cause of sudden death.
- To carry out a forensic medical investigation of a corpse, to determine cause of non-violent death and write out medical death certificate.
- To be able to make a forensic diagnosis and draw a conclusion.
- To be able to compose Act of forensic medical investigation of a corpse.

Equipment:

1. Forms of control tests in sudden death.
2. Forensic medical equipment for autopsy.
3. Order № 6 (1996), criminal-procedural code of Ukraine.
4. Corpse of human who died suddenly.
5. Medical documents which is needed to investigate before the examination of a corpse.
6. Tasks.

Plan:

1. Test-control of elementary level of student's knowledge.
2. Discussion of the key questions in autopsy room.
3. Carry out of forensic medical examination of a corpse.
4. Diagnostics of a cause of death.
5. Composition of Act of forensic medical investigation of corpse.
6. Independent work of students.
7. Control of final level of student's knowledge.

Main questions, which the Student should know:

- Signs of sudden death.
- Peculiarity of forensic medical autopsy in cases of sudden death.
- Technique of forensic medical investigation of corpse.
- Causes of sudden death and sudden cardiac death.

Questions for Out-of-Class Student Self-Preparation:

1. Cases for Medico-Legal Autopsy.
2. Method for Forensic Medicine autopsy.
3. Signs of sudden death and sudden cardiac death.
4. Causes of sudden death.
5. Structure of the Act of forensic medical investigation of corpse.
6. Structure of Medical death certificate and its composition.

Main terminology: Sudden death, sudden cardiac death, Medical death certificate.

Main information

Sudden death occurs in forensic-medical practice rather frequently. Before the autopsy the expert does not have any information on catamnesis, the character of a disease, its course, level of health before death and during the process of dying. Expert examination of such cases requires the knowledge of morphological peculiarities and pathogenesis of a number of diseases that result in sudden death.

It is necessary to keep in mind that the forensic-medical expert has a right to obtain, on request to investigating bodies, the outpatient's card, medical history, and other medical documents, to elucidate circumstances of death and measures on rendering medical aid.

The death, which took place within 6 hours from the moment of disease in a healthy person or the person, who was ill and was in a satisfactory condition, refers to the category "sudden".

In forensic practice, most of such deaths occur in minutes or even seconds after the onset of symptoms. A sudden death is not necessarily unexpected and an unexpected death is not necessarily sudden, but very often the two are in combination. No period in life is exempt.

Stages of Examination at Sudden Death

1. Studying of the official documents (including medical ones).
2. Plan of Autopsy.
3. Autopsy.
4. Performance of laboratorial and special researches.
5. Studying of the special literature.
6. Research of additional medical documents.
7. Formulation of the Diagnosis and Conclusions.

Risk factors that may lead to sudden death

- Adverse meteorological conditions (sharp change of atmospheric pressure and/or air temperature);
- Physical overstrain (even insignificant) in patients having Ischaemic Heart Disease;
- Psychical emotional exposure, especially if unexpected.
- The most frequent risk factor is alcoholic intoxication and drinking, even in small doses, of ethanol.

13. The signs of establishment of defloration time.
14. The establishment of character and mechanism of damages at violent sexual act consists of solving following questions.
15. Give the determination of notion "Sexual Reproductive Ability".
16. Give the determination of notion "Crime Abortion".
17. Enumerate the signs on which the establishment of age are based.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Михайличенко Б.В., Ергард Н.М. Судово-медичне визначення ступеня тяжкості тілесних ушкоджень потерпілих, звинувачених та інших осіб. *Метод. рек.* К.: УкрДГПІ, 2017. 24 с.
5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
6. Erhard N. Forensics examination of a living person on the trauma severity. Defining state of health. Examination of disputable sexual states and sexual assault *Methodical recommendation*. К: УкрДГПІ, 2019. 28 p.
7. Михайличенко Б.В., Ергард Н.М. Практикум для самостійної підготовки студентів з навчальної дисципліни «Судова медицина». *Метод. рек.* К.: УкрДГПІ, 2017. 44 с.

4. Loss of an ability to child birth

17. Hearing loss – complete or partial hearing loss of both ears or at a distance more than 3-5 cm from his/her ear

1. Yes
2. No

18. Permanent disfigurement of face can be determined by:

1. Court
2. Forensics expert
3. Plastic surgeon
4. Beautician

19. Simulation is:

1. hiding disease presence
2. exaggeration of symptoms or manifestations of injury
3. recreation of an unexciting disease
4. injuries created artificially using nonhazardous methods

20. Aggravation is:

1. injuries created artificially using nonhazardous methods
2. physical harm to one's own body
3. hiding disease presence
4. exaggeration of symptoms or manifestations of an injury

Control Questions:

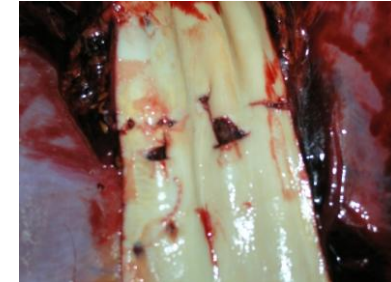
1. The purposes of examination of living persons.
2. Method of Forensic Medical Examination of living persons as for definition of degree of gravity of physical injuries
3. The basic questions that the expert is interested in at interrogation of the victim.
4. The definition of degree of gravity of physical injuries according to "Rules of forensic medical examination".
5. The criteria characterizing grievous physical injuries.
6. The criteria for injuries of moderate degree of gravity.
7. The criteria for simple physical injuries which caused short-term health disorder and insignificant persistent loss of general work capacity.
8. The criteria for simple physical injuries which did not cause a short-term disorder of health.
9. The carrying out forensic medical and forensic psychiatric examination for definition of health state is obligatory in such cases.
10. Examinations of females is carried out in order to define such sexual conditions or in a causes of sexual crimes.
11. Examination of males is carried out in order to establish such conditions.
12. At definition of sexual maturity the set of the following signs of organism development should be taken

– Smoking.

The most rare causes of sudden and unexpected death:

I. Diseases of Cardiovascular System

1. Coronary artery disease (narrowing and obliteration of the lumen by atherosclerosis):



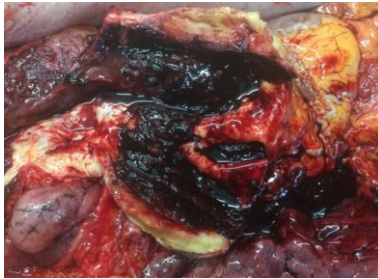
2. Coronary atherosclerosis with coronary thrombosis.
3. Coronary atherosclerosis with haemorrhage in the wall causing occlusion of the lumen.
4. Coronary artery embolism.
5. Rupture of a fresh myocardial infarct:



6. Cardiomyopathies.
7. Acute endocarditis, myocarditis or pericarditis:



8. Valvular lesions: aortic stenosis, aortic regurgitation, mitral stenosis, rupture of the chordae, ball-valve thrombus.
9. Angina pectoris.
10. Arterial hypertension with atherosclerosis.
11. Spontaneous rupture of aorta.
12. Rupture of aortic or other aneurysm:



II. Respiratory System

1. Lobar pneumonia:



2. Bronchitis and bronchopneumonia.
3. Lung abscess.
4. Massive collapse of the lung.
5. Bronchial asthma.

III. Central Nervous System

1. Subarachnoidal haemorrhage:

4. Long-lasting health disorder (over 3 weeks)

9. Minor trauma with a short-term health disorder by the longevity of health disorders is:

1. Between 6 to 10 days
2. Between 7 to 21 days
3. Between 15 to 21 days
4. Between 21 to 30 days

10. Minor trauma by the longevity of health disorders:

1. Between 6 to 10 days
2. Between 10 to 15 days
3. Between 10 to 21 days
4. Between 21 to 30 days

11. Injuries considered to be a grievous trauma if it's:

1. Hearing loss
2. Opened and closed skull base fractures
3. Loss of sexual/reproductive function
4. Opened and closed calvarial bones fractures

12. Injuries considered to be a grievous trauma if it's:

1. Cervical vertebrae dislocation
2. Closed injury of a cervical spinal cord
3. A fracture of one or a few pectoral or lumbar vertebrae
4. Closed injury of pectoral, lumbar or sacral segments for spinal cord

13. II degree burns – over 30% of overall body surface injuries considered to be:

1. Minor trauma
2. Severe trauma
3. Moderate trauma

14. III degree burns – over 20% of overall body surface injuries considered to be:

1. Minor trauma
2. Moderate trauma
3. Severe trauma

15. Grievous non-life-threatening trauma also includes:

1. Injury of a wall of pharynxes, larynxes, trachea, main bronchi, esophagus
2. Loss of any organ (or part of the body)
3. Mental diseases
4. Closed and opened injury of endocrine glands of the neck (thyroid, parathyroid, thymus)

16. Loss of sexual/reproductive function is:

1. Loss of an ability to participate in a coitus
2. Loss of an ability to conceive
3. Injury that led to interruption of pregnancy

Control tests:

1. Forensics examination is carried out on the basis of:

1. Judgement of examining court
2. Referral from investigative authorities
3. Request of the injured party
4. Court judgment (judge's order)

2. Forensics medical examination is carried out on the basis of:

1. Judgement of examining court
2. Referral from investigative authorities
3. Request of the injured party
4. Court judgment (judge's order)

3. Minor bodily injuries have such criteria:

1. Loss of general working capability by less than 10%
2. Absence of life threatening trauma
3. Long-lasting health disorder (over 3 weeks)
4. A stable loss of one third of working capability (loss of working capability from 10% to 33%)

4. There are medium trauma criteria:

1. Loss of general working capability by less than 10%
2. Absence of life threatening trauma
3. Long-lasting health disorder (over 3 weeks)
4. A stable loss of one third of working capability (from 10 to 33%)

5. There are grievous trauma criteria:

1. Loss of general working capability by less than 10%
2. A stable loss of working capability of more than 33%
3. Life-threatening conditions
4. Non-life-threatening conditions that have severe manifestations and consequences

6. Life-threatening severe trauma – is an injury that may cause a life-threatening conditions for life at the moment of causing or during clinical progression

1. Yes
2. No

7. Age determination is possible in the following ways:

1. By skin condition
2. By hair colors
3. By teeth condition
4. By DNA

8. Minor trauma by the long-lasting health disorders is:

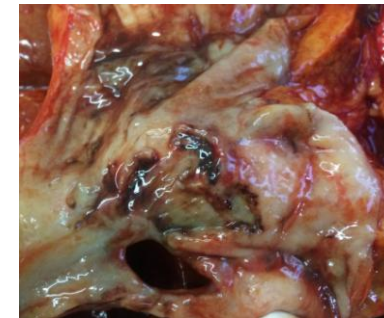
1. Minor trauma
2. Minor trauma with a short-term health disorder
3. Longevity of health disorder lasts between 15 to 35 days



2. Epilepsy.
2. Cerebral haemorrhage.
4. Colloid cyst of the third ventricle.

IV. Alimentary System

1. Severe bleeding from a gastric or duodenal peptic ulcer:



2. Mesenteric thrombosis and embolism.
3. Perforation of a peptic ulcer.

Sudden infant death syndrome (SIDS)

Also known as *Cot Death* or *Crib Death*, it is defined as the sudden and unexplained death of any infant who was either well, or almost well prior to death, and whose death remains unexplained even after a thorough autopsy, including an investigation, and laboratorial examination if necessary.

Death usually occurs between the ages of two weeks to two years with a peak around two months to four months.

Medical Death Certificate

The Medical Death Certificate is divided into two parts, the first (Part I) being the condition which led directly to the death and the second (Part II) being other conditions, not related to Part I, but which also contributed to the death.

Part (I) is further divided into three subsections a), b) and c), which are causally related to one another, in that:

- a) Immediate cause of death
- b) Manifestations of pathology (trauma)
- c) Cause of death (injury, illness).

In addition, code of the cause of death must be indicated too as the World Health Organization classifies in book International Classification of Disease.

The medico-legal document as a result of autopsy:

- Prologue including a summary of circumstances of case
- Research Part
- Diagnosis and Conclusions.

An example

Conclusion of expert

Forensic – medical corpse’s investigation began “___” from “___” till “___” hours, ___ it was (bad, fine, sunny, rainy, nasty) weather.

Order of low investigation № ___.

Forensic-medical expert _____

(position of an expert, place of work, family name, first name patronymic, name, scientific degree, rank) made forensic – medical investigation of a corpse

(family name, first name)

_____ year of birth (_____ years of old).

During post-mortem exam following persons were presented:

Students _____

Questions which are to be decided:

1. The cause of death

Circumstances of a case

(Data & extract from accompanied documents, including medical ones.

External examination

Dress describing (first outdoor clothes, then indoor ones), (complete set, look like, shape & condition, quality, color, degree of thread bareness, damages, traces of strange matters & substances – dust, dirt, mud, stains, sports etc...).

Sex, Age (look like ... as (for) ... years old): weight (kg), body’s length _____ sm, morphe-structure of body _____ (well-fed, superfluous, satisfied, not satisfied).

Rigor mortis _____ (expressed, not expressed, poor expressed) in investigated muscles.

Skin surface (color): _____ (pale, lilac).

At examination of the passive partner must be noted:

- damages such as longitudinal cracks between the folds of the rectal mucous membrane, grazes, and ruptures of the rectal mucous membrane;
- blood, smegma, pubis hair of the active partner around of an anus and in the rectum;
- venereal disease.

Establishment of Venereal Disease

The conclusions about presence or absence of venereal disease should be made only after carrying out all necessary examinations and laboratory investigations in view of conclusions of specialists in skin and venereal diseases.

Establishment of Age

Necessity of age determination occurs mainly since 10 years, because some issues of rights and duties of children and teenagers are solved depending on age: the consent of the child to adoption, application of pedagogic measures since 12 years or criminal liability since 14 years (for example, for premeditated murder, premeditated infliction of grievous physical injuries that resulted in health disorder, rape, robbery, malicious hooliganism, deliberate destruction or damage of state or personal property of citizens, etc., the right of marriage registration, evasion of doing military service, attempt of a pre-term retirement age, etc.).

The age of an individual, can be determined, within a range of 1 to 2 years, from a combination of data provided by: teeth, changes of skeleton and ossification of bones, height and weight, and miscellaneous particulars: genital system, changes of skin and its appendages (hair, nails), etc.

Control task:

Read the task and determine the mechanism and the prescription of damages, as well as substantiate the degree of their severity:

«A male citizen, Mr. M., 40 years old, seeking medical care, went to the emergency care room, having complaints of pain in the area of his left ear. From the anamnesis it is known that two days ago his wife, on the ground of jealousy, bit his left ear. At inspection: in the area of the left ear is imposed bandage with antibacterial ointment. After removing the bandage, it was fixed: the upper half of the auricle is absent, on the other part - the wound surface with uneven shroud-shaped coarse festonchymal edges of light red color and yellowish cartilage shreds up to 0,6 cm. The wound covers the upper part of the helix and antihelix, as well as part of the antitragus. The earlobe is not damaged. The hearing is saved. Re-examination in a month: the wound healed completely, the ear flap is deformed - the upper edge is absent. In other areas of the posterior margin, rough dense wrinkled scars of pinkish-blue color. Indicate any damage that they have in accordance with the method of describing the injury (anatomical localization, shape, size, color, etc.)».

The decision on these points is based on revealing and estimation of corresponding obstetrical signs, genital and extragenital pathology, and the results of special laboratory investigations.

Establishment of Artificial Abortion

By abortion is meant the expulsion of the products of conception at any period of gestation before full term.

Abortions are classified in two groups: natural, and artificial.



Natural Abortion (natural, spontaneous or accidental): Abortion may occur at any time due to natural causes: (1) defect in the ova, including chromosomal defect; (2) developmental defect of the foetus (common cause), (3) low implantation of zygote, (4) disease of decidua or placenta, (5) Rh incompatibility, (6) retroverted uterus, (7) submucous uterine fibroid, (8) malformed uterus, (9) uterine hypoplasia, (10) hypertension, (11) diabetes mellitus, (12) hormonal deficiency, (13) sudden shock, emotional disturbances, (14) syphilis, (15) nephritis, (16) arsenic or lead toxicity, (17) drug toxicity.

Artificial abortions may be: legal or justifiable, and criminal.

Complications from criminal abortion: Death may occur from shock, haemorrhage, air or fat embolism, sepsis, and poisonings.

Establishment of Sexual relations in unnatural way

Forensic medical examination is made by commission with involvement of endocrinologist, obstetrician-gynaecologist, urologist, and psychiatrist in specialized medical institutions

Establishment of Signs Testifying to Violent Satisfaction of Sexual Passion in an Unnatural Way (Violent Act of Uranism)

Examination can be made both in case of a violent act of uranism, and without violence but with a minor.

At examination of the active partner, attention should be paid to presence of haemorrhages, grazes, adhered hair, faeces, lubricant substance on the penis and presence of faeces on pubic hair. An imprint of the penis on a microscope slide is made for forensic cytological study to reveal particles of faeces and/or blood. Bacteriologic researches of the penis imprint are also carried out to reveal E. coli.

Livores mortis: lilac color, situated on lower part of body, after pushing by dynamometer _____ (disappear, become pale), and reappear in _____ minutes (not disappear).

Signs of putrefaction: _____ (not presented, presented) on _____ (abdomen wall, ect), they have grey-green colour.

There is no damages on head during observing and palpation.

Skin of face: _____ (pale, lilac).

Eyes: _____ (opened, closed), corneas: _____ (muddy, transparent), pupils: _____ (wide, narrow), connective tissue of eyes: _____ (has/without red spots (bruises)).

Bones and cartilages without damages in palpation.

Opening of nose: _____ (have/free from any subjects).

Opening of ears: _____ (have/ free from any subjects).

Mouse: _____ (opened, closed). Labia: _____ (pale, lilac), teeth _____ (natural, have caries spots, damaged).

_____ (natural, have caries spots, damaged).

There is no damages on neck.

Chest as usually, has cylindrical form. Abdomen is swelled.

External sex organs correspond to male (female) sex, have no damages. Anus closed.

Upper and lower extremities _____ (damages, no damages) on palpation.

Injuries: localization, shape, looks like, sizes, condition of edges, angles, surfaces & surrounding tissues. Condition depth of penetration.

Internal examination

The smell which we can determine after opening of abdomen cavity is usually.

Subcutaneous fat _____ cm on the chest, _____ cm on the abdomen.

Omentum covers intestines. Inner organs are placed in chest and abdomen cavity as usually.

Stomach and intestines are swolled.

Peritoneum is smooth, shining.

There is no any fluid in abdomen cavity.

Diafragma is placed as usually.

Cartilages of ribs are cut difficulty (lightly).

Lungs are placed in chest cavity.

There is no any fluid in chest cavity.

Pericardium without hemorrhages. Pericardium is not damaged. There is not a lot of yellow fluid in pericardium cavity.

There is liquid blood (red or mixtum or white clor) in heart cavity and in a blood vessels.

Cor has (oval, round) form, his size is _____, weight _____ grms.

There is a small quantity (lot) of fat on it surface and some small spots

of hemorrhages on it.

Bicuspid & tricuspid valves are changed.

Aortic valve: _____ (dense, changed, transparent).

Value of pulmonary artery: _____ (thin, elastic, luster).

Inner mucous membrane of heart is smooth.

Coronary vessels have atherosclerotic changes on the inner surface in a big degree of opening's, there is narrowing of a vessel.

Thickness of right heart's ventricle muscle is _____ cm,

Thickness of left heart's ventricle muscle is _____ cm.

Condition at touch: _____ (dense, mild), color of muscles at cut: _____ (red, brown).

Degree of Bloodfullness: _____ (large, small).

Aorta: width under valves _____ cm, color of inner surface is yellow, _____ (there are a lot of dense atherosclerotic spots, smooth).

There is no hemorrhages in cutaneous area of neck.

Cartilages of larynx and sublingual bone are not damaged.

Tongue: color of mucous is lilac, condition of papilla is usually, colour of muscles at cut is dark red, no hemorrhages.

Thyroid gland: are dense at touch, has red color, consist of small grainy at cut.

Entrance to larynx & esophagus is free, without of alien subjects.

Esophagus: is free, color of mucous membrane is lilac, intensity of foldness is well expressed.

Trachea & big bronchuses: are free (contents look like blood, foreign bodies), color of mucous membrane is lilac.

Lymphatic nodules: (only for new-born corpses) at place of trachea separation and at the gate of lungs: sizes(length, width, height), condition at touch, color & structure at cut.

Lungs like paste at touch, have small red spots, dark red and liquid blood at cut.

Ribs are not damaged.

Spleen: sizes _____ (length, width, height), dense at touch, capsule is wrinkled (smoothness), color is dark red at cut, structure of tissue is usually at cut, scrape is mixt of blood and substance of spleen.

Adrenal glands: sizes _____ (length, width, height), color of cortical substance is yellow, and medullary substance is brown. They are distinguished between each other.

Kidneys: sizes _____ (length, width, height), capsule taken off easily (hardly, with substance's loss), kidneys surface dense and smooth, color is dark at cut, condition is dense at touch, structure of tissue at cut is usually, distinguished between each other.

Liver: sizes _____ (length, width, of left & right parts, height),

spermatozoa in the vagina and the sperm group; pregnancy; infection with venereal disease or HIV.

2. Presence of signs of physical injuries with definition of their character, mechanism and time of occurrence.

3. Establishment of medical consequences of signs of violent actions with obligatory definition of degree of gravity of physical injuries.

4. Establishment of signs of a helpless condition, which may be caused by age, health state, inflicted damages, toxic effect.

Establishment of Signs of Lecherous Actions

Signs of lecherous actions are established at examination of persons under 16.

Signs of lecherous actions of a physical character are inflammatory manifestations, damages in the area of genitals, and also some structural and morphological changes of the external genitals, anal orifice and surrounding areas, resulting from pressure and friction, especially at numerous and prolonged acts of depravity.

Establishment of Ability to Sexual Intercourse and to Fertilization (Sexual Reproductive Ability)

Sexual (reproductive) ability is a morpho-functional condition of a male or female organism characterized by ability in men to copulation and fertilization and in women - to copulation, conception, pregnancy, and delivery. Examination in this case is made at request of commission on divorce affairs in situations/when the woman is incapable of fertilization, or pretends to be the mother of some other person's child, and at establishment of degree of gravity of physical injury at solving the problem of loss of sexual reproductive ability.

Female reproductive ability consists in capability of sexual intercourse, conception, pregnancy, and delivery.

At establishment of ability to fertilization in Males, laboratory investigation of semen is obligatory and should be carried out by commission with involvement of urologist. Conclusions about ability of the examined to fertilization should be based on complex data acquisition. Thus, it should be taken into account that developmental anomalies of penis, e.g., marked scrotal epi- and hypospadias are absolute proof of inability to fertilization.

Establishment of Pregnancy and Past Deliveries

Examination in this case is made by commission with involvement of obstetrician-gynaecologist for decision on the following issues:

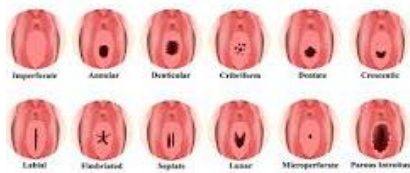
1. Availability of pregnancy and its term.

2. Time of past birth or abortion.

3. Character of pregnancy course and postnatal period.

4. Presence of diseases, including those of genitals, capable to cause miscarriage.

Types of Hymen

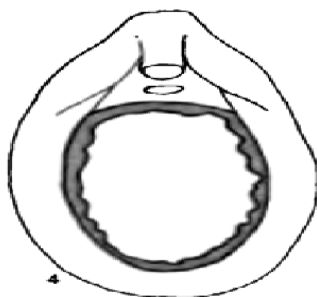


If necessary, vaginal and external cervical smears are taken to establish the presence of spermatozoa.

A virgin (virgo intacta) is a female who has not experienced sexual intercourse. Defloration means loss of virginity.

Establishment of Time of Defloration

On the morphological picture corresponding the certain period of time, last from the moment of defloration, A.N. Samojlichenko (2001) has allocated 5 kinds of a state of hymenal tears: fresh (bleeding), granulating, fresh-cicatrical, cicatrized and old. Soon after the act, the torn margins are sharp and red, and bleed on touch. Even when examined after 3 to 4 days of offence, the edges of laceration are congested and swollen. The surrounding tissues are also swollen and tender. After formation of a scar (approximately for 10 -15 day after defloration) the accurate timing of defloration becomes impossible.



The Establishment of Character and Mechanism of Damages at Violent Sexual Act (Rape)

Sexual acts involving vaginal, anal or oral penetration of another person's body using the genitals or any other object without the voluntary consent of the victim (rape).

During forensic medical examination of Femles the following questions are solved:

1. The fact of a past copulation based on revealing the rupture of hymen, establishment of its time and mechanism of damage; presence of

capsule is smooth, color is brown red at cut, tissue's structure has a lot of liquid blood at cut.

Gall bladder has dark gall, billiary tracts are permeability, color of mucous membrane is green brown.

Stomach: has liquid and pieces of food (quantity & nature of contents), color of mucous membrane _____ (pale, lilac, bloody, with hemorrhages), intensity of foldness _____ (expressed, not expressed).

Large & small intestine: _____ (natural contents), degree of distention & flatulence _____, color of mucous membrane _____, intensity of foldness _____.

Gall bladder & billiary tracts: permeability of billiary tracts _____,

quantity & nature of gallbladder's contents _____ (gallstones, nature of gallstones quantity of gallstones, sizes, structure at cut), color of mucous membrane _____.

Urinary bladder has a small (large, or empty) quantity of yellow urine, mucous membrane has pale color and well expressed foldness .

Prostate is dense at touch _____, it color is _____, tissue's structure is as usually at cut (or tumor) .

For woman:

Womb: sizes _____(length, width & height), form of fauces _____ (round-like, cleft-or-slit(fissure)-like), color of mucous membrane _____ & contents of a cavity _____.

Ovaries: sizes _____ (length, width & height), color _____ & structure of a tissue at cut _____.

Color of Mild tissues of head _____ from inner superficial.

Bones of vault and base of the skull _____ (damaged, not damaged), _____cm of thickness.

Dura mater _____ (damaged, not damaged).

Pia mater _____ (smooth, humidity, lustre, has a large degree of vessel's bloodfullness or bloody, has hemorrhages).

Vessels of brain's basis are thick, lumen somewhere narrowed (not narrowed) by atherosclerosis process.

Gyries of Brain well expressed, brain's ventricles content transparent cerebral fluid, border's intensity between gray and white substances is well distinguished, structure of brain's substance is usually at cut.

Appendance-like sinuses of skull has dark liquid blood.

Spinal column is not damaged.

A pieces of inner organs and some blood and urine were taken for additional laboratory investigation.

Signature of a forensic-medical expert (examiner)

Results of Laboratory Researches

1. Histologic Research
2. Toxicologic Research
3. Bacteriologic Researches

Forensic-medical diagnosis

- a) Immediate cause of death
- b) Manifestations of pathology
- c) Cause of death (illness).
- d. Followed background disease.

V. Conclusion:

The conclusion as to the cause of death must be given, based on the post-mortem findings. This is followed by the signature and qualifications of the Forensic medical expert. Conclusions are made out according questions of investigating agencies.

Forensic Medical Expert

Appendix (*photos, schemes, etc.*).

After the class next one part of students (see above) compose the Expert conclusion of corpse.

Control tests:

1. The main task during medico-legal investigation of corpse is:

1. To determine the type of death
2. To study case materials
3. To determine the category of death
4. To determine the circumstances of death
5. To determine the cause of death

2. Death, that happened suddenly or rapidly, from unknown disease is named as:

1. Unfounded
2. Rapid
3. Sudden
4. From disease
5. Unknown

3. Sudden death has such signs:

1. Absence of evidence of witnesses
2. Tempo of death is rapid
3. Visually the human is healthy and current of disease is latent
4. This death is non violent
5. Suspicious on violent death

4. Such risk factors can lead to sudden death:

1. Traffic accidents
2. Physical load
3. Influence of alcohol
4. Mental load (stress)

2. Rupture of hymen integrity.
3. Signs of past coitus.
4. Character and mechanism of formation of damages and changes caused by lecherous actions.
5. Ability to sexual relations and fertilization.
6. Pregnancy and past deliveries.
7. Connection of abortion with trauma.
8. Artificial abortion.
9. Sexual identity.

Examination of males is carried out in order to establish:

1. Ability to sexual intercourse.
2. Ability to fertilization.
3. Venereal diseases.
4. Signs of past coitus.

To solve the investigatory problems the knowledge in the field of forensic medicine and other medical specialities is used, special laboratory methods of research are applied, i.e. forensic immunological, forensic cytological, clinical methods. If necessary, medical documentations, materials of civil and criminal cases are studied.

Depending on the character of questions to be solved, examination can be carried out by the medico-legal expert independently or by the commission with involvement of experts of other medical specialities, i.e. obstetrician-gynaecologist, venereologist, urologist, sexopathologist.

The Establishment of Rupture of Hymen

The establishment of rupture of hymen integrity, as well as of copulation signs is of great importance at investigation of sexual crimes, rape, disputable sexual conditions and crimes against human honour.

During examination, apart from the question on rupture of hymen integrity, the question on prescription of damage is solved on the basis of macroscopic and laboratory data (monochromatic radiation).

1. Semilunar or crescentic (commonest type): the opening is placed anteriorly. Notches or clefts are seen at 10 and 11 clock position, which may be equal in size or more prominent on one side.

2. Annular: opening is oval and situated near the centre of the membrane.

3. Infantile: a small linear opening in the middle.

4. Cribriform: several openings.

5. Septate: two lateral openings occurs side by side, separated partially or completely by thin strip of tissue.

6. Imperforate: no opening the margin of the hymen is sometimes fimbriated (wavy or undulating) and shows multiple notches which may be mistaken for artificial tears.

persons having physical defects or mental deviations,

– for definition of a mental state of accused or suspected persons in cases of doubts of their sanity or ability to give an account of their actions (or to supervise over them) at the moment of procedure of affairs,

– for definition of a mental or physical health state of the witness or the victim if there is a doubt in his ability correctly to perceive the circumstances that are important for affairs, and to give correct evidences about them.

The greatest forensic medical importance is simulation of diseases (from Latin simulatio – pretence) or malingering – the medical image of disease or its separate symptoms by person, which has not the given disease.

Are distinguished: deliberate, or true simulation, i.e. conscious, and pathological, which observe at mentally sick and at the persons, suffering hysteria.

Deliberate simulation usually pursues the gain purposes (evasion from military service, reception of material privileges, etc).

Condition, the opposite to simulation, – dissimulation (from Latin dissimulatio – concealment): disease, injury or any other states (pregnancy, alcoholic intoxication, etc.) is available, but the person hides it because he/she has gain aims or other promptings (for example concealment of disease in case of admission in military college).

It is necessary to distinguish from simulation an aggravation (from Latin aggravate – to burden) – exaggeration of severity of really available mild disease or underestimation of results of treatment. Aggravation, as well as simulation, can be deliberate (conscious) and pathological (not realized), arising on a pathological basis.

Self-injury has traditionally been known as self-harm, self-inflicted violence, self-injurious behavior, and self-mutilation. A broader definition can also include the phenomenon of those who inflict harm on their bodies by different means.

Self-mutilation is a causing harm to the health with the purpose of evasion from duties of military service. Self-mutilation it can be carried out by inflicting to itself of mechanical damages (fire-arms, sharp and blunt objects), by means of inflicting of artificial unhealthy conditions or gravity of already available health disorder.

DISPUTABLE SEXUAL CONDITIONS AND SEXUAL CRIMES

Features and method of carrying out FME as for disputable sexual conditions and sexual crimes are stated in "Rules of forensic medical examinations (investigations) concerning sexual conditions in the Bureau of forensic medical examination" (Kiev, 1995).

Examination of females is carried out in order to define:

1. Sexual maturity.

5. Character of nutrition

5. Such diseases can lead to sudden death:

1. Skull fractures
2. Pneumonia
3. Myocardial infarction
4. Chronic ischemic heart disease
5. Hypertension

6. The signs for Chronic ischemic heart disease are:

1. Increasing of heart weight (more than 400 g)
2. Increasing of thickness of left Ventricles
3. Limp Heart muscle
4. Ischemic area in myocardium
5. Stenosis of myocardium vessels

7. The signs for Acute ischemic heart disease are:

1. Large myocardial fibrosis
2. Presence of blood clot (thrombus) in myocardium vessels
3. Myocardial infarction
4. Spasm of coronary vessels (histologically)
5. Loss of potassium from myocardium

8. Myocardium infarction may be:

1. Acute
2. Chronic
3. Relapsing
4. Visual
5. Repeated

9. Hypertensive heart disease can lead to death because of:

1. Cerebral haemorrhage
2. Haemorrhage
3. Large myocardium fibrosis
4. Acute heart insufficient
5. Myocardium infarction

10. Lungs in pneumonia have such signs:

1. Tardieu spots on surface
2. Drown in a water
3. Have arias of pus obstruction of bronchus
4. Particoloured on cutting
5. Dence on palpation

11. Sudden Infant death syndrome is a sudden and unexplained death of any infant

in the age of two weeks till two years after birth

1. Yes
2. No

Control Questions:

1. Definition of sudden death, its signs and main factors, which lead to sudden death. The commonest diseases that lead to sudden death.
2. Sudden death from cardiac acute disease and its diagnostics.
3. Sudden death from cardiac chronic disease and its diagnostics.
4. Sudden infant death syndrome, its definition, main causes and forensic medicine diagnostics.
5. Medical death certificate and its parts.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод.рек.* К.: УкрДГПІ, 2017. 24 с.
5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
6. Mykhailychenko B., Erhard N., Kubalya S. Early signs of death and late signs of death *Atlas*. K.: UkrSGRI, 2020. 38 p.
6. Mykhailychenko B., Erhard N., Kubalya S. Early signs of death and late signs of death *Atlas*. K.: UkrSGRI, 2020. 38 p.

Forensics expert defines:

- type of injury
- its characteristics and mechanism
- defines whether a defect is permanent or not



Forensics examination of a state of health:

Simulation – recreation of an unexisting disease

Dissimulation – hiding disease presence

Aggravation – exaggeration of symptoms or manifestations of an injury

Artificial diseases – injuries created artificially using non hazardous methods

Selfharm – physical harm to one's own body:



Forensic Medical Examination of the Health State

One of the often meeting occasions for it is forensic medical examination necessity of an establishment of a state of health of various persons - participants of criminal or civil process is. In one case it is stipulated by criminal-procedural legislation, in others – such necessity arises during investigation of criminal cases or by consideration criminal or civil cases in court.

There is obligatory carrying out forensic medical and forensic psychiatric examinations for definition of a health state in follow cases:

- bringing to the criminal account of mute, deaf, blind persons and

20. All types of mechanical asphyxia
 21. Thermal burns of III-IV degree with the surface affected being over 15% of overall body surface



23. III degree burns – over 20% of overall body surface
 24. II degree burns – over 30% of overall body surface
 25. Poisoning from substances of any origin with local or generalized activity

Severe non-lifethreatening trauma also includes:

1. Loss of any organ (or part of the body) or loss of organ's function (loss of sight, hearing, speech, limbs functions, sexual/reproductive function)

Loss of sight – complete or partial blindness of both eyes or lowering of the eyesight to an extent that a victim sees the distance less than 2 m

Loss of sexual/reproductive function – loss of an ability to participate in a coitus or to conceive, or deliver an offspring

Hearing loss – complete or partial hearing loss of both ears or a victim hears only at a distance of 3-5 cm shape his/her ear

Speech loss – a person cannot explain in an understandable way

Loss of a limb (arm, leg) – their separation from the main body or loss of their function

Attention! Considering anatomical loss of an arm or a leg you need to understand that an amputation is valid only as low as elbow or knee

2. Mental health issues

An injury that led to a development of a mental trauma

3. A health disorder which led to a stable loss of labour capacity on one-third or over 33%

4. Pregnancy termination

Injury that led to pregnancy termination at any time or part of the term

5. Permanent disfigurement of face

Smoothing of an injury - a decrease of pathologic changes with time or due to non-surgical measures (applicable for bruises and abrasions)

If a surgery is required (plastics of facial scars) than the face can be considered distorted **permanently**.

Attention! Facial distortion can only be state by the **court**.

PRACTICAL CLASSES 5

FORENSIC MEDICAL EXAMINATION OF NEWBORN CORPSES

Urgency: Death of a newborn can happen as a consequence: of generic trauma, of incompatible with life disorders of development, of pulmonary – insufficiency etc... Of course child – killing is crime according to an art. 117 of Ukr. Criminal code can be a reason of death as well.

If a killer is a woman – mother it is necessary to take into consideration her psychological status after delivery, sometimes typical after child – birth psychosis can lead to such a tragedy, but such a circumstance could be reviewed as extenuating one and even exceptional of guilt. The examination of newborn corpses requires a wide range of special technical methods' using, tests and laboratory exam the exactness and precision of which gives a definite material for truth – aims and purposes, for right conclusions. All these points are of extreme importance because juridical sentence mainly depends on them.

Aim: Students have to obtain skills as for making of FMC'I of newborns, taking into considerations specific points of the examination facing an expert.

Specific aim:

1. To master the methods of solving the main problems connected with autopsy of an infant.
2. To study the peculiarities of technique of autopsy of a newborn.
3. To study the procedure of diagnosis and expert conclusion .

Equipment:

1. Acts of forensic medical investigation of infant corps.
2. Macro- and micropreparates.
3. Tables, slides.
4. Control tests.

Plan:

1. Test-control of elementary level of students knowledge.
2. Discussion of the key questions.
3. Out – of – class students self – preparation.
4. Control of final level of students knowledge.

Main questions ,which the students should know:

1. What questions have to be decided during FMC'I of newborns?
2. Special points as for external corpse's examination of newborns. What anthropological facts and data is necessary to take into account?
3. Methods of newborn corpse's autopsy.
4. Meaning and technique of pulmonary and gastro – intestinal tests.
5. Reasons of newborns' deaths, during, after and before the delivery

period.

6. Demands as for “Expert’s conclusions”.

Questions for Independent Student Work:

1. Concept definition of “infanticide”.

2. Establishment of “new – birth.”

3. Establishment of “maturity”.

4. Duration of intra-uterine life.

5. Establishment of live – birth.

6. Duration of extra – uterine life.

7. Causes of violent death of newborns.

Main terminology: Newborn, live birth, intra-uterine life, extra-uterine life, The Hydrostatic Lung Test (Galenus-Schreyers Test – GT), The Hydrostatic Stomach-Intestine Test (Breslaus Test – SIT), Infanticide.

Main information

In forensic medicine, the period of new-birth is considered to be a short time interval during which the child has the signs inherent to foetus.



The signs of the new birth are divided into external:

1. The umbilical cord with a normal spiral twist and without signs of demarcation or with its beginning

2. At first the skin is bright-red, it becomes darker in the second or third day, and then it turns brick-red, yellow, and normal in about a week

3. Vernix caseosa covers the skin and persists for 1 or 2 days

And internal:

1. Caput sussedaneum gradually disappears in about a day to about a week after birth

2. Meconium is completely excreted from the large intestine in the first 24 to 48 hours after birth

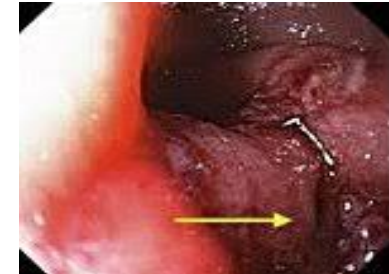
Establishment of Viability

Viability means the stage of maturity at which a foetus with normal intra uterine development is able to maintain a separate existence after birth in usual conditions. A child is viable after 210 days, or seven months but in most of these cases the foetus is immature.

11. Injury of a wall of pharynxes, larynxes, trachea, main bronchi, esophagus

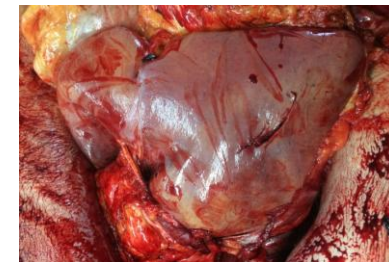
12. Closed hyoid fractures

13. Closed and opened injury of endocrine glands of the neck (thyroid, parathyroid, thymus)



14. Injury involving damage to pleura, pericardium, or mediastinum’s tissue

15. Damage to the abdominal wall with a penetration into the abdominal cavity



16. Opened fractures of diaphysis of humerus, femur, tibia:



17. Pelvic fracture

18. Severe shock, massive bloodloss, coma, gas/fat embolism

19. Injury of a major blood vessel

Grievous gravity criteria:

1. Life-threatening conditions or non-life-threatening conditions that have severe manifestations and consequences

Life-threatening severe trauma – is an injury that may cause a life-threatening conditions in clinical stage or after different amount of time

Non-life-threatening trauma – is an injury that are severe due to its manifestation and its end result/consequences

2. A stable loss of labour capacity of more than 33%

If the damage corresponds to a life-threatening sign, it is necessary to define whether it refers to the type of grievous physical injuries on the basis of danger to life. For this purpose an authorized list of such injuries is used.

Injuries considered being a Grievous trauma:

1. Opened and closed calvarial bones fractures

2. Opened and closed skull base fractures

Attantion! Fractures of facial bones are not in this group

3. Severe brain concussion



4. Isolated intracranial heamorrhage

5. Vertebrae's body fracture

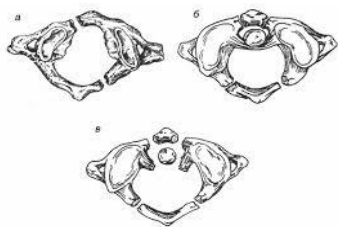
6. Onesided fracture of an arch of I or II cervical vertebrae or a fracture of a dens of axis

7. Cervical vertebrae dislocation

8. Closed injury of a cervical spinal cord

9. A fracture of one or a few pectoral or lumbar vertebrae

10. Closed injury of pectoral, lumbar or sacral segments for spinal cord



In forensic medical practice the viable infant is considered normally developed if it was born after VIII lunar months of pregnancy (the body length being more then 40 cm, the body weight being more then 1500 g).

Establishment of maturity and duration of intra-uterine life

The maturity of a foetus means such a degree of its physical development which provides readiness of organs and systems to extra-uterine life. The maturity is character by a complex of signs: the length and weight of the body, the sizes of the head, the condition of the skin, hair, nails, external genitals, umbilical cord, placenta focuses of ossification. A full term foetus is, as a rule, mature.

Signs of maturity:

1. Crown-heel length is more then 47 cm , crown- rump length is about 28-32 cm, head circumference is about 34-36 cm, and weight is about 2500 to 3500g, the female infant being usually about 100 g less in weight.

2. The head is wholly covered with hair about 2-3 cm in length .

3. The lanugo is seen only over the shoulders.

4. The limbs and the body are plump and the face has lost its wrinkles.

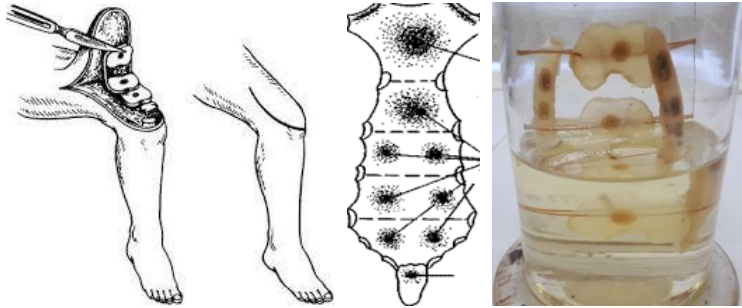
5. The papillary membrane is absent.

6. The cartilages have formed in the nose and the ears and nails project beyond the fingers tips and to the end of the toes.

7. The umbilicus is midway between sternum and symphysis.

8. Either the testicles have descended into the scrotum or the labia have closed the vulva.

9. The lower end of the femur shows a centre of ossification about 0.5-0.7 cm diameter (Beclards nuclei). A centre of ossification may be present in the sternum, cuboid and upper end of tibia:



Establishment of Live-Birth and Duration of Extra- Uterine Life

To solve the problem about live-birth means to find the proofs for extra-uterine life of the infant. Here, the main attribute is external breath. Hence , it is necessary to establish, whether the infant breathed.

Following birth, the process of aeration of lungs becomes operative and the pulmonary circulation becomes established. These two vital functions which occur at birth of a living child produce physical changes in the chest, lungs, and stomach and intestine. These changes are as follows (Table 1)

Causes of Death

Death of the foetus may be due to natural causes, and unnatural causes.

Natural causes:

1. Immaturity or general debility.
2. Malformations inconsistent with maintenance of life.
3. Diseases of the mother such as syphilis and specific fevers.
4. Diseases of the child affecting its lungs, heart and brain.
5. Haemorrhage from the umbilical cord, genital organs, stomach, rectum, ets.
6. Placenta praevia or abnormal gestation.
7. Neonatal infection.
8. Intra – partum or ante-partum anoxia
9. Cerebral birth trauma.
10. Erythroblastosis foetalis.
11. Spasm of the larynx from mucus,or meconium.
12. Pre-eclamptic toxemia.
13. Postmaturity.

Unnatural Causes.

These may be: Accidental and Criminal

Accidental:

During birth-

1. Prolonged labour;
2. Prolapse of the cord or pressure on the cord produces death by asphyxia;
3. Twisting of the cord round the neck causes strangulation;

3. Grievous gravity

Minor bodily injuries:

1. Minor bodily injury.

An injury causes mild transient consequences lasting for not more than 6 days.

2. Minor bodily injury causing short-lasting health disorder or insignificant loss of capability:

2.1. Minor trauma (longevity of health disorder lasts between 7 to 21 days).

2.2. Loss of general labour capacity is up to 10%.

If the damage does not meet the aforementioned criteria (signs), it is necessary to define whether it meets the criteria for simple physical injuries, which caused short-term health disorder and insignificant persistent loss of general work capacity (a short-term disorder of health for a period of 7 to 21 days, insignificant persistent loss of general work capacity up to 10%).

A short-term health disorder is the one that is directly connected to a damage whose duration exceeds 6 days but is less than 3 weeks (21 days).

Insignificant persistent loss of general work capacity implies a persistent loss of general work capacity up to 10%.

If injury does not meet the criteria mentioned above it is necessary to find out whether the criteria for simple physical injuries are present, which did not cause a short-term disorder of health (up to 6 days) and insignificant persistent disability.

A dangerous injury is a variety of grievous injury. It is an injury, which poses an immediate danger to life. It is either extensive or serious in relation to the organ or part wounded. The injury is fatal in the absence of surgical aid. Common examples of such injuries are: gun shot wounds, compound fractures of the skull, trauma to a large or important blood vessel, and rupture of some internal organ.

Medium gravity criteria:

1. Absence of life threatening trauma
2. A stable loss of one third of labour capacity (loss of labour capacity from 10 to 33%)
3. Long-lasting health disorder (over 3 weeks)

If the injury does not meet the criteria of grievous physical injuries, it is necessary to define whether it satisfies the criteria for injuries of moderate degree of gravity:

A long health disorder should be understood as consequences (diseases, dysfunctions, etc.) immediately following the injury with duration over 3 weeks (more than 21 days).

A considerably persistent disability by less than one third implies a loss of general work capacity from 10 up to 33 %.

3. The age of the injury can be determined.
4. Bruise may have a dirt or particles from subject, which may give a characteristics for subject.
5. Character and manner of injury may be known from its distribution:

- In throttling, crescentic bruise due to finger are found on the neck.
- In smothering bruise may be seen around the mouth and nose.
- In sexual assault, bruise may be found on the breasts, genitals, inside of the thighs and around the anus.
- Bruise on the face or body of the assailant indicate a struggle.
- In manual strangulation, the position and number of bruises and nail marks may give an indication of the method of attack or the position of the assailant.

The degree of gravity of bruise is light.

If necessary, the examined is referred to additional investigations, e.g., X-ray examination, and for consulting a doctor-specialist.

The findings of the examination and conclusions of advising doctor's are included in the research part of the composed document. In some cases the expert additionally asks for necessary initial medical documentation from medical establishments through the person who has ordered the examination. The expert can also assign the terms of repeated examination. Mostly it takes place when the consequences of damage are uncertain at the moment of initial examination. Thus, additional data obtained are also included in the research part with indication of the date of record. Drawing up the final part with conclusions.

The structure and volume of this part is determined by the set of questions that are to be solved by the expert. The answers to the following questions should be necessarily given:

1. Character of damages, their location and features;
2. The kind of object or ways by which damages are inflicted; the mechanism of their formation;
3. Time of inflicting damages, whether it corresponds to the facts of the matter;
4. Degree of gravity of physical injuries with definition of the qualifying sign.

Degree of Gravity of Physical Injuries

Physical injury is damage of anatomic integrity of tissues or dysfunction of organs due to mechanical, thermal, chemical and other external factors.

The definition of degree of gravity of physical injuries is stated in "Rules of forensic medical examinations (investigations)" (Kiev, 1995).

Judicial Classification of Trauma Severity:

1. Minor gravity
2. Medium gravity

4. Premature separation of placenta may also lead to death from asphyxia;
5. Injuries to the mother;
6. Death of the mother.

Table 1

Signs of Establishment of Respiration

Characteristics	Live-born Child	Still-born Child
Chest	Arched or drum shaped, its circumference greater than that of abdomen, and intercostal spaces wider	Flat, its circumference is less than that of abdomen, and intercostal spaces narrow
diaphragm	Level of the sixth or seventh rib	Level of the fourth or fifth rib
Lungs Position	Fill the thoracic cavity, overlapping heart and thymus gland, with taut covering pleura	Lying at the back of thoracic cavity behind heart and thymus gland, with wrinkled and loose covering pleura
Volume of lungs	Large	Normal or small
Margins of lungs	Rounded	Sharp
Colour of lungs	Mottled pink	Uniformly reddish-brown or deep-violet
Air vesicles (Optical Test 3v means of a magnifier)	On the surface of lungs, especially on edges, these are visible fine vesicles in the form of shining "pearl grains"	Expanded air vesicles not seen on surface
Appearance	Marbled due to expanded air vesicles	Smooth and not marbled
Consistency of lungs	Soft, spongy, elastic, crepitant	Dense, firm, liver-like, and non-j crepitant
Section of lungs	Abundant frothy blood exudes on section	Little froth less blood exudes on pressure
Hydrostatic Test (Galenus-Schreyer's Test)	Positive: expanded areas or whole floats in water	Negative: whole and parts sink in water
Static Test (Fodere's Test)	Ratio of weight of lung to body Less than 1:70 due to an increased flow of blood to the lungs and, therefore, the absolute weight of the lung is increased.	Ratio of weight of lung to body about 1:35
Microscopic picture of lungs	The bronchi, bronchioles and alveoli are well expanded. The alveoli lined by flattened epithelium; interalveolar septa are thin; elastic fibres are tense, argyrophilic fibres are pressed on edges of alveoli (argyrophilic membrane), in alveoli are hyaline membranes.	The bronchi, bronchioles are not expanded. The alveoli are completely atelectatic and lined by cuboidal epithelium. There are the thick interalveolar septa, twisted elastic fibres in the form of thick and short fascicle, thin twisted argyrophilic fibres.
X-ray investigation (Dillon's Test)	Positive: Presence of air in respiratory tract and lung tissue, and also in the digestive tract	Negative
Stomach-bowel Test (Breslau's Test)	Positive: Presence of air in the stomach and intestine	Negative

After birth:-

1. Mechanical asphyxia;
2. Accelerated labour.

Control Questions:

1. Peculiarity of forensic autopsy of infant corps.
2. The main question which being solving during examination?
3. Forensic medical examination of new-borns, establishment of live-birth of extra-uterine life.
4. Causes of violent death. Infanticide.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. Підручник. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Михайличенко Б.В., Ергард Н.М. Огляд трупа на місці його виявлення. *Метод.рек.* К.: УкрДГПІ, 2017. 24 с.
5. Кримінальний Кодекс України від 05.04.2001 №2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
6. Mykhailychenko B., Erhard N., Kubalya S. Early signs of death and late signs of death *Atlas*. K.: UkrSGRI, 2020. 38 p.
6. Mykhailychenko B., Erhard N., Kubalya S. Early signs of death and late signs of death *Atlas*. K.: UkrSGRI, 2020. 38 p.

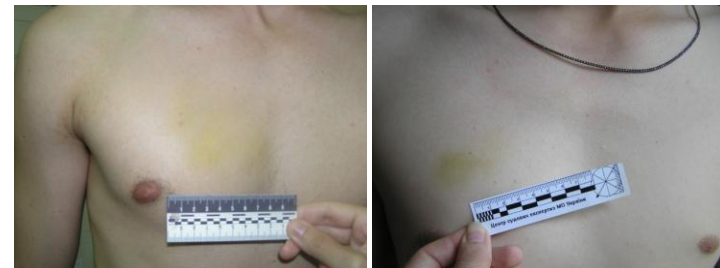
In few hours after inflicting Blue-purple because of haemoglobin leaves oxygen it used by surrounding tissues:



To 4-5 days: Brown (haemosiderin) – greenish (haemoglobin transforms into biliverdine):



To 6-8 days: Yellow (haemoglobin transforms into bilirubin):



In these period we can see Three-coloured bruise: on the periphery – brown-yellow, in the media part – greenish-brown, in the centre – blue-purple. Such bruise named old bruise.

To middle of 2-nd week: bruise disappear and skin has normal colour.

Medico-legal Importance

1. Bruise is a result of blunt subject action
2. In some cases they do not indicate the site of impact because of it movement under the weigh of blood.



In the left periocular area (*localization*) an uneven oval bruise (*shape*), which is 2×3 cm in size (*size*), with its center being blue-violet in color and sides having a shade of green (*color*).

Examples description sequence: «In the left periocular area (*localization*) an uneven oval bruise (*shape*), which is 2×3 cm in size (*size*), with its center being blue-violet in color and sides having a shade of green (*color*)»

«On the front surface of the upper third of the right thigh (*localization*) strip shaped bruise (*shape*), being 1,5×2 cm in size (*size*), greenish color in the center with a yellowish shade on the periphery (*color*)».

«On the back of the middle third of the left tibia (*localization*) oval shaped bruise (*shape*), being 1×1,5 cm in size (*size*), yellow in color (*color*)».

«On the lateral surface of the upper third of the right shoulder (*localization*) oval shaped bruise (*shape*), being 2×1,5 cm in size (*size*), yellow in color (*color*)».

«On the anterior surface of the chest on the right in the III intercostal space alongside the middle-clavicular line (*localization*) oval shaped bruise (*shape*), being 1,5×1,5 cm in size (*size*), greenish color in the center with a yellowish shade on the periphery (*color*)».

«On the back surface of the back on the left in the III intercostal space along the shoulder line (*localization*) oval shaped bruise (*shape*), being 1×1 cm in size (*size*), greenish color in the center with a yellowish shade on the periphery (*color*)».

«In the frontal area on the left, at a distance of 3 cm from the median line of the body and 1 cm from the body of the left eyebrow (*location*) oval shaped bruise (*shape*), being 1,5×1,5 cm in size (*size*), yellow in color (*color*)».

«In the left periocular area (*localization*) an uneven oval bruise (*shape*), which is 2×3 cm in size (*size*), with its center being blue-violet in color and sides having a shade of green (*color*)»

The colour change starts at the periphery and extends to the centre:

At first: Red or Purple because of haemoglobin is rich on oxygen (oxidative form).

PRACTICAL CLASS 6

FORENSIC MEDICAL TRAUMATOLOGY. BLUNT OBJECTS INJURIES

Ground of class: In many cases death of humans may be connected with mechanical injuries from blunt subjects. Beside that such injuries are inflicted to living persons who need in medical care. Therefore doctor of any speciality have to know sings of injuries from blunt subjects and have to be able to describe such injuries in medical documents.

Aim of class: to acquaint students with the forensic medical procedure for describing of injuries inflicted by blunt subjects and to teach them to diagnostics different kinds of such injuries.

The concrete aims of class:

1. To define kind of injury.
2. To describe the injury inflicted by mechanical force.
3. To define the cause of violent death.
4. To write out medical certificate of death.
5. To formulate questions for solving during forensic medical examination of corpse.

Material equipment of class:

1. Blanks of control tests in injuries inflicted by blunt subjects
2. Anatomical subjects of different kinds of mechanical injuries
3. Tables
4. Tasks

Plan of class:

1. Test-control of elementary level of student's knowledge.
2. Discussion in key questions of forensic traumatology.
3. Discussion in key questions of injuries inflicted by blunt subjects.
4. Independent work of students.
4. Control of final level of student's knowledge.

Main questions, which should know the Student:

- Key questions of forensic traumatology.
- Peculiarity of forensic medical describing of injuries.
- Signs of injuries inflicted by blunt subjects.
- Kinds of injuries inflicted by blunt subjects.
- Mechanism of trauma by blunt subjects.

Questions for Independent Student Work

1. Definition of injury. Classification of injuries according to causative factors. Anatomical and functional injuries, their difference.
2. Forensic medical describing of injuries.
3. Mechanical (physical) injuries. Characteristic of blunt objects according their surface.

4. Abrasions, mechanism of their inflicting. Stages of healing. Medico-legal significance.

5. Bruises (contusion), mechanism of their inflicting. Stages of healing, significance.

6. Lacerations, mechanism of their inflicting. Significance.

7. Bones fractures, and their morphological characteristic.

8. Signs of antemortem origin of injuries.

9. Head and brain injury. Intracranial haemorrhages.

10. Injuries at falling from a height – classification, signs of damages of internal organs.

11. Injuries at falling on a flat surface – kinds of falling. Localization of brain injury from falling of body on surface and from mechanical force on head.

Main terminology: Wound, injury, lesion, trauma, causative factors, mechanical or physical injuries, blunt subject, abrasion, bruise or contusion, laceration, fracture, origin of injuries, antemortem injury, head and brain injury, falling from a height, falling on a flat surface.

Main information

Trauma is a damage of morphological integrity of tissues or their physiological function under action of environmental factors.

There are such causative environmental factors: physical, chemical, biological, mental.

Physical factors are consist from mechanical (action of blunt and sharp subjects, mechanical asphyxia, gunshot injuries), extreme temperatures, technic and atmosphere electric current, barometric pressure, ionizing radiation.

Chemical burn is occurs after local action of chemical factor.

Poisoning is occurs after general action of chemical factor.

Biological factor of environment consist of action of bacteria, fungus, viruses, prions.

The main peculiarity of these causative factors is the possibility to determine the result of action. But the result of action of mental factor we cannot determine during medico-legal investigation because of absent a proving signs – morphological and biochemical.

Anatomical and functional damages are occur under environmental factors.

Anatomical damage manifests by morphological changes which we can determine by visual or microscopic. But functional damage have not morphological changes. They can determine only biochemically or clinically.

These **are some kinds** of injuries produced by application of mechanical blunt force:

1. Abrasion

intact surrounding skin with a certain peripheral detachment (location of the crust)».

«On the front of a left knee (*location*) lineal abrasion (*shape*), 1,5×2 cm in size (*size*), abrasion's surface is covered with a crust brown in color (*color*), placed on the level of undamaged surrounding skin (*crust's level*)».

The healing of abrasion in living person is a time-depending process that indicates as vitality and timing of injuries.

After action of blunt subject the damaging surface is covered by exudation of lymph and blood.

In a few hours becomes dry because of produce a protective covering known as a scab or crust.

Before 12 hours the scab places lower surrounding undamaged skin.

From 12 to 24 hours it places on level of undamaged skin

After 24 hours it places higher surrounding skin.

The reason of these process is connected with the developing oedema of damaging skin.

After 4-5 days of inflicting – the scab begin to fall off from peripheral side because of regeneration.

To 9-12 days scab falls off completely and we can see pink or brown spot in these place.

Medico-legal significance of abrasions:

1. Abrasion is a result of blunt subject action

2. They indicate the site of impact.

3. They indicate the direction of the acting force.

4. The age of the injury can be determined.

5. In abrasion may have a dirt or particles from subject, which may give a characteristics for subject.

6. Character and manner of injury may be known from its distribution:

– In throttling, crescentic abrasions due to fingernails are found on the neck.

– In smothering abrasions may be seen around the mouth and nose.

– In sexual assault, abrasions may be found on the breasts, genitals, inside of the thighs and around the anus.

– Abrasions on the face or body of the assailant indicate a struggle.

– Abrasions on the victim's body may show whether the fingernails of the assailant were long, irregular, or broken.

7. The degree of gravity of abrasion is light.

Bruise description sequence:

1. Localization

2. Shape

3. Size

4. Color

- Form of injury (linear, round, oval, triangular, square, rectangular, irregular, etc.)
- Size of injury (depending on the form) in centimetres; the depth of the wound is determined by the character of tissue forming its bottom.
- Quantity of physical injuries, their interposition, and height relative to the ft person's body height.
- Characteristics of injury (abrasion, bruise, wound, fracture): colour, character of crust covering a graze (colour, density, level of the surface in relation to surrounding skin), character of the wound edges (even, uneven, excoriated, crushed), angles or ends of the wound (sharp, blunt, "IF", "M"-shaped, or rounded), availability of septa, pus, granulation, hair bridges, foreign bodies.

Abrasion description sequence:

1. Location
2. Shape
3. Size
4. Color
5. Crust's level



On the front of a left knee (*location*) lineal abrasion (*shape*), 1,5×2 cm in size (*size*), abrasion's surface is covered with a crust brown in color (*color*), placed on the level of undamaged surrounding skin (*crust's level*).

Examples of abrasion description sequence:

«On the front of a left knee (*location*) lineal abrasion (*shape*), 1,5×2 cm in size (*size*), abrasion's surface is covered with a crust brown in color (*color*), placed on the level of undamaged surrounding skin (*crust's level*)».

«On the front surface of the upper third of the right thigh (*localization*), a strip shaped abrasion (*shape*), being 1,5×2 cm in size (*size*), the surface of the abrasion is covered with a crust of brown color (*color*), located at the level of the intact surrounding skin (*location of the crust*)».

«On the back of the middle third of the left shin (*localization*) of a strip shaped abrasion (*shape*), 1×1,5 cm (in size), the surface of the abrasion is covered with a crust of brown color (*color*) located above the level of the

2. Bruise or contusion
3. Laceration
4. Fracture or dislocation of a bone, ribs or joint

Blunt objects and its contact-striking surface may have:

- flat limited striking surface
- flat unlimited striking surface,
- rounded surface (cylinder, ball)
- surface with an edge
- uncertain striking surface.

Their surface contacts with the body by:

- a blow,
- a squeezing,
- a tension,
- a friction.

At Blow the force of subject directs (akts) like face to face. The time of these action is min.

At squeezing the force of subject directs like face to face too, but the time of these action is more than min, for a long time.

At tension the force of subject directs opposite for a some long time.

At friction the surface one subject moves relatively another subject under coner.

These are **some kinds of injuries** produced by application of mechanical force - blunt force:

1. Abrasion;
2. Bruise or contusion;
3. Laceration;
4. Fracture or dislocation of a bone, tooth, or joint.

Abrasions



Abrasion is a destruction of the skin that usually involves the superficial layers of the epidermis only.

Abrasion is caused by friction of blunt subject. If sufficient friction is applied, partial or complete removal of the epidermis may occur, and the superficial layer of dermis is damaged.

Abrasions vary in size. These are simple injuries, bleed slightly, and heal rapidly without scar formation. Large abrasions can cause severe pain and bleeding.

Abrasions are of four types.

Scratches are caused by a some blunt and sharp object passing across the skin, such as, fingernails, pins, or thorns.

The surface layers of the skin are collected in front of the object, which leaves a clean area at the start and tags at the end.

Sharp fin gennails produce a scratch that usually is curved, wide at the start, arid, narrow at the end. A thorn or pin produces a narrow scratch, which tails off.

Abrasions (sliding, scraping, or grinding abrasions) are the most common type. They occur when there is **movement between the skin and some rough surface** in contact with it. They show longitudinal parallel lines (grooves or furrows) with the epithelium collected at the ends of these lines, which indicate the direction in which the force was applied. The furrow may be broad at one end and narrow in the opposite direction. A glancing kick with a boot also produces a graze. These abrasions are commonly seen in a road accident. An abrasion caused by violent rubbing against a broad rough surface, as in dragging over the ground is called brush burn.

Pressure Abrasions (crushing or friction abrasions) are caused by crushing of the superficial layers of the epidermis and associated with a bruise of the surrounding area. Here, the movement is slight and largely directed inwards.

Impact Abrasions (contact or imprint abrasions) are caused by impact with a rough (raf – шершавий) object, when the force is applied at or near a right angle to the skin surface, such as when a person is knocked down by a motor car. In such cases, the pattern of the radiator grill, headlamp rim, or the tread of a tyre may be seen on the skin. Impact and pressure abrasions reproduce the pattern of the object causing them and are called patterned abrasions

Superficial epithelium is collected at the end of moving subject and indicates **the direction** in which the force was applied.

The healing of abrasion in living person is a time-depending process that indicates as vitality and timing of injuries.

After action of blunt subject the damaging surface is covered by exudation of lymph and blood.

In a few hours becomes dry because of produce a protective covering known as a scab or crust.

Before 12 hours the scab places lower surrounding undamaged skin.

From 12 to 24 hours it places on level of undamaged skin

After 24 hours it places higher surrounding skin.

The reason of these process is connected with the developing oedema of

Main Information

Examination of living persons is carried out at the department of forensic medical examination of victims, accused and other persons or in regional (inter-district) departments of Regional Bureau of Forensic Medical Examination (FME). In some cases examination can be carried out in medical establishments, imprisonment institutions, in court, or at the person's residence place in presence of a representative of legal investigating bodies.

A person who has addressed the bureau of FME concerning physical injury for definition of degree of gravity of physical injury should have a written official letter of legal investigating bodies about the purpose of examination (investigator's order, court decision) or an identity card. Examination of persons under 16 is carried out in presence of their parents, trustees or teachers.

Method of Forensic Medical Examination of Living Persons as for Definition of Degree of Gravity of Physical Injuries

This includes some consecutive stages:

a) Acquaintance with the decision on the purpose of FME or referral to forensic medical examination and documents certifying identity (their presence is obligatory).

b) Filling in the register and the introductory part of "Conclusion of Expert".

c) Finding out the circumstances of the case and filling in the corresponding part of "Conclusion of Expert".

Features of Medico-Legal Anamnesis:

The basic questions that the expert is interested in at interrogation of the victim are as follows:

– When (date, time)?

– Where (at home, in a street, etc.)?

– Who (number of attackers, their sex, age, etc.)?

– What was done and what instrument with? How many times was the damage inflicted? ("he was struck on the head with a stick 2 times", etc.);

– When and where did the victim address for medical aid?

– Complaints in process of examination.

The expert should avoid questioning whether loss of consciousness, deterioration of vision, hearing, etc. took place:

d) Collecting objective data and filling in the investigating part of the document that is being made.

The expert particularly and consistently describes the injuries from top to bottom and from the right to the left according to the following scheme:

– Location of injury (specifying the anatomic site, distance from anatomic points, and certain reference points).

– Character of injury (abrasion, bruise, wound, fracture).

Plan:

1. Control test of initial level of knowledge on the topic.
2. Discussion of the key questions.
3. Independent work of students under teacher's supervision on advising patients at the outpatient department.
4. Situational tasks solving.
5. Concluding remarks to the teacher.

Main questions, which the student should know:

- degrees of gravity of physical injuries and their qualification signs;
- method of carrying out examination of the victim;
- diagnostic parameters at carrying out examination as for disputable sexual conditions and sexual crimes, definition of age.

During the Practical Class, the Student should acquire the following Skills and he able to:

- carry out interrogation of the examined person and to receive the necessary general and special anamnesis data on a concrete case of examination;
- carry out inspection of the examined person and to fill in the legal part of "Conclusion of Expert" with the received data;
- describe physical injury;
- determine degree of gravity of physical injury, mechanism and time of its occurrence on the basis of both victim's examination and medical documentation;
- draw medico-legal documentation in case of carrying out forensic medical examination or examination of the victim.

Questions for Student's Independent Work:

1. Grounds for carrying out forensic medical examination of living persons.
2. Problems solved at examination of physical injuries.
3. Features of medico-legal anamnesis.
4. Classification and criteria of degree of gravity of physical injuries.
5. Forensic medical examination of the health state.
6. Features and methods of carrying out examination concerning disputable sexual conditions.
7. Features and methods of carrying out examination concerning sexual crimes.
8. Medico-legal definition of age.

Main terminology: living person, degree of gravity of physical injuries, permanent disfigurement of face, simulation, dissimulation, aggravation, health state, self-harm, self-mutilation, disputable sexual condition, sexual crimes, breast-feeding, virginity, rape, lecherous actions, sexual intercourse, fertilization, sexual reproductive ability.

damaging skin.

After 4-5 days of inflicting – the scab begin to fall off from peripheral side because of regeneration.

To 9-12 days scab falls off completely and we can see pink or brown spot in these place.

Medico-legal significance of abrasions:

1. Abrasion is a result of blunt subject action
2. They indicate the site of impact.
3. They indicate the direction of the acting force.
4. The age of the injury can be determined.
5. In abrasion may have a dirt or particles from subject, which may give a characteristics for subject.
6. Character and manner of injury may be known from its distribution:
 - In throttling, crescentic abrasions due to fingernails are found on the neck.
 - In smothering abrasions may be seen around the mouth and nose.
 - In sexual assault, abrasions may be found on the breasts, genitals, inside of the thighs and around the anus.
 - Abrasions on the face or body of the assailant indicate a struggle.
 - Abrasions on the victim's body may show whether the fingernails of the assailant were long, irregular, or broken.
7. The degree of gravity of abrasion is light.

Bruises

Bruise is an effusion of blood into the tissues due to rupture of blood vessels caused by the action of any blunt object (stone, stick, bar, whip, boot, etc).

The bruise is usually located in the subcutaneous tissues, often in the fat layer.

In contusion, there is no destruction of the skin.

Contusion is usually a superficial injury, but also occurs in deeper structures and viscera.

Bruises may be seen in association with abrasions (abraded contusions) or lacerations.

Bruises may appear after trauma and during disease.

Main characteristics of bruise

1. It can appear not immediately after trauma in case when the deep vessels were damaged.

2. In some cases it form may have the signs of striking subject.

3. Sometimes bruises do not always appear at the site of impact. Bruises around the eyes may move under the weight of blood lower of inflicting place and so the place where bruise is situated not correspond to striking place.

4. In living persons the bruises change their colour. These process named flowering.

A fresh bruise is usually soft and slightly raised above the surface of the skin, and even a deep-seated bruise shows some swelling when compared with the opposite limb or part of the body.

Size: Bruises vary in size from like point to some area. The size of a bruise is slightly larger than the surface of the agent, which caused it.

When a large blood vessel is injured, a tumour-like mass called *haematoma* is formed.

Patterned Bruising: The bruise is usually round or oval, but it may indicate the nature of the weapon used. A blow with a solid body, such as a hammer or a closed fist usually produces a rounded bruise.

Age and Sex: Children bruise easier because of softer tissues and delicate skin, old persons bruise easily because of loss of flesh and cardiovascular changes.

Women bruise easier than men because female tissues are more delicate and subcutaneous fat is larger.

Colour of Skin: Bruising is more clearly seen in fair-skinned persons than in those with dark skin. Bruising in persons with dark skin must be investigated in ultraviolet rays.

Delayed Bruising:

A superficial bruise appears immediately as a dark red swelling.

A deep bruise may take several hours, or 1 or 2 days to appear, and deeper extravasation of blood may never appear. Therefore, another examination should be carried out 48 hours after the first examination, to note bruises of slower development.

Occasionally, when an injury is produced before death, the bruise may appear sometime after death, due to further escape of blood from the ruptured vessels due to gravitation, and rapid haemolysis of stagnant blood, the pigment diffusing locally and producing a stain on the surface; This may explain the difference of opinion between two observers who have examined the person or the body at different times.

PRACTICAL CLASS 8

FORENSIC MEDICAL EXAMINATION OF LIVING PERSONS

Urgency: Examination of living persons is carried out by the medico-legal expert according to the legislation in force and is necessarily ordered for establishment of gravity and character of physical injuries, sexual maturity, and age of suspected, accused and other individuals. Besides, forensic medical examination is carried out in the case of sexual abuse to establish the percentage of persistent loss of general work capacity, determine disputable sexual conditions, state of health, degree of alcoholic intoxication, as well as solve some other questions. If the medico-legal expert cannot be involved in examination, forensic medical investigatory bodies invite a doctor of other speciality.

Being physically injured, the victims frequently address for medical assistance, in this connection a complete and correct history taking or filling in an out-patient card is of great significance as these data are used for further forensic medical examination. Doctors can be members of commission on forensic medical examination for different reasons. Due to this doctors should know the bases of forensic medical examination of living persons.

Forensic medical examination (investigation) concerning disputable sexual conditions or sexual crimes is frequent in forensic medical expert practice. Conclusions of the expert are of great importance for correct subsequent legal qualification of the cases under examination. Forensic medical examination concerning disputable sexual conditions and sexual crimes should be carried out by a commission with involvement of doctors of various clinical specialities. Therefore, the knowledge of features of carrying out such examinations and legal consequences of the solved questions are necessary for doctors of various specialities.

Aims: to acquaint students with the organization of forensic medical examination of living persons, the legal procedures and the normative-legal acts regulation.

The specific aim: to teach students the method and features of carrying out forensic medical examination of victims, accused and other persons for definition of the degree of gravity of physical injuries, acquaint students with the features and methods of carrying out forensic medical examinations concerning disputable sexual conditions, sexual crimes, definition of age.

Equipment:

1. Macro- and micropreparates.
2. Tables, slides.
3. Control tests.

ступеня тяжкості тілесних ушкоджень потерпілих, звинувачених та інших осіб. *Метод.рек.* К.: УкрДГПІ, 2017. 24 с.

7. Mikchaylichenko B., Erhard N., Biliakov A. Macroreparation of bodily injury for practical training from forensic medicine. *Methodical recommendation.* К: УкрДГПІ, 2019. 32 р.

8. Михайличенко Б.В., Ергард Н.М. Практикум для самостійної підготовки студентів з навчальної дисципліни «Судова медицина». *Метод. рек.* К.: УкрДГПІ, 2017. 44 с.

Age of Bruise

A bruise heals by destruction and removal of the extravasated blood. The haemoglobin is broken down into haemosiderin, haematoidin, biliverdine and bilirubin by the action of enzymes.

The colour change starts at the periphery and extends to the centre:

At first: Red or Purple because of haemoglobin is rich on oxygen (oxidative form).

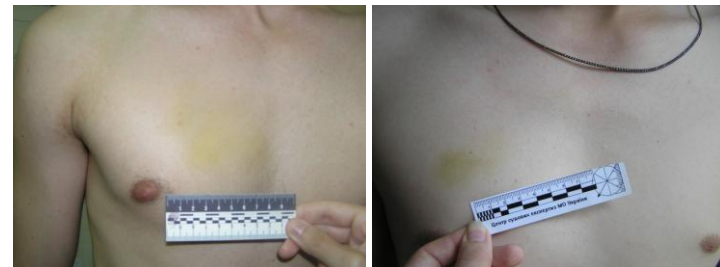
In few hours after inflicting Blue-purple because of haemoglobin leaves oxygen (it used by surrounding tissues:



To 3-5 days: Brown (haemosiderin) – greenish (haemoglobin transforms into biliverdine):



To 6-8 days: Yellow (haemoglobin transforms into bilirubin):



In these period we can see Three-coloured bruise: on the periphery – brown-yellow, in the media part - greenish-brown, in the centre - blue-purple. Such bruise named old bruise.

To middle of 2-nd week: bruise disappear and skin has normal colour.

Ante-mortem and Post-mortem Bruising

In ante-mortem bruising, (1) swelling, (2) damage to epithelium, (3) extravasation, (4) coagulation, (5) infiltration of tissue with blood cells and colour changes are observed.

These signs are absent in post-mortem bruises. The margins of post-mortem bruises are usually quite sharply defined, ante-mortem bruises are mostly less sharp or indistinct, which indicate vital reaction in the damaged tissue.

Medico-legal Importance

1. Bruise is a result of blunt subject action
2. In some cases they do not indicate the site of impact because of it movement under the weigh of blood.
3. The age of the injury can be determined.
4. Bruise may have a dirt or particles from subject, which may give a characteristics for subject.
5. Character and manner of injury may be known from its distribution:
 - In throttling, crescentic bruise due to finger are found on the neck.
 - In smothering bruise may be seen around the mouth and nose.
 - In sexual assault, bruise may be found on the breasts, genitals, inside of the thighs and around the anus.
 - Bruise on the face or body of the assailant indicate a struggle.
 - In manual strangulation, the position and number of bruises and nail marks may give an indication of the method of attack or the position of the as sailant.

The degree of gravity of bruise is light.

Deep Tissue and Organ Contusions

All organs can be contused by blunt force.

Contusions in vital centres, e.g., controlling the respiration and blood pressure, can be fatal, even when very small.

A small contusion of the heart can cause serious disturbance of normal rhythm or stoppage of cardiac action and death. Large contusions often prevent adequate cardiac emptying and lead to heart failure.

Contusions of other organs may cause rupture of that organ with slow or rapid bleeding into the body cavity and may cause death.

Contused and Lacerations wound

Wound is a damage of skin on the whole thickness or deeper.

In wound the generating area of skin involves into traumatic process which leads to scar formation.

Wound are appear after blunt action too. They are called as "contused

7. Bones fractures, and their morphological characteristic.
8. Sings of antemortem origion of injuries.
9. Head and brain injury. Intracranial haemorrhages.
10. Injuries at falling from a height – classification, sings of damages of internal organs.
11. Injuries at falling on a flat surface – kinds of falling. Localization of brain injury from falling of body on surface and from mechanical force on head.
12. Difinition traumatism and it kinds.
13. Definition transport trauma and its classification.
14. Trauma sustained from collision of moving car with pedesrain, phases of trauma and main injuries. Medico-legal significance of bumper-fracture.
15. Trauma made by run over the body with a wheel of a vehicle – phases of injury and main mechanism causing injuries. Signs of these kind of trauma. Medico-legal significance of tread pattern mark.
16. Railway trauma and it peculiarity.
17. Aircraft trauma and it medico-legal peculiarities.
18. Kinds of sharp subjects and injuries they inflict.
19. Morphological signs of cutting,
20. Morphological signs of stabbing,
21. Morphological signs of stabbing-cutting,
22. Morphological signs of chopping.
23. Age of wound and antemortem or postmortem origion of wounds.
24. Causes of death from sharp subjects.
25. Signs of injuries, which were inflicted by own hand.

References

1. Babanin A.A., Belovitsky O.V., Skrebkova O.Yu. Forensic medicine. *Textbook*. Simferopol, 2007. P. 7-14.
2. Михайличенко Б.В. Судова медицина. *Підручник*. К.: ВСВ «Медицина», 2011. 447 с.
2. Наказ Міністерства охорони здоров'я України № 6 від 17.01.1995 року «Про розвиток та вдосконалення судово-медичної служби України».
3. Mykhailychenko B., Biliakov A., Savka I. Forensic medicine. *Textbook*. Kyiv: AUS Medicine Publishing, 2017. 223 p.
4. Erhard N. Forensics examination of a living person on the trauma severity. Defining state of health. Examination of disputable sexual states and sexual assault *Methodical recommendation*. К: УкрДГПІ, 2019. 28 p.
5. Кримінальний Кодекс України від 05.04.2001 № 2341-III: URL: <http://zakon5.rada.gov.ua/laws/show/2341-14>
6. Михайличенко Б.В., Ергард Н.М. Судово-медичне визначення

4. Combination of sharp edge and sharp end
5. Large weight (heavy weapon)

11. Chopped wound has such characteristics:

1. Bone is not damaged
2. The margins show bruising
3. Bone is damaged in all cases
4. The margins show slight abrasion
5. Application of substances from surface of sharp object around the

wound

12. Incised-stab wound is produced object, having:

1. Sharp blade
2. Sharp end only
3. Combination of sharp edge and sharp end
4. Sharp edge only
5. Large weight

13. The tailing of the cut wound indicates the direction in which the cut was made

- Yes
- No

14. Self-inflicted wounds have such signs as follows:

1. They are multiple
2. The direction of wound canal corresponds to comfortable position of own hand
3. Placed on one area
4. They are uniform in direction
5. They are parallel to each other

15. The causes of death due to wounds may be:

1. Haemorrhage
2. Sudden death
3. Air Embolism
4. Fat Embolism
5. Blood aspiration (mechanical asphyxia)

Control Questions:

1. Definition of injury. Classification of injuries according to causative factors. Anatomical and functional injuries, their difference.
2. Forensic medical describing of injuries.
3. Mechanical (physical) injuries. Characteristic of blunt objects according their surface. 4. Abrasions, mechanism of their inflicting. Stages of healing. Medico-legal significance.
5. Bruises (contusion), mechanism of their inflicting. Stages of healing, significance.
6. Lacerations, mechanism of their inflicting. Significance.

laceration" (laceration, tears or ruptures). If a blunt force produces extensive bruising and laceration of deeper tissues it is called crushing injury.



Types

1. Split Contused: Splitting occurs by crushing of the skin between two hard objects.

Lacerations over bone may simulate incised wounds.

2. Stretch Contused: Overstretching of the skin if it is fixed will cause laceration. There is a local pressure with pull, which increases until tearing occurs and produces a flap. This is seen in cases of run-over by a motor vehicle, and the flap may indicate the direction of the vehicle's movement.

3. Avulsive Wound produced by sufficient force (shearing force) applied at an acute angle to detach (tear off) a portion of the traumatized surface of an organ from its attachment.

The shearing and grinding force produced by a weight, such as a lorry wheel passing over a limb, may cause separation of the skin from the underlying tissues (avulsion) over a relatively large area. This is called "flaying". The underlying muscles are crushed, and the bones may be fractured. The separated skin may show extensive abrasions from the rotating frictional effect of the tyre.

4. Lacerations: rupture of the skin and tissues can occur from impact by or against irregular or semi-sharp objects, such as the door handle of a car. This is another form of overstretching.

The object causing a lacerated wound crushes and stretches a broad area of skin, which then splits in the centre.

The edges are irregular and rough because of the forcing and tearing nature of the blunt trauma.

Frequently, the margins are abraded due to the flatter portion of the striking object rubbing against the skin, as it is indented by a forceful blow.

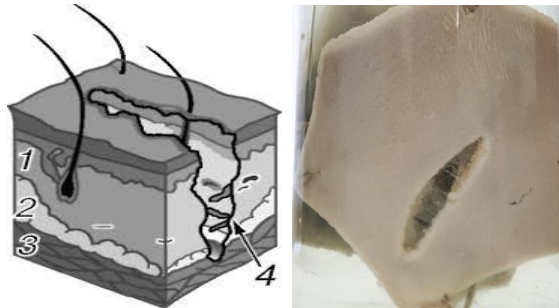
The margins are contused due to bleeding into the tissues caused by trauma.

Lacerations of the internal organs may be *caused by*: (1) direct injury of the internal tissues by fragments of fractured bone, (2) development of traction shears or strain shears in the viscera, (3) stretching of the visceral

attachments, and (4) hydrostatic forces.

Characteristics

1. Form of wound may corresponds to blunt subject
2. Margins are irregular, ragged, arid, uneven, and their ends are pointed or blunt, but show minute tears in the margins. The edges of laceration, especially over a bony area, e.g. the skull, are undermined due to the crushing and tearing force of the impact.
3. Bruising of margins occurs in peripheral zone of injury.
4. Deeper tissues may be damaged too.
5. At the bottom of the wound obviously must be elastic and connective tissue fibres named as **tissue intersections**.



6. Hair bulbs are crushed.
7. Hair and epidermal tags may be driven deeply into the wound.
8. Haemorrhage is less because the arteries are crushed and torn across irregularly, and thus retracts and the blood clots readily.
9. Foreign matter may be found in the wound.
10. The skin on the side of the wound opposite to the motion direction is usually torn free or undermined for a variable distance

Ante-mortem Lacerations show

- bruising of margins,
- vital reaction,
- eversion and gaping of the margins.

Medico-legal Importance

1. The type of laceration may indicate the cause of the injury and the shape of the blunt weapon.
2. Foreign bodies found in the wound may indicate the circumstances in which the crime has been committed.
3. The age of the injury can be determined.
4. The degree of wound is light which leads to transitory disturbance of health.

Bone fractures

Bone fractures occur after action of blunt subject. They may be opened

4. The mechanism of incised wound inflicting consist of:

1. Moving of sharp object
2. Cutting by sharp blade of object
3. Pressing of sharp object
4. Tension of object
5. Blow of object

5. In incised wound:

1. Its length is longer than depth
2. Shape is usually spindle-shaped
3. May be greater retraction of the edges in the centre than in .
4. The gaping of margins is larger if cutting is perpendicular to connective tissues fibres.
5. The gaping of margins is not large if cutting is parallel to connective tissues fibres.

6. Stab wound produced by object which has:

1. Sharp end only
2. Sharp edge only
3. Combination of sharp edge and sharp end
4. Some length
5. Some corner

7. The mechanism of stab wound consist of:

1. Stabbing into depth of tissue
2. Cutting by sharp blade of object
3. Moving of sharp object
4. Pressing of sharp object into depth
5. Moving into depth of tissue

8. Stab wound has such morphological parts:

1. Wound of entrance
2. Tissue intersections
3. Wound exit in all cases
4. May be wound exit
5. Wound canal

9. In Stab wound:

1. Margin is clean-cut
2. Have narrow abrasion around the entrance of wound
3. Wound entrance has the Shape corresponding to object
4. Application of substances from surface of sharp object around the entrance of wound
5. Depth is the larger than length on skin

10. Chopped wound inflicted object, having:

1. Flat limited surface
2. Sharp blade
3. A sharp-cutting edge

1. Immediate Causes

1. Haemorrhage.
2. Mechanical Injury to a Vital Organ.
3. Shock.

Types:

– Haemorrhagic shock: This occurs when the blood loss is sufficient to impair peripheral perfusion that produces a sufficient degree of systemic anoxia. Loss of 10 to 40% of the total blood volume produces shock.

- Traumatic or wound shock.
- Reflex Vagal Inhibition.
- Embolism (Air, Fat, Tissue).

2. Remote Causes

1. Infection.
2. Gangrene or Necrosis.
3. Crush Syndrome.
4. Neglect of Injured Person.
5. Surgical Operation.
6. Natural Disease.
7. Fibrous scar tissue formed due to healing may contract and produce complications, e.g., fibrous scar in a hollow muscular organ may produce stricture and obstruction.
8. Thrombosis and Thromboembolism.

Control tests:

1. Sharp object has such characteristics:

1. Thin edge
2. Sharp edge
3. Flat limited surface
4. Sharp end
5. Sharp edge and sharp end simultaneously

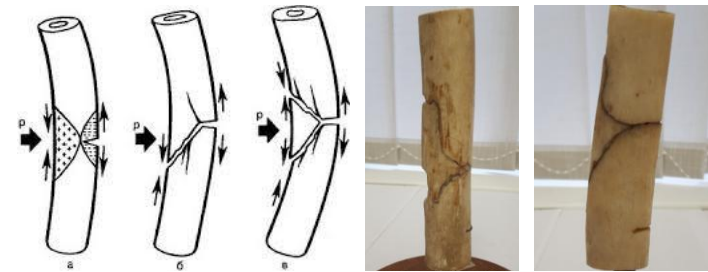
2. Sharp objects can produced such injuries:

1. Lacerations
2. Stab wound
3. Incised-stab wound
4. Chopped wound
5. Incised wound

3. An incised wound is inflicted by object which has:

1. Sharp edge and sharp end simultaneously
2. Sharp end only
3. Sharp edge only
4. Flat thin limited surface
5. Flat thin limited surface and Sharp edge only

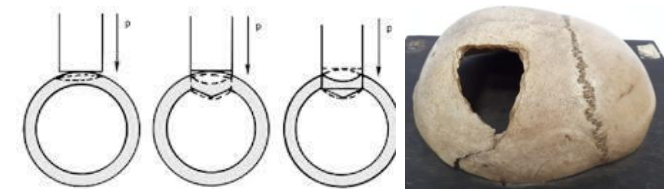
if it contact with environment, and closed. They may occur at impacting place (**direct**) or in place which situated in opposite side (**indirect**).



Bone is damaged under impact and bending. Accordingly biological regularity the bone stands the squeezing (compression) but does not stand the tension. The bone begins damaged in place where is it a tension.

Peculiarity of skull bones damaging:

1. Under the powerful action of blunt subject which has flat limited striking surface (about 9-16 cm sq) the bone fracture of skull will be (holing). The form of these hole will correspond to the form of subject and so we can determine (identify) this subject:



2. Under the powerful action of blunt subject which has flat unlimited striking surface the bone fracture of skull will be plural fissured (lining or will have one line):



3. Under the non powerful action of blunt subject which has striking surface with edge the bone fracture of skull will be depressed. The form of these edge will correspond to the form of subject and so we can determine (identify) this subject:



4. Under the non powerful some actions of blunt subject which has flat limited striking surface or surface with edge the bone fracture of skull will be stepping:



5. The line of bone fracture directs to the side where the force acts:



A clean, incised, surgical wound normally heals in about a week and a definite scar appears in about two weeks. The scar forms earlier in smaller wounds than in large ones. It forms quickly in the process of healing by first intention and is delayed in the presence of sepsis. Scar formation is earlier in a vascular area as compared to an avascular one. In addition, it is earlier in young and healthy persons as compared to old and undernourished ones.

Ante-mortem or Post-mortem Wound

Injuries inflicted shortly before death cannot be differentiated from those inflicted shortly after death. Wounds sustained shortly before death are not always associated with thrombosis or fibrin deposition. Absence of swelling does not exclude ante-mortem injury. The physical components of vital reaction are swelling, effusion of lymph, leucocytic infiltration, pus formation or evidence of repair. These changes are not seen within 8 hours of injury by physical, histological and biochemical methods.

In trauma to the living tissue, two zones are marked around the wound: (1) close to the edge of the wound, there is decreasing enzyme activity, possibly as an early sign of imminent necrosis; (2) a deep peripheral zone that shows an increase in enzyme activity being possibly a defence mechanism.

Within a few minutes after the injury, dilatation of the capillaries and migration of leucocytes can be seen. Emigration of leucocytes occurs within an hour. Monocytes appear in the exudate after 12 hours. In aseptic inflammation, the maximum exudate is found within 48 hours. In an infected wound, pus may be seen after 36 hours. Reactive changes in the tissue histiocytes and swelling of the vascular endothelium can be seen within an hour after injury. At the site of injury, the fibroblasts show reactive changes within a few hours. Mitotic division is seen in fibroblasts about 15 hours after the injury. Vascularised granulation tissue develops in 11 hours. New collagen fibrils are formed within 4 or 5 days.



The causes of death due to wounds are:

1. Immediate or direct.
2. Remote or indirect.

bones, and the joints may be separated or disarticulated. Wounds on the head and trunk are usually associated with injuries to important structures and are fatal. The cranium may be depressed, but if the blow is a glancing one, a fragment of the skull may be removed. The neck may be almost completely separated.

Most of these injuries are homicidal and usually inflicted on the head, face, neck, shoulders, and extremities. Accidental injuries are caused by power fans, band saws, or ship propellers, which may lacerate the soft tissues extensively or amputate parts of the body. Suicidal injuries of this type are rare.

Wound Healing (Age of Wound)

The morphological sequences of wound healing can be divided into four periods:

1. The phase of traumatic inflammation which lasts from 1 to 3 days after wounding, characterized by the appearance of fibrin and dilated capillaries,
2. The destructive phase, from 4 to 6 days, characterized by presence of numerous leucocytes and macrophages,
3. The proliferative phase, from 4 to 14 days, characterized by fibroblasts around capillaries and some metachromasia of tissue ground substance;
4. The phase of maturation setting gradually over many months, in which collagen is found with a decrease in the number of fibroblasts and a progressive increase in tensile strength of the wound. An educated estimate is the best that can be expected.

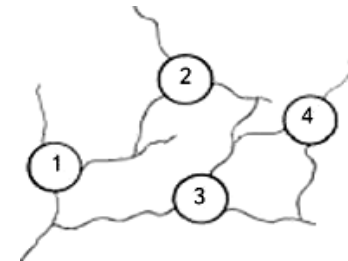
Scar tissue is formed in 1-2 weeks.

The approximate age of a scar can be estimated by its ageing phase:

1. Depending on vascularity, a recently formed scar may appear reddish or bluish. It is tender and soft. The age of such a scar is up to 2 weeks.
2. As the vascularity diminishes, the scar becomes pale and white but is still tender and soft. Its age is up to 2 months.
3. With time, the scar contracts. It becomes smaller and whiter but is still a little tender and soft. The age is between 2 to 6 months.
4. As the scar contracts further, it becomes tough, white, and glistening. The probable age is not less than 6 months to an indefinite number of years.



6. If there are some lines of bone fractures we can determine what was the order of their inflicting. The rule is: line from next fracture does not cross the line from first fracture:



Control tests:

1. Injury has such characteristics:

1. Violation of morphological integrity of any tissue
2. It is a result of any disease
3. It is a result of action of environmental factors
4. Violation of physiological function of any tissue
5. It is a result of trauma

2. What is the difference between injury and trauma?

1. Trauma is violation of morphological integrity of tissue only
2. Injury is superficial trauma
3. Injury and trauma are the synonyms
4. Trauma is a deeper than injury
5. Trauma is violation of physiological function of any tissue only

3 Any injury is a result of action of any causative environmental factor on human

Organism

- Yes
- No

4. Causative environmental factors are following

1. Mechanical
2. Physical
3. Mental
4. Chemical
5. Biological

5. Physical environmental factors of surrounding may be like:

1. Action of high or low temperature
2. Action of high or low barometric pressure
3. Action of mechanical object
4. Action of electricity (atmosphere or technique)
5. Action of ionizing radiation

6. Anatomical injury has following characteristics:

1. Can be determine by visually
2. Visually morphological violation is absent
3. Can be determine by instrumental investigation
4. Microscopically morphological violation is absent
5. Can be determine by microscopic investigation

7. Fuctional injury may be determine as following:

1. Visually morphological violation is present
2. There are pathological clinical symptoms
3. Visually morphological violation is absent
4. There are changings in clinical analyses
5. There are changings in results of clinical instrumental investigations

8. Blunt object has following general characteristics:

1. Contact surface more than sharp end
2. Contact surface is flat
3. Contact surface may be different
4. Contact surface is rounded
5. Contact surface more than sharp edge

9. Blunt object may be like

1. Upper and low extremities only
2. Head, nails, teeth only
3. Any anatomical part of human body
4. Head only
5. Objects out of human body

10. Contact striking surface of blunt object may be as following:

1. Flat limited
2. Rounded (spherical, cylindrical)
3. Flat unlimited
4. With edge
5. Uncertain

11. Action of blunt object may be such:

1. Cut
2. Blow (impact)
3. Squeezing
4. Tension
5. Friction

12. Such anatomical injuries can produced by blunt object:

1. Commotion of brain
2. Abrasion
3. Bruise
4. Laceration
5. Fracture of bone

of the canal of a stab wound, along with the site of the entrance wound; tell about the relative position of the victim and the assailant.

Medico-Legal Importance of Stab Wounds

The shape of the wound may indicate the type of the weapon that may have caused the injury.

If a broken fragment of the weapon is found, it may identify the weapon or connect the accused person with the crime.

The depth of the wound indicates the force of penetration.

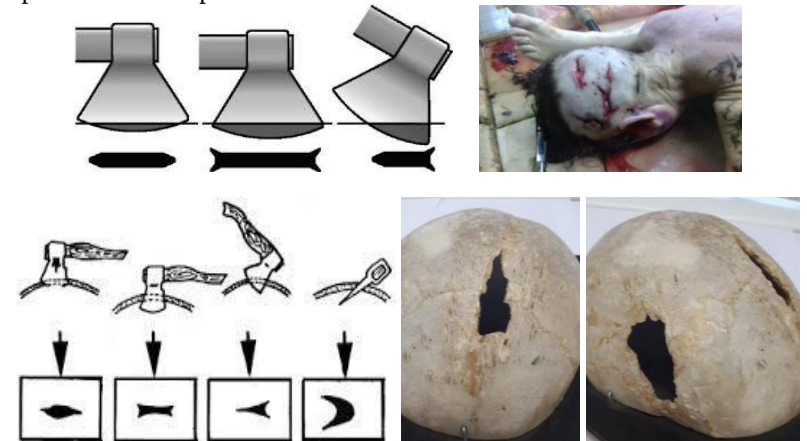
The direction and dimensions of the wound indicate the relative positions of the assailant and the victim.

The age of the injury can be determined.

Position, number, and direction of the wounds may indicate the type of injuring, i.e., suicidal, accidental, or homicidal.

Chopped Wounds

They are deep gaping wounds caused by a blow of a sharp-cutting edge of a heavy weapon, like a hatchet, an axe, a sabre, or a cleaver. The dimensions of the wound correspond to cross-sections of the penetrating blade. Necessarily the wound has damage of the bone in the form of superficial and deep cuts.



The margins are sharp and may show slight abrasion and bruising with marked destruction of underlying organs. If the edge is blunt, the margins are ragged.

Undermining occurs in the direction towards which the chop is made. When the whole blade strikes the body at one blow, the depth may be uniform throughout the wound. Usually the heel of the axe strikes the surface first, producing a deeper wound than the axe toe does. The deeper end indicates the position of the assailant. If the extremities are attacked, there may be complete or incomplete amputation of the fingers or other

- Wound canal
- Wound exit



Wound entrance has the Shape corresponding to subject. If the subject is thick the wound of entrance is pointed. If the subject has a circle at horizontal cutting the shape is like oval. Margin is clean-cut, well defined for non thick subject. Have narrow abrasion and sometimes application of substances from surface of sharp subject.



Breadth of the external wound: Breadth of the wound of entrance or the wound of exit corresponds to the thickness of the corresponding part of the blade of the weapon up to which it has passed through the wounds of entrance and exit respectively.

Wound canal: Depth is the largest dimension of a punctured wound. The depth of the wound canal usually depends on the length of the weapon or its blade up to which it enters the body. The depth of the stab wound corresponds to the length of the weapon blade when it enters the body for the whole blade length but does not produce any wound of exit.

If the blade of the weapon enters the body for the whole blade length, around the wound of entrance a bruise or abrasion forms due to friction or pressure by the hilt or blade-guard of the weapon (hilt mark), hi other cases, when there is not any hilt mark, the depth of the wound does not correspond with the length of the blade.

The measurement of the depth of the stab wound gives the possibility to determine the length of subject. Direction of the wound canal of a stab wound should be study in course of dissection of the dead body. Direction

13. Abrasion has following characteristics:

1. It is a deep destruction of skin (mucous membrane)
2. Colour of skin changes during healing
3. It is a superficial destruction of skin (mucous membrane)
4. Scar is present after healing
5. Scar is absent after healing

14. Abrasion is caused by:

1. Impact of blunt object
2. Squeezing of blunt object
3. Friction of blunt object
4. Tension of blunt object
5. Cut of blunt object

15. In a first few hours (about 3) after trauma surface of abrasion becomes

1. Low than undamaged skin
2. On the level of undamaged skin
3. Dried because of evaporation of liquid and scab formation
4. Higher than undamaged skin
5. Scab begin to fall

16. In a first 12 hours after trauma abrasion;

1. Scab on the level of undamaged skin
2. Scab higher than undamaged skin
3. Scab Low than undamaged skin
4. Scab begin to fall
5. Becomes dried because of evaporation of liquid and scab formation

17. In 12-24 hours after trauma surface of abrasion

1. Begin to fall
2. Low than undamaged skin
3. On the level of undamaged skin
4. Becomes dried because of evaporation of liquid and scab formation
5. higher than undamaged skin

18. In a period more than 24 hours but less than 4 days after trauma abrasion

1. Becomes dried because of evaporation of liquid and scab formation
2. Begin to fall
3. Higher than undamaged skin
4. Low than undamaged skin
5. Low than undamaged skin

19. In a period more than 4-5 days after trauma scab of abrasion

1. Begin to fall off from centre to peripheral zone
2. Fall off completely
3. Begin to fall off from peripheral zone to centre
4. Fall off partially

5. Transforms into scar

20. In a period about 9-12 days after trauma healing is finished and scab of abrasion disappears completely

- Yes
- No

21. Bruise has following characteristics:

1. There is no destruction of skin
2. Blunt object acts by blow
3. There is effusion of blood into tissue from damaged vessels
4. Blunt object acts by friction
5. There is destruction of skin

22. During healing a bruise changes their colour

- Yes
- No

23. In a first few hours (about 3) after trauma colour of bruise becomes

1. Red
2. Greenish
3. Blue-purple
4. Brown
5. Yellow

24. In a period till 4-5 days after trauma colour of bruise becomes

1. Blue
2. Yellow
3. Greenish
4. Red
5. Blue-purple

25. In a period more than 5 days but less than 8 days after trauma colour of bruise becomes

1. Blue-purple
2. Greenish
3. Yellow
4. Red
5. Blue

26. In the middle of 2-nd week bruise disappears completely

- Yes
- No

27. The result of healing of laceration is:

1. Scab formation
2. Red spot
3. Scar formation
4. Blue spot
5. Normal skin because of absent of scar

wounds may also be caused by an object having no pointed end, e.g., the blunt end of an iron rod.



Varieties of Stab Wounds

Stab wounds may be of the following varieties:

1. *Penetrated wound*: Here the wound terminates inside a body cavity.

2. *Perforated wound*: Here part of the weapon passes through and through the whole thickness of any part of the body, e.g. when the tip of a weapon enters the body through the anterior surface of the chest and exits through the posterior surface of the chest.

In a perforated wound, there will be two external wounds with a single strike, (a) wound of entrance, the wound through which the weapon enters the body and (b) wound of exit, through which the tip of the weapon comes out of the body.

3. *Punctured wound* is a wound without penetration to a body cavity or without perforating the whole thickness of the body. Here the tip of the weapon terminates inside the body except in a body cavity.

Examination of Stab Wounds

Examination of stab wounds require extra vigil, because these wounds have larger depths, which cannot be examined from outside and because stab wounds are expected to cause injury to the vital organs of the body and extensive internal haemorrhage.

Like in other injury cases, here examination of the clothing is an important -part of the total examination. The clothes should be examined for any corresponding cut marks or recent tears, blood or other stains. These findings should be properly located and recorded.

The *external examination* of the wounds should establish their number, external dimensions, and exact location.

Characteristics

Stab wound has such morphological parts:

- Wound of entrance



Medico-Legal importance of an incised Wound

1. It indicates the nature of weapon (sharp-edged).
2. It gives an idea about the site of impact and direction of the force.
3. The age of the injury can be determined.
4. Position and character of wounds may indicate mode of infliction, suicidal, accidental, or homicidal.

Circumstances of injuries

The important features of self-inflicted wounds are as follows:

- They are multiple and parallel or nearly so, in any one area.
- They are uniform in depth and direction.
- They are relatively trivial.
- Fatal wounds are present on several limited, easily reachable areas of the body, such as the front of the neck, wrists, groin, and occasionally on the back of legs or on the chest.
- Hesitation marks or tentative cuts or trial wounds: they are cuts which are multiple, small and superficial, often involving only the skin and seen at the beginning of the incised wound.

Stab Wounds

Stab wound produced by subject which has only sharp end. As usually such subject has some length.

The mechanism of stab wound producing consist of combination of stabbing and moving into depth of tissue.

Stab wounds are deep wounds. Depth is the largest dimension of a punctured wound.

A pointed weapon may or may not have a sharp edge. Punctured

28. Main signs for laceration are:

1. Red spot
2. Absence of connective tissue intersections (fibrous strands) in a deep of wound
3. Presence of connective tissue intersections (fibrous strands) in a deep of wound
4. Margins are uneven, bruising
5. Presence of hair bridges in a deep of wound

29. Bone fracture according mechanism of formation may be like:

1. Closed
2. Nonclosed
3. Open
4. Direct
5. Indirect (distance)

30. Biological property that leads to bone damage is:

1. Bone stands to squeezing
2. Bone stands to impact
3. Bone stands to tension
4. Bone does not stand to squeezing
5. Bone does not stand to tension

PRACTICAL CLASS 7

FORENSIC MEDICAL TRAUMATOLOGY. SHARP OBJECTS INJURIES

Ground of class: In many cases death of humans may be connected with mechanical injuries from sharp subjects. Beside that such injuries are inflicted to living persons who need in medical care. Therefore doctor of any speciality have to know signs of injuries from sharp subjects and have to be able to describe such injuries in medical documents.

Aim of class: to acquaint students with the forensic medical procedure for describing of injuries inflicted by sharp subjects and to teach them to diagnostics different kinds of such injuries.

The concrete aims of class

1. To define kind of injury.
2. To describe the injuries inflicted by sharp subjects.
3. To define the cause of violent death.
4. To write out medical certificate of death.
5. To formulate questions for solving during forensic medical examination of corpse.

Material equipment of class

1. Blanks of control tests in injuries inflicted by sharp subjects.
2. Anatomical subjects of different kinds of sharp injuries.
3. Tables.
4. Tasks.

Plan of class

1. Test-control of elementary level of student's knowledge.
2. Discussion in key questions of forensic traumatology.
3. Discussion in key questions of injuries inflicted by sharp subjects.
4. Independent work of students.
4. Control of final level of student's knowledge.

Main questions, which should know the Student

- Key questions of forensic traumatology.
- Peculiarity of forensic medical describing of injuries.
- Signs of injuries inflicted by sharp objects.
- Kinds of injuries inflicted by sharp objects.
- Mechanism of trauma by sharp objects.

Questions for Independent Student Work

1. Definition of injury. Classification of injuries according to damaging subject.
2. Forensic medical describing of injuries.
3. Characteristic of sharp objects according their property.
4. Signs of antemortem origin of injuries.

Main terminology: wound, injury, sharp object, Incised wound; Punctured (stab) wound; Incised-stab wound; Chopped wound.

Main information

Under the action of sharp subjects produce wounds. Sharp subject has only sharp edge, only pointed sharp end or simultaneously sharp edge and sharp end.

Injuries produced by application of sharp edge and pointed end of a weapon:

1. Incised wound;
2. Punctured (stab) wound;
3. Incised-stab wound;
4. Chopped wound;
5. Sawn wound.

Incised Wounds

An incised wound (cut, slash, and slice) is inflicted by subject which has sharp edge (knife, razor, scalpel, scissors, sword),. The mechanism of wound inflicting consist of combination of moving and pressing of subject. These action leads to cutting of tissue. Such injury is longer than it is deep.

Here, the force is applied over a very narrow area corresponding to the cutting edge of the blade.

Characteristics

Shape: It is usually spindle-shaped due to greater retraction of the edges in the centre. The gaping of margins is larger if cutting is perpendicular to connective tissues fibres. The gaping of margins is not large if cutting is parallele to connective tissues fibres.

Margins: The margins are clean-cut, well defined, and usually everted. The edges are free from contusions and abrasions.

Length: The length is greater than the width and depth and has no relation to the cutting edge of the weapon.

Width: The width of the wound is greater than the edge of the weapon causing it due to retraction of the divided tissues.

Depth: Incised wounds are deeper at their beginning because more pressure is exerted on the knife at this point. This is known as the head of the wound. Towards the end of the cut, the wound becomes increasingly shallow, until finally, as the knife leaves the tissues, only the skin is cut. This is known as the tailing of the wound and indicates the direction in which the cut was made.

Haemorrhage: As the vessels are cut cleanly, the haemorrhage is large.

Bevelling cut: If the blade of weapon enters obliquely, the tissues will be visible at one margin, and the other margin will be undermined, and if the blade is nearly horizontal, a flap wound is caused. Bevelling can be produced by sharp weapon only. It is usually homicidal and may indicate the relative position of the assailant and the victim.