LECTURE 1. METHODICAL INSTRUCTION FOR LECTURE

« Procedural and organizational basis of forensic medical service in Ukraine. Questions of the forensic dentistry (odontology). Forensic medical thanatology.»

1. Relevance of the topic. During the investigation of various crimes is required to determine the course of examination of medical or biological nature. The most important element in the organization of forensic services in Ukraine is the regional bureau of forensic expertise. Forensic Medicine - one of the separate, independent and interesting subjects of medical science. "Forensic" means that this subject is relevant to the court that the state authority in charge of settling civil and criminal cases consider, and therefore directly connected with the law.

2. Objectives:

- To analyze basic medico-legal system in the world.
- To explain structure of forensic services in Ukraine.
- To know the documentation is needed to complete forensic medical examination
- To be able to explain difference between cause of death, manner of death and mechanism of death.
- To get acquainted with ICD-10 and be able to use it.
- To now structure of the forensic medical examination.
- To classify changes after death.
- To be able to determine changes after death on a dead body.
- To interpret changes after death on a dead body. Read nommograms.

3. Basic knowledge skills necessary to study of the topic (interdisciplinary integration):

Previous disciplines	Obtained skills
Medical low	To have knowledge of duties and rights of expert, doctor and responsibility for the violation. To be acquainted with The Criminal Code and Constitution of Ukraine.
Anatomy	To have knowledge of structure of the human body and organs.
Histology	To explain histological structure of the human organs and tissues.

Pathology	To know the morphological manifestations of pathological changes of internal organs and systems of the human body in diseases that often lead to death.

4. Tasks for independent work during preparation for the class and on the class.

4.1. The list of the basic terms, concepts, characteristics, which must be learned by student during preparing to the lesson:

Term	Definition
Forensic Medicine	Special multidiscipline science learning and answering the medico-biological questions of low practice during investigation of criminal or civil cases.
Coroner	is an elected and trained person, not obligately a physician, who examines dead bodies and investigates cause and manner of death in medico-legal cases. In many areas of the USA the coroner is also a funeral director.
Cause of death	is the disease or injury that produces the physiological disruption in the body resulting in the death of the individual, e.g., a gunshot wound of the chest.
Mechanism of death	is the physiological derangement due to the cause that results in the death, e.g., hemorrhage.
Manner of death	is how the cause of death came about: natural; accident; suicide; homicide.
ICD-10	a medical classification list by the World Health Organization (WHO). It contains codes for diseases, signs and symptoms, abnormal findings, complaints, social circumstances, and external causes of injury or diseases.
Rigor mortis	t its simplest, a temperature-dependent physicochemical change that occurs within muscle cells as a result of lack of oxygen in form of rigidity and stiffness of the muscle.
Post-mortem hypostasis	Discoloration of the skin due to cessation of the circulation and passive settling of red blood cells under the influence of gravity to the blood vessels in lowest areas of the body.

4.2. Theoretical questions for the class:

- What are th basic medico-legal system in the world?
- What is the structure of forensic services in Ukraine?

- What is the cause of death, manner of death and mechanism of death? Difference between them?
- What is the ICD-10. Aims and tasks?
- What is the structure of the forensic medical examination?
- How changes after death are classified?

4.3. Practical work (tasks) which are done on the class:

- Code cause of death using ICD-10.
- Determination changes after death on a dead body.
- "Read" changes after death and interpret them.
- "Read" nommograms.

Topic contents

Forensic Medicine__– Special multidiscipline science learning and answering the medico-biological questions of low practice during investigation of criminal or civil cases.

Forensic medicine (synonym: *legal medicine*) is a fundamental and independent part of medicine dealing with the interaction of medical science and practice with the law.

The practice of using the terms **"forensic medicine"** and "**medical jurisprudence**" (*medical law*) has led to considerable confusion as to their correct meaning. These definitions are closely related but somewhat different:

* Medical jurisprudence (medical law) is that part of law which is concerned with the regulations governing the professional practice of the doctor of medicine.

* Forensic (or legal) medicine is that part of medical science which is employed by the legal authorities for the solution of legal problems.

Medico-legal systems. The structure of a department of forensic medicine.

There are three main medicolegal systems in the world:

♦ The coroner system (adopted both in the USA and in the ex-British empire countries).

♦ The system of medical examiners (adopted in the USA, European. African and Asian countries).

♦ The system of medico-legal departments (adopted in some European countries).

Coroner - is an elected and trained person, not obligatory a physician, who examines dead bodies and investigates cause and manner of death in medico-legal cases. In many areas of the USA the coroner is also a funeral director.

In the United States the medical investigation of fatal cases is done most often by an elected official of the county known as a coroner. In a few states, however, similar functions are performed by a physician known as the medical examiner who is an appointed officer of the county or municipal government.

The coroner system in England and some states of the USA, this system has its own 800-year history. Originally the coroner *(crowner)* was appointed by the British King to represent the Crown as its magistrate in a certain district. The coroner typically is elected by popular vote for a term of office which varies from two to four years. The coroner is subordinated to a sheriff.

Medical examiner - is the professional physician who can solve both medical and legal problems concerning cause and manner of death, performs autopsies and advances his medico-legal work because on effect of mcreased specialization.

In the present the working place of medical examiner is the Office of Chief Medical Examiner in big cities of most states in the USA and some countries of Europe (Scotland France), the Office should be opened *nonstop* day and night with a medical examiner on duty always present. The duties of medical examiner are:

- ♦ investigation of the scene of death (together with a police, but independently of policemen)
- ♦ analysis of circumstances of death with taking the names of witnesses
- ♦ issuing the death certificate
- ♦ performing the autopsy and necessary additional examinations
- ♦ preparing the report of case investigation
- ♦ representing as a subpoena witness in a court.

The system of medico-legal departments

The medico-legal service in most European countries is built on the system of Departments of Forensic Medicine. The Department of Forensic Medicine is the basic entity for services in forensic medicine. At the universities, there are Institutes of Forensic Medicine with additional tasks as education and research. These Institutes are often regional centers for toxicology and forensic chemistry as well as for forensic serology, haematology and genetics (because of very expensive equipment and methods).

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Objects of Forensic medicine:

- Corpse
- Living persons
- Evidence
- Metter of criminal and civil cases.

The main tasks of forensic medicine

1. Autopsies in cases of:
   - violent deaths
   - sudden and unexpected deaths
   - "*mors in tabula*"
   - death in custody
   - death of foreign citizens
   - deaths caused by medical malpractice
   - exhumation.
2. Clinical seminars and case analyses (regularly with the Departments of Traumatology, Neurosurgery, Intensive Medicine. Emergency Medicine).
3. Medical reports and statements, expert opinions.
4. Forensic toxicology and drug analysis (living and dead persons).
5. Forensic serology, hematology and genetics (examination of blood and other biological materials and DNA profiling for identification).
6. Forensic alcohology (the measurement of alcohol in blood, urine and other biological fluids).
7. Forensic anthropology (identification of decomposed or skeletonized human remains by anthropological methods).
8. The presence at the scene of crime.
9. Participation in mass disasters.
10. Investigation of living persons (examination of wounding, injury and trauma, pregnancy and abortion, sexual offences, abuse of alcohol and drugs of dependence etc.)
11. Pregradual and postgradual education.

12. Scientific research.

CAUSE, MECHANISM AND MANNER OF DEATH

Deaths can be categorized as to cause of death, mechanism and manner.

A. The cause of death is the disease or injury that produces the physiological disruption in the body resulting in the death of the individual, e.g., a gunshot wound of the chest.

B. It should not be confused with the mechanism of death which is the physiological derangement due to the cause that results in the death, e.g., hemorrhage.

C. The manner of death is how the cause of death came about.

1. **Manners of death are:**

a. natural;

b. accident;

c. suicide;

d. homicide;

e. undetermined;

The term "homicide" just means that one individual killed another.

A classification of homicide does not necessarily indicate that a crime has been committed as the term homicide is not synonymous with murder.

Classification of death as murder is done by a Court not a pathologist.

The forensic examination, as opposed to forensic medicine, is a branch of practical medicine, which uses knowledge of forensic medicine to solve questions posed of investigations and court cases regarding illegal activities of life and human health.

Changes after Death

EARLY CHANGES:

- Rigor mortis

(Rigor mortis is, at its simplest, a temperature-dependent physicochemical change that occurs within muscle cells as a result of lack of oxygen. The lack of oxygen means that energy cannot be obtained from glycogen via glucose using oxidative phosphorylation and so adenosine triphosphate (ATP) production from this process ceases and the secondary anoxic process takes over for a short time but, as lactic acid is a by-product of anoxic respiration, the cell cytoplasm becomes increasingly acidic. In the face of low ATP and high acidity, the actin and myosin fibers bind together and form a gel. The outward result of these complex cellular metabolic changes is that the muscles become stiff.)

Rigor develops uniformly throughout the body but it is first detectable in the smaller muscle groups such as those:

- around the eyes and mouth, the jaw, neck – 1-6 hours;
- Limbs 6-12 hours;
- All body 12-24 hours.

(It appears to 'spread' down the body from the head to the legs as larger and larger muscle groups are rendered stiff. That it can never provide an accurate assessment of the time of death and in practice should never be used alone. The chemical processes that result in the stiffening of the muscles, in common with all

chemical processes, are affected by temperature: the colder the temperature the slower the reactions and vice versa. It is also important to be aware of the microenvironment around the body when assessing rigor: a body lying in front of a fire or in a bath of hot water will develop rigor quickly, whereas rigor will progress slowly in a body lying outside in winter.)

The passive settling of red blood cells under the influence of gravity to the blood vessels in lowest areas of the body due to cessation of the circulation of blood. It produces a pink or bluish color to these lowest areas.

(Hypostasis is not always seen in a body and it may be absent in the young, the old and the clinically anemic or in those who have died from severe blood loss. It may be masked by dark skin colors, by jaundice or by some dermatological conditions.)

(As most bodies fall down or lie horizontally when dead and most are placed in a supine position, hypostasis

commonly forms on the back, buttocks, thighs, calves and the back of the neck. However, hypostasis occurs only where the superficial blood vessels can be distended by blood and, if the body is lying on a firm surface, the weight of the body will compress those areas of the skin that are in contact with the surface and prevent the filling of the blood vessels.

These compressed areas will remain pale and their pallor will be all the more striking because of the surrounding hypostasis.

This is commonly referred to as blanching. Blanching may also be caused by pressure of clothing or by contact of one area of the body with another.)

There are, however, a few color changes that may act as indicators of possible causes of death: the cherry pink color of carbon monoxide poisoning, the dark red or brick red color associated with cyanide poisoning, and infection by *Clostridium perfringens*, which is said to result in bronze hypostasis.

post-mortem hypostasis
estimate time of death

- *Absence of post-mortem*

hypostasis - 0-3 hours

- *Reinstating after 1 min - 3-6 hours*
- *after 3-5 min - 6-12 hours*
- *Become bit pale - 12-24 hours*
- *Does not change - 24 hours and more*

COOLING OF THE BODY AFTER DEATH

The cooling of the body after death can be viewed as a simple physical property of a warm object in a cooler environment.

(Newton's Law of Cooling states that heat will pass from the warmer body to the cooler environment and the temperature of the body will fall. However, a body is not a uniform structure: its temperature will not fall evenly and because each body will lie in its own unique environment, each body will cool at a different speed, depending upon the many factors surrounding it.)

Factors affect the rate of cooling of a body:

- *Mass of the body.*
- *Mass/surface area.*
- *Body temperature at the time of death.*
- *Site of reading of body temperature(s).*
- *Posture of the body – extended or curled into a fetal position.*
- *Clothing – type of material, position on the body – or lack of it.*
- *Obesity – because fat is a good insulator.*
- *Emaciation – lack of muscle bulk allows a body to cool faster.*
- *Environmental temperature.*
- *Winds, draughts, rain, humidity etc.*

Nomograms

1. Connect the points of the scales by a straight line according to the rectal and the ambient temperature. It crosses the diagonal of the nomogram at a special point.
2. Draw a second straight line going through the center of the circle, below left of nomogram, and the intersection of the first line and the diagonal.
3. The second line crosses the semi-circle of the body weight: the time of death can be read off. The second line touches a segment of the outermost semi-circle.

Here can be seen the permissible variation of 95%.

Late Changes

- ***Putrefaction***

(In temperate climates the process is usually first visible to the naked eye at about 3–4 days as an area of green discoloration of the right iliac fossa of the

anterior abdominal wall. This change is the result of the extension of the commensal gut bacteria through the bowel wall and into the skin, where they decompose hemoglobin, resulting in the green color. The right iliac fossa is the usual origin as the caecum lies close to
the abdominal wall at this site. This green color is but an external mark of the profound changes that are occurring in the body as the gut bacteria move out of the bowel lumen into the abdominal cavity and the blood vessels. The blood vessels provide an excellent channel through which the bacteria can spread with some ease throughout the body. Their passage is marked by the decomposition of hemoglobin which, when present in the superficial vessels, results in linear branching patterns of brown discoloration of the skin that iscalled 'marbling or net of putrefaction.)

- ***Mummification***

A body lying in dry conditions, either climatic or in the microenvironment, may desiccate instead of putrefying.

(Mummified tissue is dry and leathery and often brown in color. It is most commonly seen in warm or hot environments such as the dessert and led to thespontaneous mummification of bodies buried in the sand in Egypt.)

- ***Adiopocere***

is a chemical change in the body fat, which is hydrolyzed to a waxy compound not unlike soap.

(The need for water means that this process is most commonly seen in bodies found in wet conditions (i.e. submerged in water or buried in wet ground) but this is not always the case and some bodies from dry vaults have been found to have adiopocere formation, presumably the original body water being sufficient to allow for the hydrolysis of the fat.)

Control tests

1. What is carried out at external research bodies in the morgue?

A. Description of injury

B. Investigation of clothes

C. Research extent of dead men's changes

D. Description of the anatomical and constitutional features

E. All of the above

2. The doctor examines the dead driver and establishes that PML completely disappears under the thumb pressure. Estimate postmortem interval.

A. Not more than 8-10 hours.

B. 14-18 hours.

C. 20-24 hours.

D. 30-36 hours.

E. more than 36 hours.

3. The forensic examination under the Criminal Procedure Code must be appointed for:

A To establish age

B. Establishing the causes of death

C. Establishing the nature and severity of injuries

D. When sex crimes

E. All of the above

4. The kind of examination assigned for decision on matters of medical or biological character during the case investigation by police department and court is called:

A. Forensic medical examination

B. Forensic examination

C. Criminal examination

D. Juridical examination

E. Human examination

5. What is the difference between Forensic medicine and Forensic examination?

A. Forensic medicine is a medical discipline, but forensic examination means a practical expert activity

B. Forensic examination is a medical discipline, but forensic medicine means a practical expert activity

C. They are the same

D. Forensic examination doesn't have any relations to medicine

E. They are different fields of sciences

6. What kind of forensic examination is appointed in cases of malpractice?

A. Special

B. Initial

C. Additional

D. Repeated

E. Commission

7. Commission examination in medical cases is performed by

A. High qualified experts of Bureau of Medico-Legal Examination

B. A doctor of policlinics

C. Pathologist

D. Investigating police-officer

E. Surgeon

8. Indicate a doctor`s duty to each other:

A. All are correct

B. A physician shall not entice the patients from his colleagues

C. A physician shall observe the principles of the "Declaration of Geneva" approved by general Assembly of the World Medical Associations

D. A physician shall always maintain the highest standards of professional conduct

E. A physician shall deal honestly with the patients and colleagues, and strive to expose those physicians deficient in character or competence

9. What types of juridical responsibility do you know:

A. Administrative

B. Discipline

C. Civil

D. Criminal

E. All are correct

10. Patient M. was admitted to the hospital with abdominal pain. He was examined by a surgeon but an urgent surgical pathology was not diagnosed. Therefore, conservative treatment of gastritis was recommended. Some days later the patient died. Autopsy revealed acute gangrenous appendicitis. Which unfavorable result of the doctor`s activity took place?:

A. All are true

B. All are false

C. Medical error

D. Accident

E. Professional offence of a medical worker

E-1; A-2; 3-E;4-A; 5 - A; 6 - E; 7 - A; 8 - A; 9 – E; 10 - C.

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4. Eckert, William G. Introduction to forensic sciences. / William G. Eckert second editon. - New York: Elsevier, 1992. – P. 385

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6. Mykhailychenko B.V. Forensic Medicine : textbook / B.V. Mykhailychenko, A.M. Biliakov, I.G. Savka ; edited by B.V. Mykhailychenko. — 2nd edition. — Kyiv : AUS Medicine Publishing, 2019. — 224 p.

Supplementary literature:

1. Color Atlas of Forensic Medicine and Pathology -Edited by Charles A. Catanese, USA, 2009, p. 424.;
2. Color Atlas of the autopsy / Scott A. – Wagner Boca Raton London New York Washington, 2004, p. 226.

Informational sources:

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2. http://www.medicalstudent.com/
3. http://www.thestudentroom.co.uk/wiki/Resources_for_Medical_Students
4. https://quizlet.com
5. http://library.med.utah.edu/WebPath/webpath.html
6. http://www.webpathology.com/
7. https://www.geisingermedicallabs.com/lab/resources.shtml
8. http://www.umsa.edu.ua

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11. http:/forens-med.ru
12. Electronic library.

LECTURE 2. METHODICAL INSTRUCTION FOR LECTURE

"**Forensic medical examination of living (suspected, accused and other individuals). Forensic medical (dental) examination of establishing the severity of injuries, health status and age.**"

1. Relevance of the topic. Practical activity of investigator (detective) is actually associated with cases of violence when different injuries occur in victims. To investigate such crimes, a forensic medical expert should know specific questions: traumatic objects are used for the crime, time of injuries, mechanism of their infliction etc. Besides, one of the most important problems for an investigator is determination of degree of the severity. Forensic examination for the determination of severity degree can be fulfilled not only for victims (living or dead persons), but for medical documents (patient card's, ambulatory card's, another medical documentation) too. This helps an investigator to resolve a case. Forensic conclusion in cases of the violence is necessary for both investigation and law procedure because it also establishes also punishment for an accused side. Therefore any doctor should know how to determine severity degree and how to draw an expert's conclusion ("Forensic Report") in cases of crimes against human health and life. That's why the topic is so actual for medical students.

2. Objectives:

- To describe injuries on the body of the victim according to the methodology.
- To teach students to methodology and features of realization of medico-legal examination of victims, defendants and other persons.
- To determinate the degree of the severity of injuries.
- To know how to determine severity degree in victims and according to medical documentation.
- To know structure of forensic medical report (expert conclusion).
- To draw forensic conclusion.

3. Basic knowledge skills necessary to study of the topic (interdisciplinary integration):

Previous disciplines	**Obtained skills**
Internal medicine	To have knowledge of conditional lines on the chest, abdomen and another anatomical regions
Anatomy	To have knowledge about anatomical regions of the human body and their parts, sides to know the structure of the human system of organs.
Histology	To explain histological structure of the skin and other human organs and tissues.
Pathology	To know the morphological manifestations of pathological changes of internal organs and systems of the human body in diseases that often lead to death.

4. Tasks for independent work during preparation for the class and on the class.

4.1. The list of the basic terms, concepts, characteristics, which must be learned by student during preparing to the lesson:

Term	**Definition**
Injury	signifies a disorder of anatomic structure (continuity) or physiological function of human tissues or organs caused by the action of different environmental factors (mechanical, physical, chemical etc.).
Damages, dangerous for life.	his is such damages, which ourselves on oneself threaten to victim life in moment of its infliction, or which attached to usual their flowing (without assignment of medicare) expire whether can result in death.
Abrasion	is a wound caused by superficial damage to the skin, no deeper than the epidermis.
Contusion, bruise	injury in which capillaries and sometimes venules are damaged by trauma, allowing blood to seep, hemorrhage, or extravasate into the surrounding interstitial tissues.
Hematoma	is a localized collection of blood outside the blood vessels, due to either disease or trauma including injury or surgery and may involve blood continuing to seep from broken capillaries.
Wound (laceration, incision)	is a type of injury which happens relatively quickly in which skin is torn, cut, or punctured (an open wound), or where blunt force trauma causes a contusion (a closed

	wound).
A bone fracture	is a medical condition in which there is a damage in the continuity of the bone.
The accused person	is a person that in the order set by a law is instituted criminal proceedings against at presence of sufficient evidences about a feasance by him crimes.
Victim	is a person that as a result of crime a moral, physical or property damage is inflicted.

4.2. Theoretical questions for the class:

- How to describe injuries according to the methodology?
- What are the specialties of forensic-medical examination both on alive persons and case materials?
- What are the scheme and contents of «Expert's Conclusion» in cases of determination of severity degree?
- What are the forensic criteria and sings of the severe, moderate and simple injuries.

4.3. Practical work (tasks) which are done on the class:

- Describe injuries during examination.
- Carry out interrogation and inspection of the victim.
- Fill in the «Expert's Conclusion» with the received data.
- Determine severity degree of any injury.
- Make medicolegal conclusions in cases of forensic evaluation of severity degree.

Block of information

Examination of the victims, suspected or accused (alive) persons are objects of forensic-medical examination and take the second place after autopsies (dead body examination) according to work time and importance in expert practice of general profile. Forensic-medical examination of living persons is usually carried out by expert of forensic-medical examination bureau. According to Criminal Procedural Code as an expert it can be appointed any specialist, if it has necessary knowledge,thenfor taking offorensic-medical examination can be entangled

doctor. Negligence and insufficient education of doctor during examination can bring serious mistakes and false forensic conclusion, which is unacceptable.

The necessity in examination of living persons in some cases is a result of demands of the criminal legislation. Specifically, in article 76of CFC of Ukraine provided for **obligatory** examination destination: "…2) for establishment of damages heaviness and kind of bodily injury …". Exclusive of straight law direction, examination can be taken for determination of mechanism and remoteness of damages formation, object, by which a trauma was caused, levels of steady capacity loss, in case of self-damages, members mutilation, etc.

Solving of the counted questions is impossible without other evidence sources, because it is needed a special medical knowledge. If investigator or judge even have such knowledge, they can't use it for deductions because of incompatibility of their forensic position with forensic expert position an thay can directly or indirectly be interested in results of the colclusion (examination).

Solving of some questions, can't be realized personally by forensic-medical expert or doctor, as a specialists in some medical field (radiologist, traumatologist, gynecologist etc.) For example, in cases of cranial-cerebral trauma estimation has to be made with participation of the neuropathologist or neurosurgeon, vision organ trauma with participation of the ophthalmologist etc.

Both corpse examination and examination of living persons, are realized by **passing a court resolution**. Forensic-medical examination cannot be taken for requests of private persons, establishments, organizations, honour law-courts etc.

Examination of living persons is carried out in forensic-medical establishment or in doctor's cabinet. Drawing up a conclusion only according to data of medical documents (hospital or ambulatory cards, additional clinical studies (MRI, KT, analisis etc.), information from the trauma center, etc.) is made in cases of the urgent necessity of the expert conclusion, if it is difficult to examine victim or suspected person, temporally impossible for medical reasons, when from moment of the trauma it has been a long time.

Among all examination cases of living persons examination of the severity of the injuries takes place more often and composes 90 %, especially with determination of the injuries properties and their severity.

Personnel damage is not only medical, but also legal. From the point of view of criminal law, bodily harm is criminal, intentional, without the intention to take life, injuring one's health by another person. It can be called by an action (for example, blow as a result of a blow, a burn) or inaction of a suspect person (for example, unintentional prescribing by a doctor inappropriate medication which caused severe consequences).

A corporal damage is concept not only medical, but juridical. From point of view of criminal law an injury is criminal, intentional or unintentional, without intention to take a life, infliction of harm to health by one person to another person. It can be made by action (e.g., striking with blunt object, infliction of burns) or inaction of accused or suspected person (e.g., inappropriate assignment of medicare by doctor caused severe consequences).

From medical point of view the injury is called as violation of anatomic integrity or physiological function of tissue or organs of the human organism caused by action various factors of external environment (mechanical, physical, chemical, etc.), which lead to harm to health or death.

According to criminal code of Ukraine (further - CC of Ukraine) the bodily injury subdivide on GRIEVOUS (a. 101), MODERATE (a. 102) and SIMPLE (a. 106). Among last the followed types are defined: 1) simple bodily injury with short-term health disorder 2) light bodily injury without short-term health disorder.

In medicine all of bodily injury subdivide on abrasion, bruises, wounds, dislocations, fractures, cracks, tearing, squashing, tearing off, fragmentation of the body, traumatic toxicosis, burns (thermal, chemical), hypothermia, electrocusion, etc. This is the medical classification of bodily injury.

ΓΡΙΕϛΟΥΣ ΙΝϑΥΡΙΕΣ

For article 121 of The Criminal Code of Ukraine grievous injuries (punishment according to CC with imprisonment for a term of five to eight years), which may be described by one or more from its six forensic criterions:

1. life-threatening injuries at the infliction moment;
2. the loss of any body organ or loss of its functions
3. action that has caused mental illness;
4. injuries that has caused health disorder attended with a persisting loss of health not less than one-third of working capability;
5. injuries that has caused abortion of the pregnancy;
6. injuries that has caused irreparable facial disfigurement.

Let consider these criterions (signs) separately.

Life-threatening injuries-

- without medical assistance, with their usual course, end or can end with death;
- in the clinical course at different times causing life-threatening states;

Prevention of death caused by the provision of medical care should not be taken into account when assessing the threat to life of such injuries.

A life-threatening condition that develops in the course of the clinical course of the injury, regardless of the time passed after its infliction, must be with him in a *direct causal relationship*.

Life-threatening injuries include:

1) any damage that caused at least one of the following life-threatening states:
   - severe shock;
   - acute or massive blood loss;
   - deep coma;
   - acute renal or hepatic failure;
   - acute heart or respiratory failure;
   - fat or gas embolism;
   - hormonal dysfunction.
2) injuries that penetrate the cranial cavity, including without damage to the brain;
3) open and closed fractures of the bones of the cranial vault and the base of the skull, with the exception of the bones of the facial skeleton and isolated fracture solely the outer plate of the cranial vault;
4) severe brain contusion with both compression and without compression of the brain, a brain contusion with moderate severity in the presence of symptoms of damage to the brainstem region;
5) isolated intracranial hemorrhages in the presence of life-threatening states;
6) closed spinal cord injuries in the cervical region;
7) injuries that penetrate into the spinal canal, including without damaging the spinal cord and its meninges;
8) dislocations, fracture-dislocations and fractures of the bodies or both arcs of the cervical vertebrae, unilateral fractures of the arcs of I or II cervical vertebrae, as well as fractures of the dentate process of the 2nd cervical vertebrae, including without dysfunction of the spinal cord;
9) fracture or fracture-dislocation of one or more thoracic or lumbar vertebrae with dysfunction spinal cord;
10) injuries with disruption of the all layers of the pharynx, larynx, trachea, main bronchi, esophagus;
11) injuries of the chest, with penetration of the cavity of the pleura, the pericardial cavity or the mediastinal tissue, including without damaging the internal organs;
12) injuries to the abdomen, which penetrate the cavity of the peritoneum, including without damaging the internal organs; open injuries of internal organs located in the retroperitoneum (kidneys, adrenal glands, pancreas) and in the pelvic cavity (bladder, uterus, ovaries, prostate, upper and middle rectum, membranous part of the urethra).

Diagnostic laparotomy, if there are no lesions of the abdominal cavity organs, in determining of the severity of injuries are not taken into account.

13) open fractures of the diaphysis of humerus, femoral and tibia;
14) injuries of the aorta, carotid (general, internal, external arteries), subclavian, brachial, iliac, femoral, popliteal arteries or their veins;
15) thermal burns of the III-IV degrees with an area of affection of more than 15% of the body surface; burns of the III degrees more than 20% of the body surface; burns of the II degrees more than 30% of the body surface;

Not life-threatening injuries but related to *GRIEVOUS* according to the outcomes and consequences: the loss of any organ, including one eye, lung, kidney, eggs, hands, feet, or loss of body of its functions.

a) **injury of the blind eye**, leading to its removal, is evaluated depending on the duration of the health disorder;
b) **loss of the hand or leg:** separation from the trunk of the entire arm or leg, and amputation at a level no lower than the elbow or knee joints; all other cases should be considered as a loss of a part of the limb and be evaluated on the basis of persistent disability;
c) **loss of vision:** complete persistent blindness in both eyes or a condition where there is a decrease in vision to counting the fingers at a distance of two meters and less / visual acuity in both eyes 0.04 and lower;
d) **loss of hearing**: full persistent deafness on both ears or such an irreversible condition, when the victim does not hear speaking at a distance of three to five centimeters from the auricle;
e) **loss of language (speech):** loss of the ability to express one's thoughts in terms of sounds that are understandable to others;
f) **reproductive capacity:** the loss of the capacity for copulation or loss of fertility, conception and childbirth / delivery;

Mental disease: injury is classified as severe only when it determines the development of a mental illness, regardless of its duration and degree of curability. The diagnosis of mental illness and the causal relationship between injury and developed mental disease, is established by psychiatric examination.

Health disorder attended with a persisting loss of not less than one-third of working capability:

– any violation of the normal functioning of the body, or a painful process that is directly caused by bodily harm;
– irreversible loss of function that is not completely restored;

Abortion of the pregnancy

Injury that lead to the termination of pregnancy, regardless of its term, refers to GREIVIUS if there is direct causal relationship between this damage and the termination of pregnancy.

Permanent disfigurement of face

A forensic expert does not qualify injuries of the face as a disfigurement, since this concept is not medical (it is judicial). It determines the type of damage, its features and the mechanism of formation, determines whether this damage is reparable or irreparable.

Reparability: significant decrease of the pathological changes (scar, deformation, mismanagement etc.), do not heal with time or cannot be removed with non-surgical means. Damage to the face is considered irreparable, when surgical intervention (cosmetic surgery) is necessary to eliminate pathological changes.

MODERATE DEGREE(MEDIUM) OF SEVERITY

For article 122 of The Criminal Code of Ukraine grievous injuries (punishment according to CC with *imprisonment for a term of three to five years.)*

1) not life-threatening;
2) not result in the consequences provided for by Article 121 of Criminal Code;
3) caused a lasting health disorder;
4) significant and persisting loss of not less than one-third of working capability.

Lasting health disorder: long term illness should be considered to be more than 3 weeks / more than 21 days.

Working capability loss not less than one-third: should be considered to loss of general working capacity from 10% to 33%.

ΣΙΜΠΛΕ ΔΕΓΡΕΕ ΟΦ ΣΕϛΕΡΙΤΨ (□μινορ βοδιλψ ινφυρψ)

For article 122 of The Criminal Code of Ukraine:

Intended minor bodily injury:

(shall be punishable by a fine up to 50 tax-free minimum incomes, or community service for a term up to 200 hours, or correctional labor for a term up to one year)

Intended minor bodily injury that caused a short-term health disorder or insignificant loss of working capability:

(shall be punishable by community service for a term of 50 to 200 hours, or correctional labor for a term up to one year, or arrest for a term up to six months, or restraint of liberty for a term up to two years)

Short-term health disorder, meaning:

- a health disorder lasting more than six days, but not more than three weeks (21 days).

Insignificant loss of working capability, meaning:

- stable loss of general working capacity less than 10%.

Battery and torture

Battery does not constitute a special kind of injury. They are characterized by causing multiple strikes. If there are injuries after the drubbing on the body of the victim, they are evaluated for severity, based on the usual signs. If the beatings did not leave behind any objective traces, the forensic expert marks the complaints of the victim, indicates that the objective signs of damage are not revealed and does not establish the severity of bodily injuries.

Torture is the actions consisting in repeated or prolonged infliction of pain (pinching, flogging, tasks of numerous but small damages with blunt or sharp-pricking objects, the action of thermal factors and other similar actions.)

A forensic expert does not qualify damage as causing torture, because this is not within his competence (it is court`s). In such cases, the forensic expert must determine presents, character, localization, the amount of damage, the simultaneity or the time of their formation, the characteristics of the injured objects, the mechanism of their action, and the severity of the damage.

Test evaluation and situational tasks.

1. Choose the correct definition - an injury is

A. any bruise
B. any wound
C. disorder of anatomical structure or physiological function of human tissues or organs caused by the action of external forse
D. any anatomical disorder
E. any assault

2. Which kinds of severity do you know?

A. simple (mild), moderate and grievous
B. moderate and severe
C. only severe
D. simple (mild) and severe
E. contusion, scratch, incision

3. Which juridical criteria of grievous injuries do you know?

A. dangerous for life
B. which entailed loss of organ
C. which entailed steady loss of working capacity more than 33%
D. which entailed irreparable face disfigure
E. all these criteria

4. Find an injury dangerous for life at the moment of its infliction:
A. a penetrative wound into the thoracic cavity
B. an incised wound of the arm
C. a fracture of the nasal bones
D. a contusion of the brain
E. a firearm injury of the extremity
5. Choose the correct juridical criterion of moderate severity:
A. injuries threatening life
B. any firearm wounds
C. any injuries caused by the action of sharp objects
D. injuries which entail temporary loss of working capacity more than 3 weeks
E. all cases of sexual crimes
6. Which injury can be classified as moderate severity?
A. open fracture of the skull
B. rupture of the spleen
C. great internal bleeding
D. closed fracture of the radii
E. abrasion of the face
7. Simple (mild) severity means such damage which entails:
A. temporary loss of working capacity more than 3 weeks
B. temporary loss of working capacity less than 3 weeks
C. steady loss of working capacity more than 33%
D. steady loss of working capacity less than 33%
E. without loss of working capacity
8. During road accident V. received an opened fracture of right tibia. Indicate degree of severity.
A. severe
B. moderate
C. simple
D. its impossible to establish
E. no enough of data
9. Lady S. was beaten by her husband. As a result of this incident some bruises and abrasions on her body were formed. Forensic pathologist examined her and considered that injuries were:
A. dangerous for life
B. simple
C. moderate
D. grievous (severe)
E. very moderate

10. A soldier accidentally shot his friend with a carbine. A trauma was lethal. Some hours later a forensic pathologist investigated the body in an autopsy room and found a penetrative firearm wound of the head. Which severity of the damage did forensic pathologist determine?

A. moderate
B. simple
C. no simple
D. threaten to victim
E. grievous (severe)

Situatioonal tasks

TASK

In the moment of fight C. was inflicted blow by the rib of palm in the area of larynx. C. became pale and fell down on ground. He was given first-aid in the othorinolaringological department of hospital. Data from hospital chart: consciousness is absent, adinamical. Skin is pale, covered by sticky sweat. A pulse is threadlike, weak, 120 beats per min, blood pressure is 60/0 mm Hg. Performed PSR, successfully. At an inspection found out the break of cricoid. Discharged on 10th day».

To define and ground the degree of weight of bodily harms.

Basic Books.

1. DiMaio V. Forensic Pathology, 2nd ed. / V. DiMaio, D. DiMaio // Practical aspects of criminal and forensic investigation, Boca Raton, London, New York, Washington, D.C.: CRC Press, 2001, p.562.

2. Richard Shepherd - Simpson's Forensic Medicine/Twelfth Edition Senior Lecturer in Forensic Medicine Forensic Medicine Unit St George's Medical and Dental School Tooting, London, UK, 2003, p. 198.

3. Longauer A., Bobrov N., Labaj P. Practicing in forensic medicine, Faculty of Medicine, P. J. Safarik University Kosice, Slovak Republic, 2000, p.98.

4. Eckert, William G. Introduction to forensic sciences. / William G. Eckert second editon. - New York: Elsevier, 1992. – P. 385

5. DiMaio V. J. M. Gunshot wounds. Practical aspects of firearms, ballistics, and forensic techniques. Second Edition / Vincent J. M. DiMaio. – CRS Press: New York, - 1999. – 400p.

7. Mykhailychenko B.V. Forensic Medicine : textbook / B.V. Mykhailychenko, A.M. Biliakov, I.G. Savka ; edited by B.V. Mykhailychenko. — 2nd edition. — Kyiv : AUS Medicine Publishing, 2019. — 224 p.

Supplementary Literature:

1. Color Atlas of Forensic Medicine and Pathology -Edited by Charles A. Catanese, USA, 2009, p. 424.

2. Color Atlas of the autopsy / Scott A. – Wagner Boca Raton London New York Washington, 2004, p. 226.

Informational resources:

13. https://www.4tests.com/usmle#StartExam
14. http://www.medicalstudent.com/
15. http://www.thestudentroom.co.uk/wiki/Resources_for_Medical_Students
16. https://quizlet.com
17. http://library.med.utah.edu/WebPath/webpath.html
18. http://www.webpathology.com/
19. https://www.geisingermedicallabs.com/lab/resources.shtml
20. http:// www.umsa.edu.ua
21. http://ukrmed.org.ua
22. http://sudmed-p.ru
23. http:/forens-med.ru
24. Electronic library.

LECTURE 3. METHODOLOGICAL INSTRUCTION FOR STUDENTS:

"General questions of forensic traumatology. Blunt force trauma. Forensic justification for mechanism of injury and the cause of death from the effects of blunt objects. Injuries of the oral mucosa and teeth. Injuries caused by teeth. Fractures of the facial bones. Falls from height (katatrauma)."

1. Relevance of the topic. Forensic examination of injuries caused by blunt and sharp object is an important section of forensic medical traumatology, since such injuries are the most widespread. They can occur in every day life activities, sports activities, in criminal actions (in cases of crimes against human life). Such real situations can result in death frequently. Forensic examination is required in all these cases where specific medicolegal questions such as cause of death, type of traumatic instrument, mechanism of it's action, time of injury etc., must be solved. That is why any physician or forensic expert should know perfectly a morphological properties of injuries caused by the blunt and sharp objects and to be able to investigate and to describe correctly in a medical documents. Generally answers to these questions help to police officers in a crime detection.

2. Objectives:

- To define terms of a trauma, traumatism.
- To classify a types of the blunt objects.
- To determine injuries of the soft tissues caused by blunt objects.

- To know forensic significance of abrasions, bruises, scratches, contusions, wounds.
- To interpret general and typical signs of wounds caused by blunt instruments.
- To define internal injuries and bone fractures inflicted by blunt objects.
- To classify a types of the sharp objects.
- To define general (typical) signs of wounds caused by a sharp instruments.
- To make forensic diagnostics of an incised wounds.
- To know typical signs of wounds caused by stabbing instruments (single- and double-bladed, thrust weapon with verges and without verges).
- To define morphological features of chopped injuries. Variants of the axe action to a human body.

3. Basic knowledge skills necessary to study of the topic (interdisciplinary integration):

Previous disciplines	**Obtained skills**
Physics	To have knowledge of Newton's laws of motion, types of the deformation
Anatomy	To have knowledge of structure of the human body and organs.
Histology	To explain histological structure of the human organs and tissues.
Pathology	To know the morphological manifestations of pathological changes of internal organs and systems of the human body in diseases that often lead to death.

4. Tasks for independent work during preparation for the class and on the class.

4.1. The list of the basic terms, concepts, characteristics, which must be learned by student during preparing to the lesson:

Term	**Definition**
Abrasion	is a wound caused by superficial damage to the skin, no deeper than the epidermis.
Contusion, bruise	is a type of hematoma of tissue, in which capillaries and sometimes venules are damaged by trauma, allowing blood to seep, hemorrhage, or extravasate into the surrounding interstitial tissues.
Laceration	is a type of injury which happens relatively quickly in which skin is torn, cut, or punctured (an open wound)
Bone fracture	is a medical condition in which there is a damage in the continuity of the bone.
"tramline" or	bruise caused by a blow from a linear object. This pattern

"railway line"	occurs because the major stretching and shearing of the skin occur at the edges of contact and not directly beneath the center of the object, which is simply compressed.
Hematoma	is a localized collection of blood outside the blood vessels, due to either disease or trauma including injury or surgery and may involve blood continuing to seep from broken capillaries.
Trauma	is injury or damage to a biological organism caused by external harmful factors (physical, mechanical, chemical, biological)
"Bridges" of tissue, "bridging fibers"	is incomplete separation of the stronger elements, such as blood vessels and nerves, so that when one looks into the depth of the laceration due to different components of soft tissue have different strengths

4.2. Theoretical questions for the class:

- What is modern forensic classification of blunt and sharp objects.
- What is the definition of the terms of a trauma, traumatism.
- What are the injuries of the soft tissues caused by blunt objects.
- What is the mechanism and morphogenesis of the injuries caused by blunt force and in cases of falling from height.
- What are the general and typical signs of the wounds inflicted by blunt objects.
- What is the mechanism and morphogenesis of injuries inflicted by sharp objects.
- What are the specific and typical signs of wounds caused by sharp instruments.

4.3. Practical work (tasks) which are done on the class:

1. Describe wounds caused by action of blunt and sharp objects.
2. Determine a kind of traumatic blunt and sharp objects according to definite morphological features of the wounds.
3. Make up complete forensic conclusions in cases of violence when different blunt or sharp instruments were used.
4. To make a correct scheme of wounds description in initial medical documents.

Block of information

Blunt force trauma –an injury produced by a blunt object striking the body or impact of the body against a blunt object or surface.

Blunt object when an object, usually without a sharp or cutting edge, impacts the body or the body impacts the object.

Wounds of **Blunt force trauma** indicate:

- Fact of trauma;
- Number of impacts;
- Shape and size of injuring object;
- Direction of injuring action;
- Strength of injuring action;
- Remoteness of injury;
- Was a person alive when injury was inflicting.

The severity, extent, and appearance of the injury produced by blunt trauma is determined by:

1. **Nature of the weapon** (*A weapon with a flat surface, such as a board, diffuses the energy over a broader area, resulting in a less severe injury than one caused by a narrow object, such as a pipe, delivered with the same amount of energy. A weapon, which is easily deformed or broken upon impact, will deliver less energy to the impacted surface.*)
2. **Amount of body surface over which the force is delivered**. (*The greater the area over which the force is delivered, the less severe the wound, as the force is dissipated. A blow delivered to a rounded portion of the body (i.e., head) will cause a more severe injury than one delivered to a flat surface (i.e., the back), where a larger area of contact leads to a dispersion of the force.)*
3. **Amount of force delivered to the body by the blow.**
4. **Time over which the force is delivered**. (*In general, if the period of time over which a force is delivered is* increased, *a less severe injury will result than if the same force was delivered in a* shorter *period of time.)*
5. **Region of body impacted by the blow.**

Types of injury

- Abrasions
- Contusions
- Lacerations
- Fractures of the skeletal system.

An abrasion is the most superficial type of injury and affects only the epidermis.

A skin injury caused by scraping off of superficial skin due to friction against a rough surface.

(As the epidermis does not contain blood vessels, abrasions should not bleed, but the folded nature of the junction between the dermis and the epidermis and the presence of loops of blood vessels in the dermal folds will mean that deep abrasions have a typical punctate or spotty appearance)

- Anternortem abrasions appear reddish-brown, red, dark red,
- in contrast to postmortem abrasions, which usually appear yellow and/or translucent, due to a lack of blood flow, so cold parchmented abrasion (*Postmortem insect bites, caused by ant or cockroach activity after death, can mimic true abrasions, and are often misinterpreted as such by inexperienced physicians and law enforcement personnel*

Abrasions are usually caused by tangential glancing impacts but they can also be caused by crushing of the skin when the force is applied vertically down onto the skin.

The size, shape and type of abrasion depend upon the nature of the surface of the object which contacts the skin, its shape and the angle at which contact is made.

(Contact with the squared corner of an object may well result in a linear abrasion, whereas contact with a side of the same object will cause a larger area of abrasion.)

The direction of the causative force can be identified by inspecting the wound – with a hand lens if necessary – and identifying the torn fragments of the epidermis which are pushed towards the furthest (distal) end of the abrasion.

If one end of a wound has margins with raised skin, for example, the force originated from the opposite side.

(a portion of the skin scraped free may remain attached to the body, at the edge of an abrasion, thus indicating the direction in which the scrape occurred.)

Types of abrasions:

1. Scrape (or brush) abrasions caused by a scraping-type of injury.

(*May denude the epithelial layer only or extend deep into the dermis. Examples include linear abrasions, or scratches, sliding abrasions seen on lower extremities of pedestrian struck by motor vehicle, dragging abrasions (may be ante- or postmortem*).)

2. Brush burn abrasion (*is a term commonly used to describe a scraping injury over a large area of the body, such as the back; such injuries, when dry, may be very firm, even though no true "scab" is present*)

(A)"Brush" abrasions caused by relatively smooth surface (e.g.,paved road). **(B)** Punctate and linear abrasions ("road rash") owing to more uneven surface (e.g., gravel road).

3. Impact (pressure) abrasions (*are caused when the force is delivered perpendicular to the skin, so that the skin is crushed by the force, usually over a bony prominence. Impact abrasions may occur as a body collapses to the ground, or is thrown against a flat surface, at the time of death (perimortem), or immediately after death (postmortem*)).

4. A patterned abrasion **Crush abrasions are important because they retain the pattern of the causative object.** (is a variation of the impact abrasion, where the pattern of the object, or pattern of an intermediary object such as clothing, is imprinted on the skin underlying the point of impact.)

- Patterned injuries should be photographed from various angles, and directly with a scale, for size comparison, in the picture. (*Diagrams and sketches can be extremely useful and, if possible, scaled photographs should be taken. Many different objects have been identified in this way: car radiator grills, the tread of escalator steps, plaited whips and the lines from floor tiles*.)
- The use of alternative light sources, such as UV light, may reveal, in some cases, patterned injuries not readily apparent with visible light.

CONTUSIONS

the rupture of a blood vessel and the leakage of blood from the site of rupture into the surrounding tissues.

(*Bruising is most commonly seen in the skin, but it can also occur in the deeper tissues, including muscle and internal organs*.)

The extent of the damage to the blood vessels is proportionate to the force applied: in general terms, the greater the force, the more blood vessels are damaged, the greater the leakage of blood and the bigger the bruise.

(The blood leaks into the tissues along the fascial planes and so a bruise will not reliably reproduce the object which caused it and, as a bruise ages, the spread of the blood and so the relationship between the size and shape of the bruise and the causative object reduce.)

But sometimes bruises can reproduce the nature of the object that caused them.

(Once outside the confines of the blood vessel, blood is considered by the tissues to be foreign and they immediately begin to degrade and remove it. This degradation results in the colour change of a bruise that is so well known.)

A contusion changes color as hemoglobin undergoes degradation. The color progresses from blue or red, to red-blue, to green, to brown, and finally yellow. These color changes, however, may appear out of order and may overlap. There is no way to know how long each color stage lasts. Occasionally a recent contusion has a brown tinge. The color of the edge of a bruise usually is the best indicator of age, the oldest color being at the edge.

In general terms, a bruise will initially be blue/dark blue/purple (depending on the amount of blood within the tissues) and it will then change to brown to green to yellow as the hemoglobin passes through various stages of degradation.

(The speed of these changes is variable and it is not possible to use the colour changes as a 'clock' or 'timetable' of the bruise. Even in one individual, two bruises inflicted at the same time may differ in their appearances during resolution.)

As a very broad rule of thumb, a small bruises in a fit young adult will resolve in about 1 week. Research in the 1980s showed that if yellow was identified, the bruise was over 18 hours old, whereas if no yellow could be seen, the bruise could not be reliably aged.

It is essential to remember that the skin from Asians, Africans and blacks has a layer of melanin pigment of varying intensity. This will reduce the visibility of a bruise and will mask the colour changes that occur.

(In the examination of a living victim with dark skin, a bruise may only be identified by palpation. Pathologically, it is possible to identify bruising by dissection and inspection of the undersurface of the skin.)

Although bruises do not reflect with any accuracy the object causing them, but there are some particular patterns that indicate the type of weapon used.

One such pattern is the 'tramline' or 'railway line' bruise caused by a blow from a linear object.

This pattern occurs because the major stretching and shearing of the skin occur at the edges of contact and not directly beneath the centre of the object, which is simply compressed. Impact by a hard ball produces concentric rings of bruising for similar reasons.

The patterns of bruises are extremely important: a row of oval or round bruises may be due to impact by the knuckles in a punch; groups of small oval or round bruises are also indicative of fingertip pressure as in gripping and

there is sometimes a single, larger, thumb bruise on the opposite side of the limb. Fingertip bruises on the neck or along the jaw line are commonly seen in manual strangulation.

Lacerations are the result of a blunt force overstretching the skin and the result is a split, which usually passes through the full thickness of the skin.

(A laceration is deep and will bleed.)

Lacerations are most common where the skin can be compressed between the applied force and underlying bone (i.e. over the scalp, face, elbows, knees, shins etc).

(They are rare (unless severe force has been applied) over the soft, fleshy areas of the body such as the buttocks, breasts and abdomen.)

Because the skin is composed of many different tissues, some of the more resilient tissues will not be damaged by the forces that split the weaker tissues. These most resilient tissues are often nerves, the small fibrous bands of the fascial planes and, sometimes, at the base of the laceration, the occasional medium-sized elastic blood vessels. These fibres arch across the defect in the skin and are referred to as 'bridging fibres'.

When the force applied to the skin is more tangential, as in the rolling or grinding action of a vehicle wheel, the laceration may be horizontal and result in a large area of separation of skin from the underlying tissues. This can be termed 'flaying'.

(The margins of a laceration are always ragged; however, if a thin regular object inflicts an injury over a bony area of the body, the wound caused may lookvery sharply defined and can be mistaken for an incised injury. Careful inspection of the margins will reveal some crushing and bruising, and examination of the inner surfaces of the wound will reveal the presence of bridging fibres. The laceration may reflect the object causing it if that object is straight, but this wound is a poor reproducer in other circumstances.)

SKELETAL FRACTURES DUE TO BLUNT FORCE TRAUMA

i) Bone fractures are caused by *direct* and *indirect* trauma.

(1) *Direct* trauma is subdivided into three types, depending on the amount of force applied and the size of the area impacted:

(a) *focal* (tapping) fracture —produced by small force striking a small area:

(i) usually transverse;

(ii) in regions where two bones lie adjacent to each other, usually only one bone is fractured.

(b) *crush* fracture—produced by a great force striking a large area:

(i) usually comminuted;

(ii) usually accompanied by soft tissue injury.

(c) *penetrating* fracture—produced by a great force striking a small area (i.e., gunshot wound).

(2) *Indirect* trauma is produced by a force acting at a location removed from the fracture site.

Subdivided into (6) categories:

(a) *traction* fracture—bone pulled apart;

(b) *angulation* fracture—bone is bent until it snaps; usually a transverse fracture is produced;

(c) *rotational* fracture—bone is twisted, producing a spiral fracture;

(d) *vertical compression* fracture—produce, oblique fracture of the v body of long bones; in the femur, this produces a T-shaped fracture at the distal end of the bone;

(e) *angulation* and *compression* fractures are usually curved, not transverse;

(f) angulation, rotation*, and* compression *fractures.*

Fractures of the Face

Fractures of the mandible, maxilla, zygoma and zygomatic arch are produced predominantly by assaults and motor vehicle accidents. All can be fractured by a single blow. Maxillary fractures can be placed in five categories:

1. Dentoalveolar
2. LeFort I
3. LeFort II
4. LeFort III
5. Sagittal

In **dentoalveolar fractures**, direct force applied anteriorly or laterally causes separation of a fragment of the mandible. This fragment generally contains a number of teeth. **The LeFort I fracture** (Fig.1) is a transverse fracture of the maxilla, above the apices of the teeth, through the nasal septum and maxillary sinuses, the palatine bone and the sphenoid bone. The **LeFort II** (the "pyramidal") fracture has the same path posteriorly. As it proceeds anteriorly, however, it curves upward near the zygomatic-maxillary suture, through the inferior orbit rim onto the orbital floor, through the medial orbital wall and across the nasal bones and septum. The

LeFort III is a high transverse fracture of the maxilla that goes through the nasofrontal suture, through the medial orbital wall and fronto-zygomatic suture, across the arch and through the sphenoid. **Sagittal fractures** run in a

sagittal plane through the maxilla.

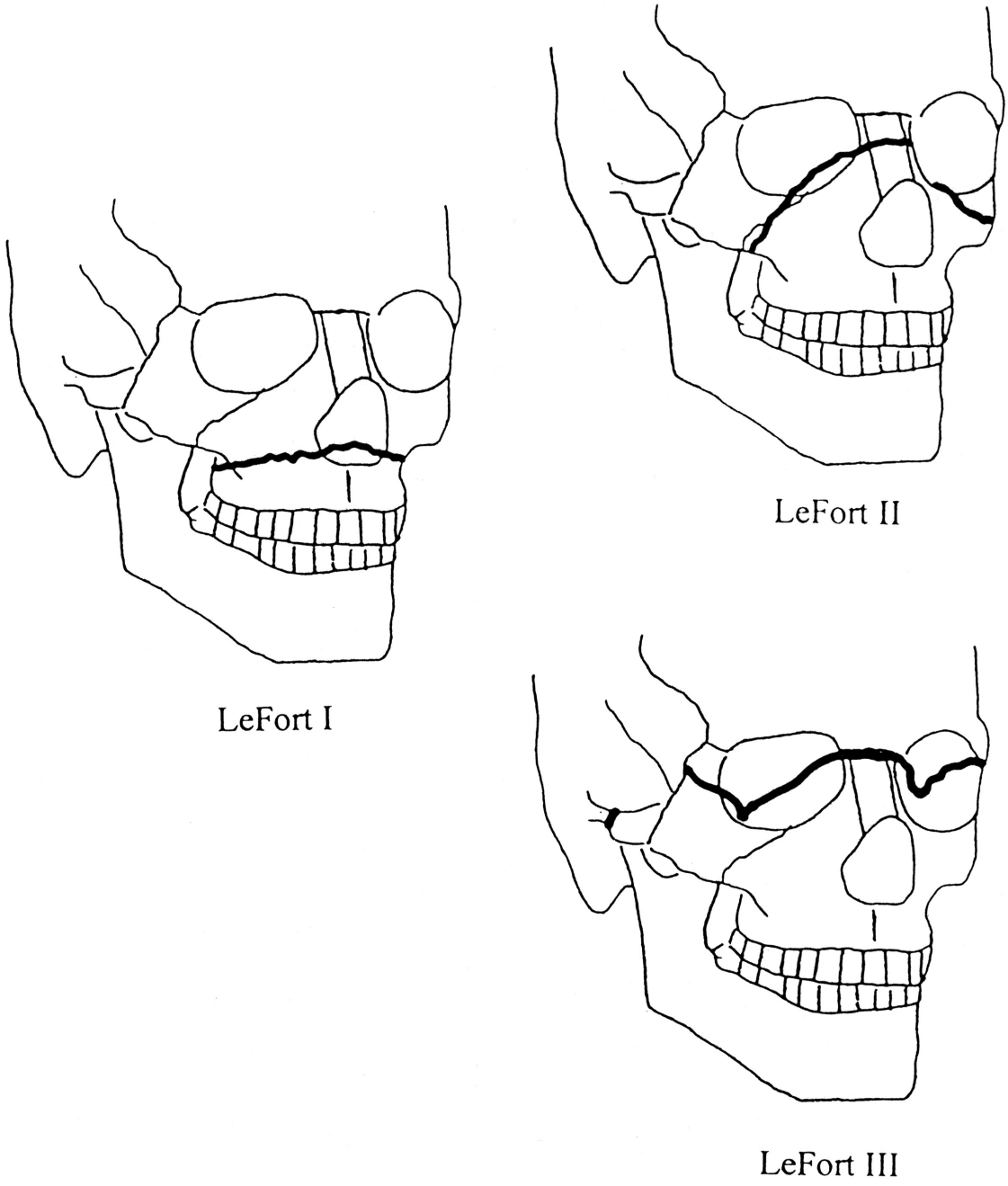

Figure 1. Fractures of the face: LeFort I, LeFort II, LeFort III.

Control test tasks

1. To the factors of outward environment, that can operate on an organism and cause damages, take:

A. Biological
B. Physical
C. Psychoemotional influences
D. Chemical

E. Medicinal facilities and gaseous substances

2. All of the following are true statements regarding injuries, except:

A. It is harm caused illegally to a person regarding body, mind, reputation or property

B. Physically violent injuries are mechanical injuries

C. All injuries are wounds but all wounds are not injuries

D. Disorder of anatomic structure of human tissues or organs caused by the action of different environmental factors (mechanical, physical, chemical etc.).

E. It entails health disorder or death.

3. Effusion of blood in the tissues due to violence is:

A. Wound

B. Abrasion

C. Scratch

D. All are false

E. Bruise

4. Bruise of eyelids, which extend to the check or even lower may be due to the remote effect of:

A. Fracture of nasal bone

B. Meningitis

C. Fracture of the base of anterior cranial fossa

D. Fracture of the base of medium cranial fossa

E. Fracture of the base of posterior cranial fossa

5. During healing process in bruise, livid red color appears:

A. Before greenish

B. After greenish

C. Before bluish black

D. After yellowish

E. Before yellowish

6. What injuries are firstly bright red and then change to yellow with no bluish or green:

A. Petechial hemorrhages

B. Incised wounds

C. Grazes

D. Subconjunctival hemorrhages

E. Contusions

7. Suicidal bruises are rare because of:

A. More penalty to the person to be involved

B. More pain

C. More skill required to produce it

D. All are true

E. All are false

8. All are true about postmortem bruise, except:

A. No color changes

B. No clotting of blood in the tissues

C. No swelling of tissue

D. Cannot be produced 2 hours after death at any part of the body

E. All are false

9. A dead body was found on the street. Forensic autopsy was done later and revealed a linear fracture of the occipital bone and contusion of the brain. Try to determine the cause of death:

A. Falling down from a height (pedestrian`s falling).

B. Collision of a moving car with a man.

C. Compression between automobiles.

D. Trauma made by wheels of a car.

E. Falling from an automobile

10. Which one of the following is an incorrect statement about incised wounds:

A. There are caused by sharp edges or cutting weapons

B. There are broader than edge of weapon causing it

C. Margins are usually everted

D. Their length is more than depth

E. They have no any slight cuts and notches in the ends

11. The common suicidal incised wound is:

A. On the back of the left index finger

B. On the back of the right index finger

C. On the back of the left foot

D. On the anterior side of the left arm

E. On the back of the right foot

12. The most typical wound with a false change is:

A. Incised wound

B. Abraded wound

C. Lacerated wound

D. Contused wound

E. Chopped wound

13. All the statements are true about postmortem wounds except:

A. Signs of blood spurting on the body

B. The edges are inverted

C. The edges do not gape

D. No inflammation

E. No blood spurting

14. A wound with oval margins can be produced by:

A. A knife

B. A file

C. Long pointed conical weapon

D. A dagger

E. A nail

1 – A,B,D; 2-C; 3 - E; 4 - C; 5 - C; 6 - D; 7 – D; 8 – B; 9 – A; 10-E; 11 - D; 12 - A; 13 - A; 14 - C;

Situational tasks

TASK 1.

During medico-legal research of dead body of deceased man, 49 years old, found out such damages. On the front surface of the left thigh in the his middle third on height of a 72 cm from a foot there is a scratch of the uneven oval shape, sizes is 5x7 cm, covered by a scab that is located higher than level of surrouded skin with decorticating on periphery of scratch. On a right knee there is the rounded bruise 4x3cm in size. green-yellow color on periphery.

Task.

To define the remoteness of infliction of damages.

Basic Books.

1. DiMaio V. Forensic Pathology, 2nd ed. / V. DiMaio, D. DiMaio // Practical aspects of criminal and forensic investigation, Boca Raton, London, New York, Washington, D.C.: CRC Press, 2001, p.562.

2. Richard Shepherd - Simpson's Forensic Medicine/Twelfth Edition Senior Lecturer in Forensic Medicine Forensic Medicine Unit St George's Medical and Dental School Tooting, London, UK, 2003, p. 198.

3. Longauer A., Bobrov N., Labaj P. Practicing in forensic medicine, Faculty of Medicine, P. J. Safarik University Kosice, Slovak Republic, 2000, p.98.

4. Eckert, William G. Introduction to forensic sciences. / William G. Eckert second editon. - New York: Elsevier, 1992. – P. 385

5. DiMaio V. J. M. Gunshot wounds. Practical aspects of firearms, ballistics, and forensic techniques. Second Edition / Vincent J. M. DiMaio. – CRS Press: New York, - 1999. – 400p.

6. Mykhailychenko B.V. Forensic Medicine : textbook / B.V. Mykhailychenko, A.M. Biliakov, I.G. Savka ; edited by B.V. Mykhailychenko. — 2nd edition. — Kyiv : AUS Medicine Publishing, 2019. — 224 p.

Supplementary Literature:

3. Color Atlas of Forensic Medicine and Pathology -Edited by Charles A. Catanese, USA, 2009, p. 424.

4. Color Atlas of the autopsy / Scott A. – Wagner Boca Raton London New York Washington, 2004, p. 226.

Informational resources:

25. https://www.4tests.com/usmle#StartExam
26. http://www.medicalstudent.com/
27. http://www.thestudentroom.co.uk/wiki/Resources_for_Medical_Students
28. https://quizlet.com
29. http://library.med.utah.edu/WebPath/webpath.html
30. http://www.webpathology.com/
31. https://www.geisingermedicallabs.com/lab/resources.shtml
32. http:// www.umsa.edu.ua
33. http://ukrmed.org.ua
34. http://sudmed-p.ru
35. http:/forens-med.ru
36. Electronic library.