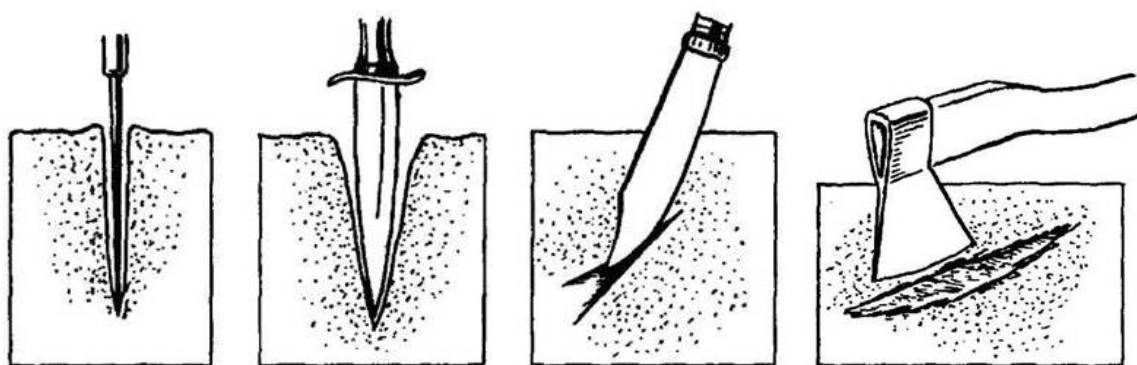


Module 1. The organization of forensic -medical examination and general problems of forensic medicine. Forensic-medical principles of examination violent and natural death

Sub module 4. Forensic-medical examination of damages and death caused by mechanical factors

Theme 10. Damages caused by sharp objects

Guidelines for students and interns



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Тема 10. Ушкодження гострими предметами

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для студентів та лікарів інтернів*

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Харківський національний медичний університет

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Module 1. The organization of forensic-medical examination and general problems of forensic medicine. Forensic-medical principles of examination violent and natural death. Sub module 4. Forensic-medical examination of damages and death caused by mechanical factors. Theme 10. Damages caused by sharp objects: guidelines for students and interns / comp. Vasil Olhovsky, Mykola Gubin, Petr Kaplunovsky, Vjacheslav Sokol. - Kharkiv: KNMU, 2013.

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Mykola Gubin
Petr Kaplunovsky
Vjacheslav Sokol

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Упорядники: Ольховський В.О.
Губін М.В.
Каплуновський П.А.
Сокол В.К.

Substantiation of the Topic. Forensic medical examination of sharp injuries is an important section of forensic medical traumatology, since such injuries are the most widespread. They can be inflicted in situations of private life, work, sports activities, etc.

Before forensic medical examination, legal-investigating bodies put a number of specific questions, including the identification issue, which require detailed studies of this type of injuries. Action of sharp objects can be caused death of an injured person. Thus, in order to establish the cause of death it is important to find out its genesis and signs.

Duration of practical classes: 3 academic hours

Purpose of the Practical Class: to reveal describe, diagnose, and estimate injuries of skin, soft tissues, bones, and inner organs caused by sharp objects.

Direct purpose of study:

1. To be able to investigate and to describe injuries caused by different sharp objects;

2. Determine the type of traumatic instruments;

3. Make medico-legal conclusions in cases of injuries caused by sharp objects.

Basic level of knowledge and skills (before the practical class):

1. An essence about trauma and traumatism

2. Morphological appearances of inflammation, healing, bleeding etc.

3. Clinical and morphological characteristics of scratches, bruises, wounds, fractures

Visual Aids and Material Tools

1. Different natural specimens (human skin with wounds, internal organs injured due to action of sharp objects, fractured bones) are the objects of the investigation;

2. Studying tables, photos, video.

Technological card of carrying out of practical classes

No	Level	Time (min)	Manuals	Place of carried
1	Control of initial level of knowledge on the topic	15	Oral answering	Class room
2	Analysis the scheme of the description of damages	10	Tables with scheme	Class room
3	Studying theme of classes, description of damages of a skin on natural preparations	30	Natural preparations	Class room
4	Conclusion about character of described damages	15	Natural preparations	Class room
5	Studying theme of classes, description of damages of a bones on natural preparations	30	Natural preparations	Class room
6	Conclusion about character of described damages	15	Natural preparations	Class room
7	The decision of situational tasks	15	Situational tasks	Class room
8	Classes summarising	5	-	Class room

BLOCK OF INFORMATION

Passing to studying damages from influence of sharp instruments, students must get acquainted with classification sharp instruments. The sharp instrument influences a body of the person the sharp end or edge which in forensic medicine name "spike", "edge" and "blade". Depending on design features, and also the mechanism of their influence on damaged surface, all sharp instruments share on stabbing, cutting, stabbing-cutting, chopping and sawing. These objects in the majority are instruments as they are made for application in a life or on manufacture (sewed, a kitchen knife, an axe, saw, etc.). However, it is necessary to remember, that some of these objects can be designed for an attack or defense and then they are a cold steel, for example: a bayonet, sword-bayonet, sabre, dirk, stylet, dagger.

Sharp instruments (objects or the weapon) cause mainly such injuries as wounds, and also little cuts and scratches. Cuts name superficial injuries of a skin and internal bodies, scratches – linear abrasions. Attributes the wounds formed from influence of sharp instruments, are: linear character, equal smooth edges, more often without additional damages, absence of tissue fibres. It is necessary to remember, that the same sharp object, for example a knife like combined tool, can carry out cutting and stab-cutting functions.

Wounds

Stab wounds are formed from action stabbing objects which are subdivided on conic, cylindrical and pyramidal, for example: awl, needle, a nail, a tetrahedral bayonet. These objects, damaging a skin, operate mainly the spike, and in process of immersing in thickness of a tissue and by the lateral surfaces, sides and edges. At immersing a stabbing object it moves apart tissues, causing such way wounds. At sliding an edge on a skin abrasion are formed. The shape of stab wounds on a skin basically depends on the form of cross-section of a used stabbing object. Stabbing objects, having round section, wounds of round shape or the oval shape, the length of which is almost always focused on a course lines Langer (an arrangement of elastic fibres of a skin). Radiance of wounds speaks due to influence of edges stabbing object, and abrasion - for the account of influence of the edges, stabbing object, and for the account of influence of its sides in process of immersing. The objects having the big number sides, leave after itself wounds of round shape or oval, but in edges of such injuries still it is possible to define (on available anguishes) the quantity of influencing edges, however, is rather difficult to make it, when a object has in section over six sides.

Incised wounds are formed from sharp edges of cutting objects.

A characteristic example of the cutting instrument can be the razor, a table knife, etc., however it is necessary to remember, that cutting action can render any other object with sharp edge (a cover of a can, a splinter of glass).

Edges of cut wounds are opened which is connected with crossing of elastic fibres of a skin and a wound strongly bleed. Happens, that the cutting object damages

also muscles, and sometimes reaches a bone; more often it occurs on those sites bodies where there is an insignificant layer of soft tissue (for example, on a forearm and a shin). At examination of incised wounds the expert must establish a direction of action cutting instruments, quantity of influences and an opportunity of causing such damages by own hand of the victim. The direction can be established on a structure of a bottom of incised wounds. The wound usually is deeper at that end where the instrument started to operate, and at the opposite end of the wound only superficial incision is present. Bottom of a wound, testify to the gradual termination of influence of an edge.

On sides of a body, where the skin easily gathers in folds (for example, on a neck), in edges of incised wounds it is possible to see the triangular rags of a skin giving to edges certain zigzag, these rags are formed owing to crossing folds and the tops specify a direction of movement-edge.

The quantity of influences can be certain by quantity of cuts and incision and if the edge operated repeatedly in to one wound-on step shaped to crossing of muscular bundles, and also by quantity of cuts on ligaments, vessels and periosteum. The opportunity of causing of incised wound (wounds) is established by own hand depending on localization of wounds, their orientations and interpositions. An opportunity of drawing of damage to itself specifies also presence at one of the ends of a wound of additional little cuts (so-called "first attempt at writing"). Helps with the decision of this question and character of traces of blood on a body and clothes, and also on a place of incident.

Stab-incised wounds are formed owing to influence of stabbing-cutting instruments (more often knives). These instruments, damaging a skin render simultaneously the edge pricking, and an edge - cutting action. Stabbing-cutting the instrument of type of a knife consists of the handle and blade. Blades of knives can be two types: one-edged and double-edged (such knives more often are called blade). Edges of stab-incised wounds are equal and smooth. The end of a wound where the knife blade operated - the sharp, opposite end can be rounded off, rectangular, M-shaped depending on a structure of a butt (not grinded part opposite to an edge of blade).

In the region of the sharp end the additional cuts arising from action of an edge of blade at it are often observed extraction with turn; such damages, as a rule deviate a direction of the length the basic damage, and can sometimes depart from it under a right angle and even to exceed the sizes of the basic damage. The ends of such cuts are sharp with passing in a superficial cut. Depth of the stab-incised wounds always prevails of its length. Depth of the channel of the specifies length of the plunged part of the blade. However it is necessary to remember, that at stab-incised wounds of a belly cavity it is necessary to consider a pliability of an anterior abdominal wall.

The length of stab-incised wound on a skin (without taking into account length of additional cuts) can specify wounds width of the used blade; however, doing a conclusion about this feature of the blade, it is necessary to remember, that the skin after removing it from a wound is a little reduced, reducing length of a wound on 0,1-0,2 cm. At action of the blade under a corner to a surface of a skin (with an inclination aside an edge or a butt) the length of a wound always is more than width

of a blade. At inclinations of the blade in aside its lateral surfaces (cheeks) of a wound have the arcuate form. At damage double-edged structure or one-sided sharp weapon with a thin butt (less than 0,2 cm) of blade both of the end damages are represented sharp; at extraction such instruments with rotation, can give additional cuts to a wound the X-shaped form. On flat bones stab-incised injury in most cases, has the form reflected the form of cross-section of the stabbing-cutting instrument.

Chopped wounds are formed owing to influence the chopping instrument, operating which beginning is the sharp edge-blade. As chopping instruments axes more often are used. Chopping influence is rendered also with such kinds of the instrument as a sabre, broadsword.

It is possible to call such heavy instruments: machete, shovel; chopping action can possess as well even the big knife or a dagger. Chopping instruments (weapon) cause deep linear character of a wound which settle down on a head more often. Chopped wounds, have, as a rule, equal smooth edges with small superficial abrasion in the form of narrow strips, hair on edges of such injuries are divided on an identical level, and bruise of edges is expressed much less, than at injuries from action of blunt instruments. Tissues fibres are isolated and, as a rule, they are located down at the ends of such wounds. The ends of cut wounds can be sharp, and in cases of the expressed action a forward or back part of an edge of an axe, one of the ends of a wound can be sharp, and opposite can have the rectangular form. If cutting the instrument operates under a corner to a surface of a leather, edge of a wound from a sharp corner remains an abrasion. On flat bones, in case of perpendicular action of an edge of the cutting instrument, are formed fractures with attributes of the local and remote influence. Attributes of local influence are expressed in the form of linear character of fracture with equal margins on which surface can be the smallest parts of the bone. As a result of wedge-shaped actions of the instrument are formed the remote damages of a bone in the form of the cracks departing from the ends of linear fracture.

At immersing a heel or toe of the wedge of an axe the shape of fracture reminds the isosceles triangle, one end of fracture gets rectangular form, and opposite one remains sharp, passing smoothly and "trace-impression". If impact by an edge of the chopping instrument is put under a sharp corner, the part of a bone from the opposite side to impact breaks off, forming defect of the round or oval form and on a surface of edge of cut it is possible to observe the traces reflecting roughnesses of an edge, in the form of parallel lines (platens and grooves) which direction specifies a direction of action of an sharp edge.

On width and interposition of these lines probably carrying out of identification of the instrument, i.e. an establishment of the concrete chopping instrument to which damage has been caused. On tubular bones minced injuries often find out in cases of examination of the dismembered corpse. Traces of influence of the chopping instrument on such bones can be in the form of parallel superficial damages with equal edges and the sharp ends (owing to numerous action of an edge of the chopping instrument). Fracture on a tubular bone in the beginning arises on a scene of action of an edge and a plane cut is equal, on it lines can be formed, and due to wedge-shaped actions rough fracture of compact substance is formed.

Wounds from action of sawing instruments on appearance remind bruise-lacerated wounds. The form of such wounds more often zigzag with the length, focused cross-section of the length to any part of a body. The ends of a wound it is rounded off. The form of wounds is caused recurrent-forward or forward mechanism of action of the sawing instrument. The basic difference from bruise-laceration is the smaller quantity of fibres and less expressed abrasions of the edges. Edges consist of the fine triangular rags formed from collected bits of the saw or folds of a skin.

There are plural wounds of a skin from influence of bits of saws, owing to impact by its handle in perpendicular direction to a skin. Such wounds remind plural stab-wounds of rhomboid shape. Distance between them and their interposition specify features of a handle of the sawing instrument and allow to establish exact copy of the instrument. Saw cut of tubular bones differ from cut of the axe by the presence of precisely expressed defect of a bony tissue which can be revealed by comparison of the saw cut fragments. The width of this defect depends on width of the handle of the sawing instrument. Such damages meet more often at examination of dismembered corpse and less often - at to an industrial trauma.

SCHEME OF DESCRIPTIONS OF INJURIES

The description of damages must include following data:

1. **Localization.** At definition of localization of damage it is necessary to specify **anatomic area** of a body in which it is located (for example, in the field of a forehead, on a forward surface of a thorax, on a stomach, etc.), and then to detail an arrangement (under condition of vertical position of a body). Detailed elaboration of an arrangement of damage should be made under the attitude (distance) to **anatomic reference points** (the lower angle of the scapula, the lower end of the xiphoid process, a junction between left clavicle and sternum, etc.) and if necessary in view of the conditional lines lead through a body of the person (for example, on a breast at the left in the fourth intercostal space on an axillary line is available...). At transport damages it is expedient to specify and height of an arrangement of injury, measuring it from plantar surface of the foot of the victim (the last can promote an establishment of a part of the machine which have caused damage).

2. **A kind of injury.** After an establishment of localization it is necessary to name a kind of injury. Thus it is necessary to use the definitions standard in medicine - a graze, a scratch, bruise, a wound, etc.

3. **The shape of injury.** It is necessary to specify the shape of injury with reference to **geometrical figures** (oval, round, triangular, rectangular and others). If the shape of injury not precisely corresponds geometrical, add a word **incorrectly** (is wrong-oval, is wrong-triangular and others). It is admissible also the specified forms of damage with reference to the form of letters of the Russian alphabet (the T-shaped form, the Y-shaped form, X-shaped, etc.).

4. **The sizes of injury.** It is necessary to specify the sizes of damage in centimeters. Thus if an injury has length and width it is necessary to specify all over at first and after smaller size (for example 3×0,5cm). To define length of a wound follows at its shown edges, that in some cases matters for an establishment of the

sizes of an operated part of the instrument. Injury can sometimes have the form of two, three beams converging in one point. In these cases it is necessary to define length of beams and their direction.

5. **Direction of the length of injury.** In cases when length of damage more than its width, it is necessary to note a direction of the length. The direction of the length determines under its attitude to a vertical axis of the person (for example, a direction of the length of wounds vertical, horizontal, from top to down and from left to right, etc.).

6. **Color.** It is necessary to specify color at the description bruises and abrasions.

7. **Character of edges and the ends of a wound.** It is necessary to remember, that edges of a wound can be equal, smooth, rough, ragged smallnotched, bignotched, the ends of a wound – sharp, rounded off, rectangular, doubled (M-shaped). In some cases between edges of a wound, at its ends, in depth (at the bottom of a wound) can be observed in connective crosspieces (tags). It should be without fail noted at the description of injury.

8. **A condition of surrounding tissues.** After the description of character of edges and the ends of a wound it is necessary to note changes of surrounding tissues. Edges of a wound can be scratched, bruised. Thus it is necessary to note, on what edge (or where exactly) is available scratches, bruises, its sizes (width), etc.

Around of injury it is often possible to observe a various sort of imposing (a soot, a dirt, railway greasing, etc.). In these cases it is necessary to note a total area borrowed by imposings (sometimes with the instruction of a place of imposing – upwards, to the left, downwards, to the right from injury), with the instruction of color of imposings, their features. At absence of changes and imposings around of damages it is necessary to note, that a leather and tissues around of injury are not changed.

9. **Interposition of damages.** At presence of the several injuries which are settling down in one anatomic area, it is necessary to specify not only their localization, but also interposition under the attitude to each other.

QUESTIONS FOR STUDENT'S INDEPENDENT WORK

1. Stab wound, their features, medico-legal importance
2. Incised wound, their features, medico-legal importance
3. Stab-incised wound, their features, medico-legal importance
4. Chopped wound, their features, medico-legal importance
5. Sawn wound, their features, medico-legal importance
6. Injuries of bones, which caused by sharp objects, their features, medico-legal importance
7. Causes of death from action of sharp objects, their substantiation

TESTS AND SITUATIONAL TASKS FOR SELF-ASSESSMENT

1. Which statement about incised wounds is correct:
 - A. They are caused by sharp edges or cutting weapons

- B. They are broader than edge of weapon causing it
 - C. Margins are usually everted
 - D. Their length is more than depth
 - E. All statements are correct
2. A wound with oval shape, regular margins can be caused by:
- A. A knife
 - B. A file
 - C. Long pointed conical weapon
 - D. A dagger
 - E. A nail
3. The common for 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
4. On the left forearm of the corps 5 parallel horizontal superficial wounds were found only, during medico-legal autopsy. All of them are spindle-like, their margins are smooth, ends are sharpened. Is it typical for self-inflicted injury:
- A. No
 - B. Yes
 - C. They are accidental
 - D. Traces of tortures
 - E. Traces of defense
5. Patient L. was delivered to the doctor in a poor condition with a bleeding wound in the upper surface of neck-vertical 1,8x0,5 in size. Margins of wound are regular and even smooth, ends are acute. Depth more than external sizes – 7,0 cm. That wounds is:
- A. Stab-incised
 - B. Stab
 - C. Chopped
 - D. Lacerated
 - E. Punctured

ANSWERS

1 - E; 2 — C; 3 — D; 4 — B; 5 — A

After the practical class every student

should know:

1. Modern classification of sharp objects
2. The mechanism and morphogenesis of injuries inflicted by sharp objects
3. Specific and typical signs of wounds caused by sharp instruments
4. Type and signs of the injuries of bones caused by sharp objects

should be able to:

1. Describe wounds caused by action of sharp objects
2. Determine a kind of traumatic sharp objects according to definite morphological features of wounds
3. Make up complete forensic conclusions in cases of violence when different sharp instruments are used



RECOMMENDED LITERATURE

Basic:

1. Babanin A.A. Forensic medicine: Textbook / A.A. Babanin, O.V. Belovitsky, O. Yu. Skrebova. – Simferopol, 2007. – 464 p.
2. Franchuk V.V. Forensic Medicine: practical guide / V.V. Franchuk. – Ternopil: TSMU, 2011. – 2004 p.

Additional:

1. Anderson W.R. Forensic Sciences in Clinical Medicine: A Case Study Approach / W.R. Anderson - USA: Lippincott Williams & Wilkins, 1998. – 225 p.
2. DiMaio V.J.M. Forensic Pathology, Second Edition (Hardcover) / DiMaio V.J.M.. - USA: CRC Press, 2001. – 565 p.
3. McLay W. D. S. Clinical Forensic Medicine 2E / W. D. S. McLay . – London: Greenwich Medical Media, 1996. - 336 p.
4. Jason P. Forensic Medicine: Clinical and Pathological Aspects / P. Jason, B. Anthony, S. William. - London: Greenwich Medical Media, 2001. – 832 p
5. Shepherd R. Simpson's Forensic Medicine / Shepherd R. - London: A Hodder Arnold, 2003. – 208 p.
6. Stark M.M. Physician's Guide to Clinical Forensic Medicine (Forensic Science) / M.M. Stark– USA: Humana Press, 2000 - 326 p.

Навчальне видання

Модуль 1. Організація судово-медичної експертизи та загальні питання судової медицини. Судово-медичні засади експертизи насильницької та ненасильницької смерті.

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Упорядники:

Ольховський Василь Олексійович
Губін Микола Володимирович
Каплуновський Петро Анатолійович
Сокол Вячеслав Костянтинівич

Відповідальний за випуск Губін М.В.

Комп'ютерний набір Губін М.В.