Ministry of Health of Ukraine
National Medical University
Named after O.O. Bohomolets
Department of Forensic Medicine and Medical Law

N.M. ERHARD

Forensic Examination of a Gunshot Wound. Forensic Examination of a Mechanical Asphyxia. Forensic justification of a mechanism of trauma and the cause of death

Methodologic materials

Educational edition

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Author's edition

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KYIV-2018

Agreed and amended by the department of forensic medicine and medical law of the National Medical University of Ukraine named after O.O. Bohomolets (Protocol № 3 from 27.09.2018).

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These methodologic materials contain tasks for a practical class in English, based on a competent approach with students of higher medical and justice education institutions with III-IV level of accreditation.

These methodologic recommendations can be of use for medical workers, employees of all entities of Ministry of Internal Affairs, students, interns, teaching professors of higher medical and justice educational institutions.

Table of content

Foreword

Every year there is an increase in number of criminal offence against human life and health which is caused in an increase of crime rates in Ukraine. Worsening of criminogenic environment in Ukraine demands to use all the power of its legislation in the fight against crime.

A big toll in this process not only lays on law enforcement agencies but also on forensic experts. A number of forensic investigation conducted increases each year and core factors that stimulate it are: legislative awareness of population and active layers community.

As a result of a forensic examination issues like presence of physical injury, their location, mechanism and type of injury, severity and time of onset to be resolved, as well as to state the cause of death etc.

In these methodologic materials tasks are presented that are prepared for a specific module topic of "Forensic medicine" to be solved by students of higher medical and justice educational institutions of III-IV level of accreditation.

Conclusions

A modern approach for materials presentation for a practical seminar (class) with specifically identified core concept that correlated to the topic and also by using interactive cooperation with students (using clinical cases and illustrations), new technologies – will not only bring audience to life but also is highly suitable to motivate millennials and "Z" generation representatives to attend class.

List of literature

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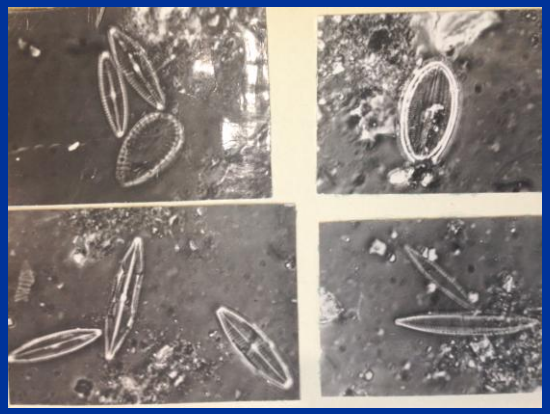
Types of diatom plankton



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Chest and abdomen compression

1. General asphyxiation signs

2. Specific signs:

- ecchymotic mask on upper parts of the body

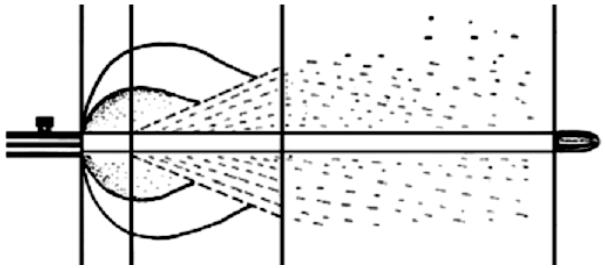
- carmine pulmonary edema

Slide 42

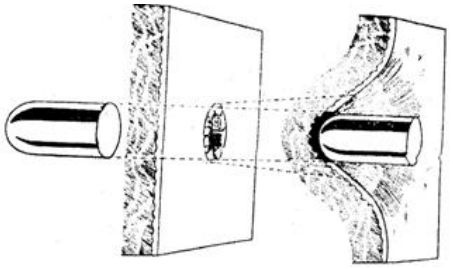
I. Forensic Examination of a Gunshot Wound

Task № 1. Based on pics. presented describe signs of a contact shot:

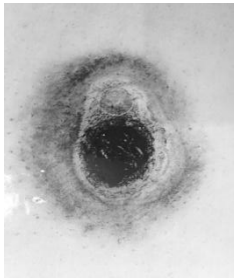
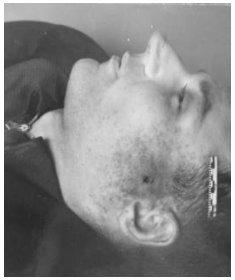
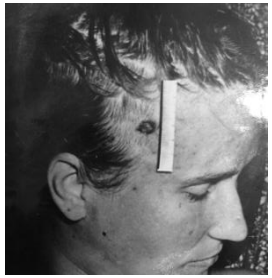
Task № 2. Based on pics. presented describe signs of a near-contact wound:



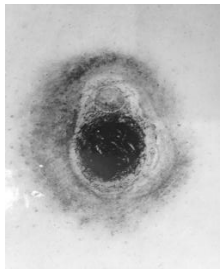
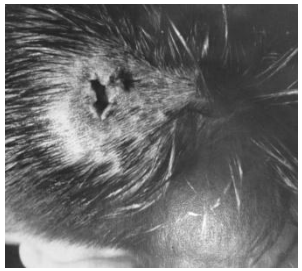
Task № 3. Based on pics. presented describe signs of an intermediate-range shot:



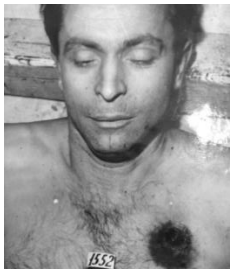
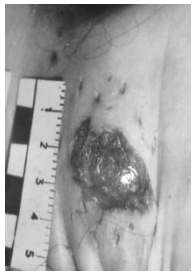
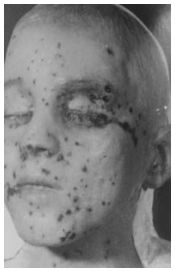
Task № 4. Based on pics. presented define the proximity of a shot:

Task № 5. Based on pics. presented, describe an Entrance and Exit wound:

Task № 6. Based on pics. provided define the proximity of each gunshot wound from a hunting rifle:

Task № 7. List laboratory methods used for gunshot wound inspection:

1. _____
2. _____
3. _____

Drowning

1. Sings of a body that been in the water

- wet clothes, wet hair, skin maceration, diatomic plankton in lungs and in the stomach

2. Signs of drowning:

-presence of a foreign body on the airways' mucus membrane (trachea, bronchi)

-presence of small hemorrhages on the airways' mucus membrane (trachea, bronchi) under the foreign body

- diatom plankton in kidneys and bone marrow

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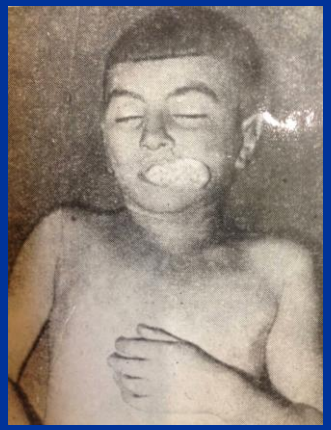
Foam around the mouth



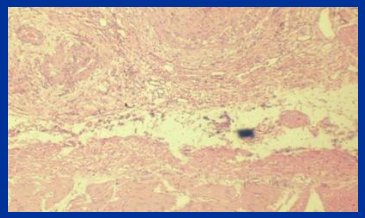
Skin maceration

Slide 40

Histology results

1. Within ligature mark's tissue:

- hyperemia, hemorrhages and swelling of a derma
- margination of leucocytes
- signs of nerve fiber starching



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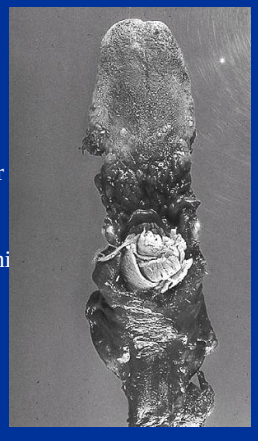
Airways obstruction by foreign bodies

1. General asphyxiation signs

2. Specific signs:

-foreign bodies on the mucous layer airways (trachea, bronchi)

-small hemorrhages on the mucus lini of airways (trachea, bronchi)



Slide 38

Task № 8. List questions solved by forensics during examination of physical harm caused by guns:

1. _____
2. _____
3. _____
4. _____
5. _____

Task № 9. Describe Savigny-Nekiforov sign:

1. _____
2. _____
3. _____
4. _____

Task № 10. List causes of death (and why did they happened) caused by guns:

1. _____
2. _____
3. _____
4. _____
5. _____

Task № 11. Name characteristics of damage caused by a gunshot to a flat bone and a cylindrical bone:

1. _____
2. _____
3. _____
4. _____

Task № 12. In the table below describe ways to determine whether damage was done while a body was still alive:

Methods	Ways of conduct
Histology	
Histochemical	
Biochemical	

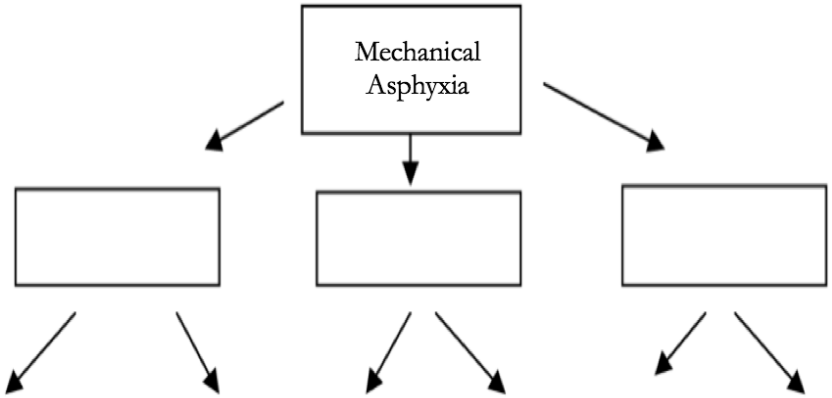
Task № 13. Name damage characteristics of bullet hydrodynamic activity:

1. _____
2. _____
3. _____

II. Forensic Examination of a Mechanical Asphyxia

Task № 1. Provide definitions:
Hangings –….
Ligature strangling –….
Airways obstruction with foreign bodies –….
Compressive Asphyxia –….
drowning –….

Task № 2. Complete a diagram by adding to classification of Mechanical Asphyxia:



Task № 3. Fill the table with Asphyxia's development stages:

Stage	Pathogenesis
I	
II	
III	
IV	

Task № 4. Fill the table by adding General external/internal signs of Asphyxiation:

External signs	Internal signs

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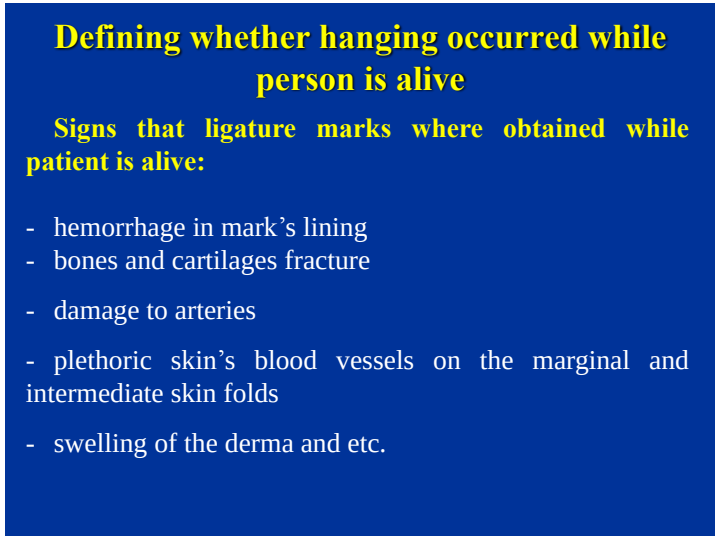
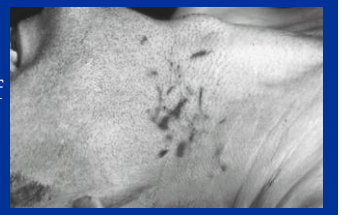


Slide 36

Manual strangulation



1. General signs of asphyxiation

2. Specific signs:

-half-moon bruises around the neck

-fracture of larynx' s cartilages and hyoid fracture

Slide 33

Ligature strangulation

1. General signs of asphyxiation

2. Specific sign:

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

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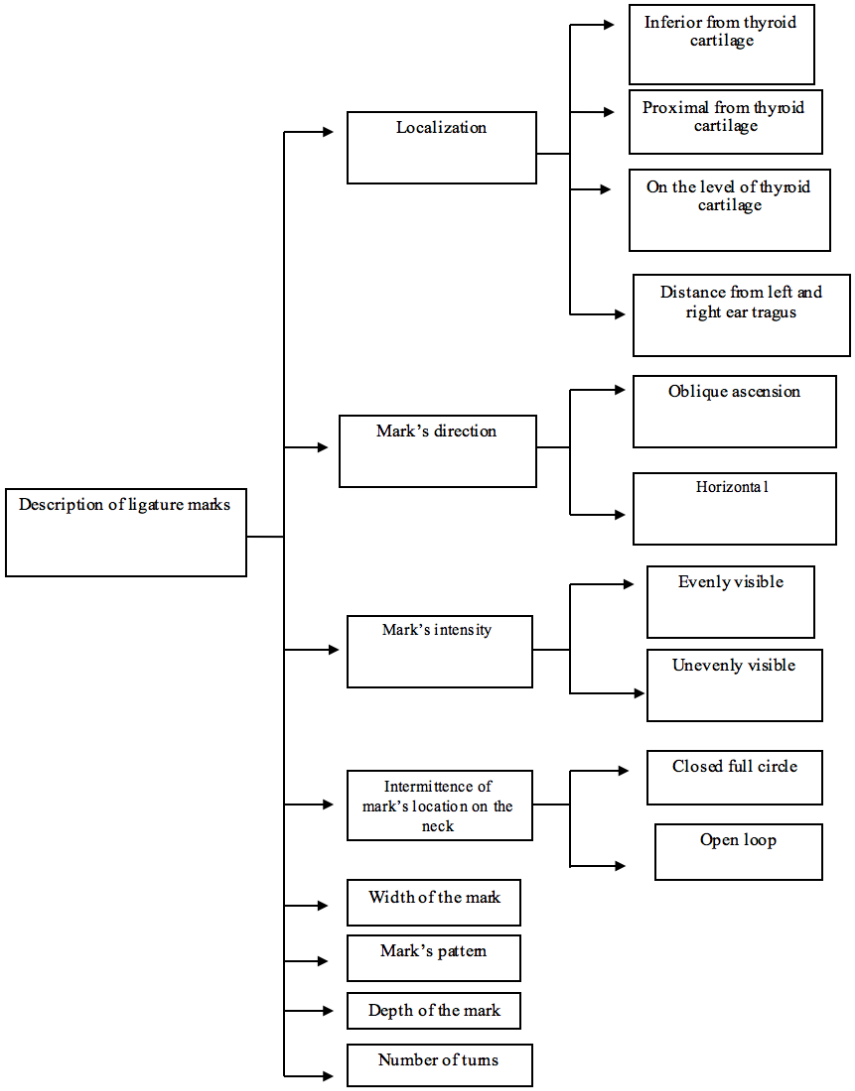
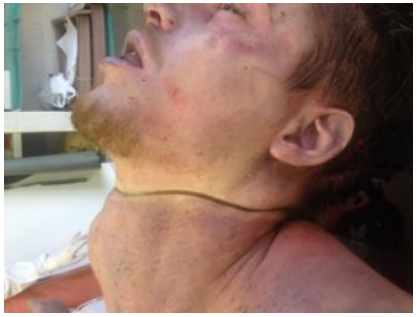
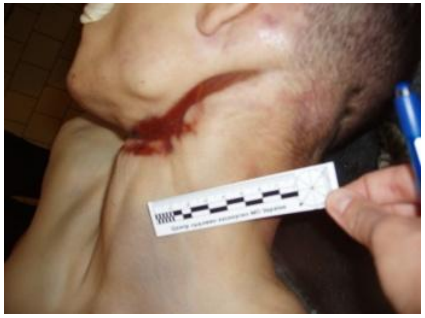
Task № 5. Based on algorithm provided described ligature marks on two given pics. (1,2) and define a type of a Mechanical Asphyxia:



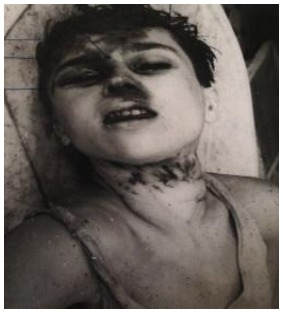


Pic. 1.

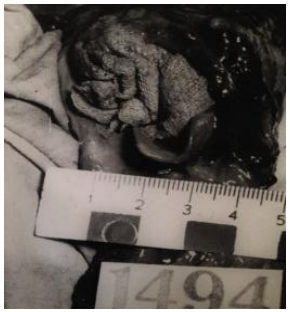


Pic. 2.

Task № 6. Based on pics. (3,4) provided below define and explain the type of Mechanical Asphyxia:



Pic. 3



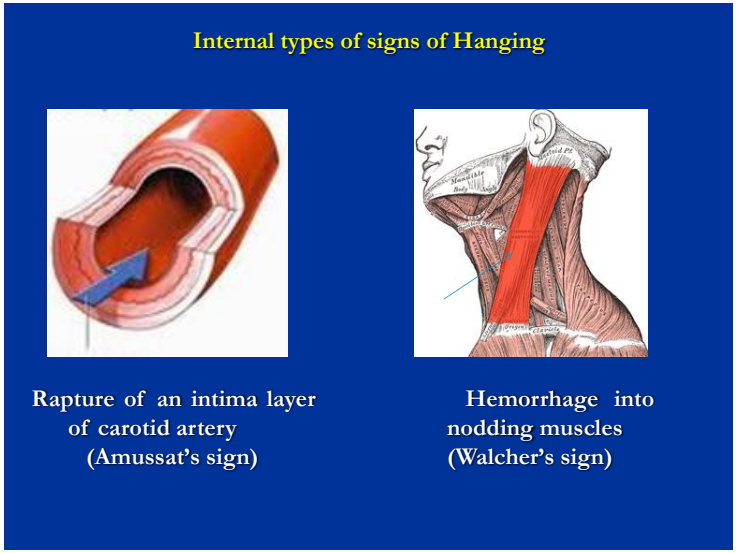
Pic. 4

Task № 7 List specific signs related to Mechanical Asphyxia caused by chest/abdomen compression:

1. _____
2. _____
3. _____
4. _____
5. _____

Task № 8. Dill the table with signs of drowning and signs a body being in the water:

Body being in the water	Signs of drowning



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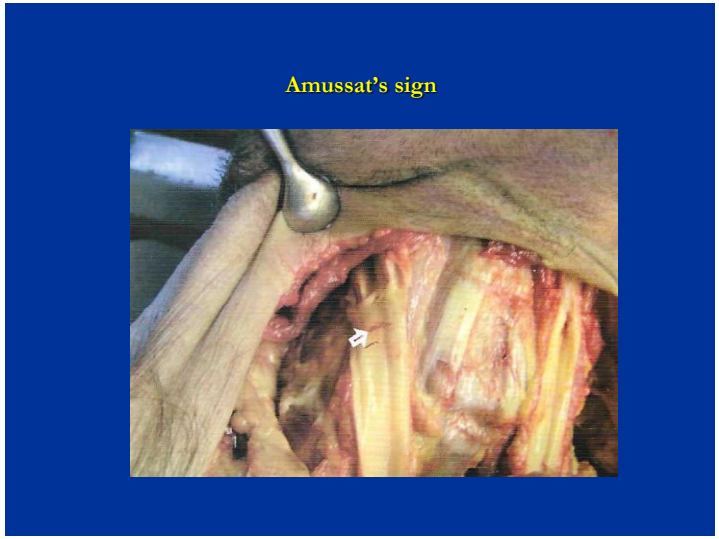

Slide 32

Mechanism of death in Hanging

-Trachea's lumen blockage by tongue's root

- Jugular veins compression by the ligature

-Vague nerve trunk's compression which creates a reflex and heart stops

- Disruption of a spinal cord in neck vertebrae

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Signs of Hanging

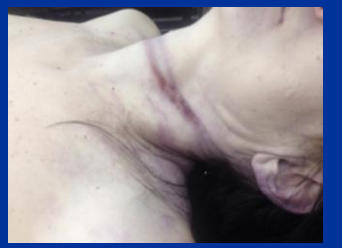
1. General signs of asphyxiation

2. Specific signs:

- oblique-ascending ligature mark

- Amussat's sign

- Walcher's sign



Slide 30

III. Forensic justification of a mechanism of trauma and the cause of death

Task № 1. List and explain signs that a body was hanged while still being alive:

1. _____
2. _____
3. _____

Task № 3. List and explain causes of death from different types of Mechanical Asphyxia:

1. _____
2. _____
3. _____

Task № 3. List number of questions to answered by forensics service after Mechanical Asphyxia examination:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

IV. Example of a PowerPoint presentation for the class

National medical university named after O.O. Bohomolets
Department of Forensic Medicine and Medical Law

Forensic Examination of a Gunshot Wound. Forensic Examination of a Mechanical Asphyxia

Associate Teacher of Forensic Medicine and Medical Law Department
Erhard Natalia Mykolayivna

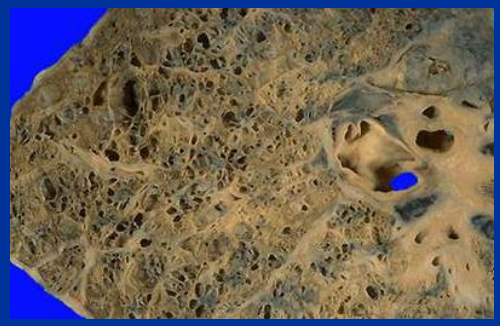
Slide 1

Lesson's plan (core objectives):

I. Gunshot Wound

II. Types of Mechanical Asphyxia

Slide 2

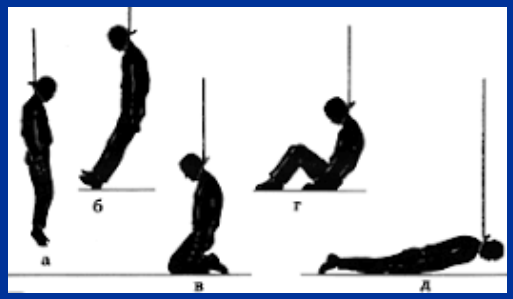


6. Vesicular emphysema

Slide 27

Hanging

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

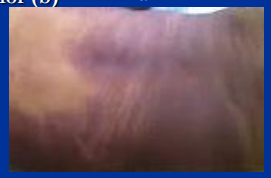


Slide 28

General external asphyxiation signs

1. Cyanotic face (blue face)
2. Subconjunctival hemorrhage (a)
3. Livor mortis of dark-purple color (b)
4. Sphincters paresis

a



b

Slide 25

General internal signs of a mechanical asphyxiation

1. Liquid dark-red blood
2. Right heart chambers are filled with blood
3. Plethoric internal organs
5. Tardieu spots (a, b)

a

b

Slide 26

I. Gunshot Wound

Shooting distance

1.1. Contact wound

1.2. Near-contact wound

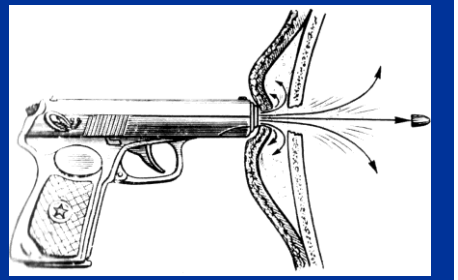
1.3. Intermediate-range shot

Slide 3

1.1. Contact wound

-Presence of a muzzle imprint around entrance wound

-Location of additional signs of a gunshot alongside the wound tract



Slide 4

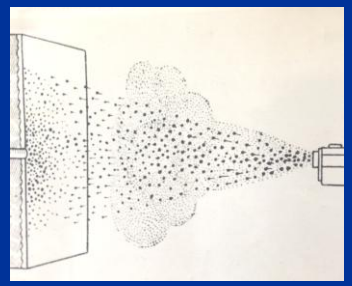
Lesions appearing on an entrance wound in contact wounds

Slide 5

1.2. Near-contact shot

-Presence of additional signs of a shot around an entrance wound

- Location of additional signs of a gunshot alongside the wound tract



Slide 6

Stages of Mechanical Asphyxia development

- Preasphixiation stage
- Inspiratory dyspnea (ins. shortness of breath)
- Expiratory dyspnea (exp. shortness of breath)
- Resting stage
- Gasping
- Persistent apnea

Slide 23

Forensic diagnostic of Mechanical asphyxia

1. General asphyxiation signs of a mechanical asphyxia

1.1. External signs

1.2. Internal signs

2. Specific signs of hanging

2.1. External signs

2.2. Internal signs

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II. Obstructive Mechanical Asphyxia

1) Airways obstruction by a foreign body

III. Aspiration Asphyxia

1) Drowning

2) Aspiration by vomit

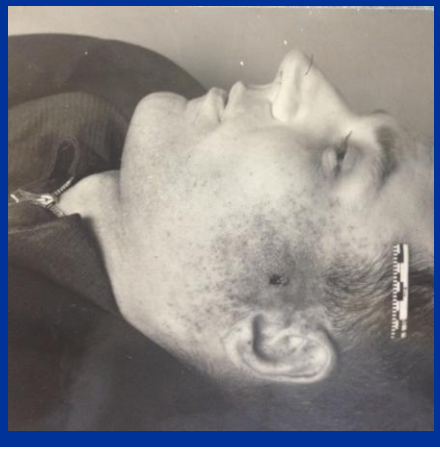
Slide 21

IV. Compressive Mechanical Asphyxia

1) Chest and abdomen compression

Slide 22

Lesions appearing on an entrance wound form a near-contact shot

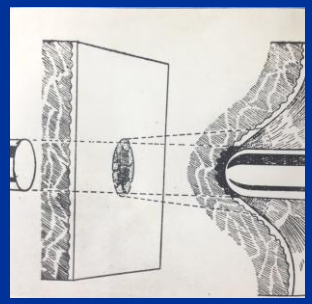


Slide 7

1.3. intermediate-range shot

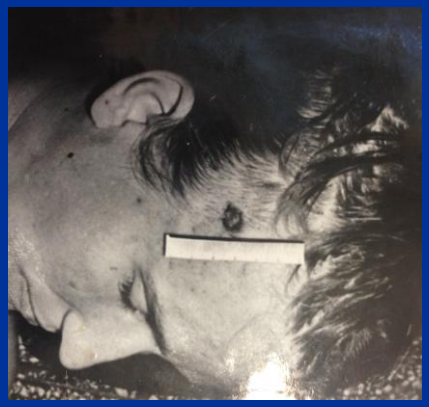
- Presence of dust tattooing around the entrance wound

- Absence of additional signs of a shot around entrance wound and inside the wound tract



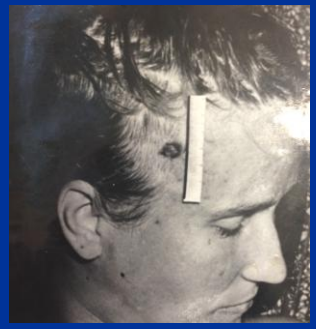
Slide 8

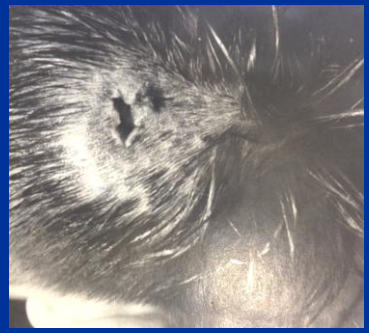
Lesions appearing on an Entrance Wound form a Intermediate-range shot



Slide 9

Lesions appearing on an Entrance and Exit wound





Slide 10

II. Mechanical Asphyxia

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

Slide 19

Types of Mechanical Asphyxia

I. Neck's organs compression

1. Strangling Mechanical Asphyxia

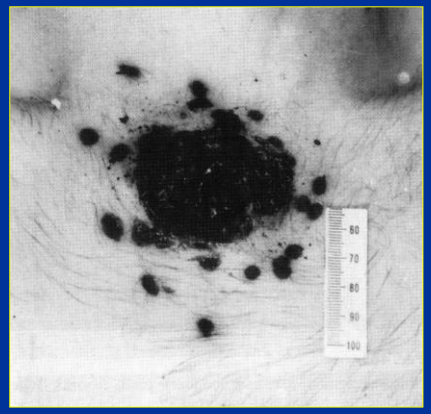
а) Hanging

б) Ligature strangulation

2. Manual strangulation

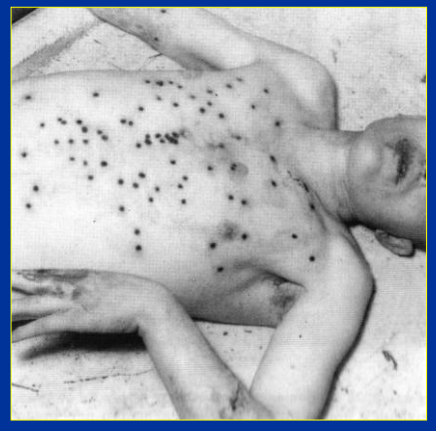
Slide 20

Lesions appearing around an Entrance Wound of a Close-Range rifle wound (from 2 meters)



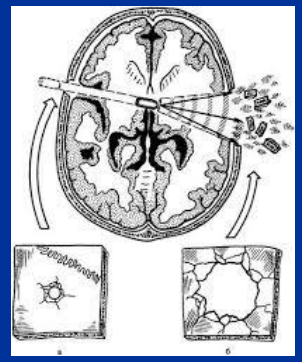
Slide 17

Lesions appearing around an Entrance Wound of a Intermediate-range shots (more than 5 meters)



Slide 18

Lesions created on a flat bone

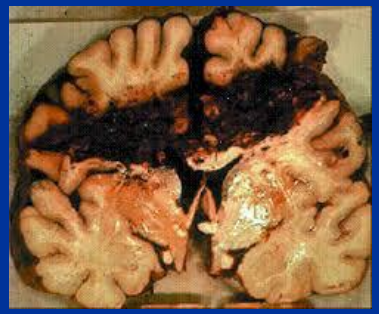


Slide 11

Entrance and Exit wound on skull bones (Flat Bones)

Slide 12

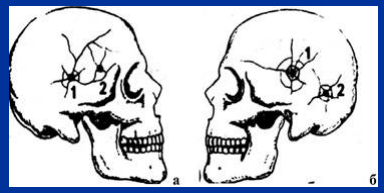
Hemodynamic action of a bullet



Slide 13

Determination of the sequence of gunshot wounds

Rule of Savigny-Nekiforov



Slide 14

Range of rifle wounds

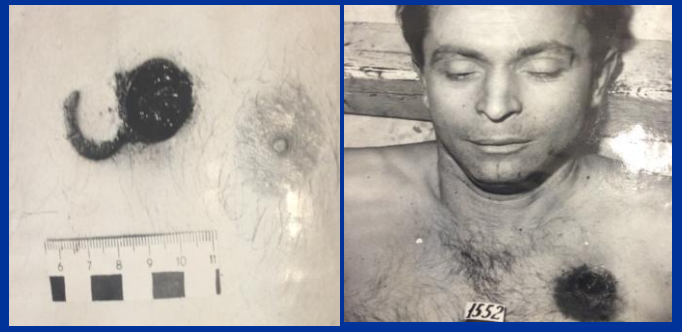
1.1. Contact rifle wound

1.2. Shot from 2 to 5 meters

1.3. Shot from more than 5 meters

Slide 15

Lesions appearing around an Entrance Wound of a Contact Rifle Wound



Slide 16