Forensic and Legal Medicine
Course 1

Introduction. Thanatology

Definition

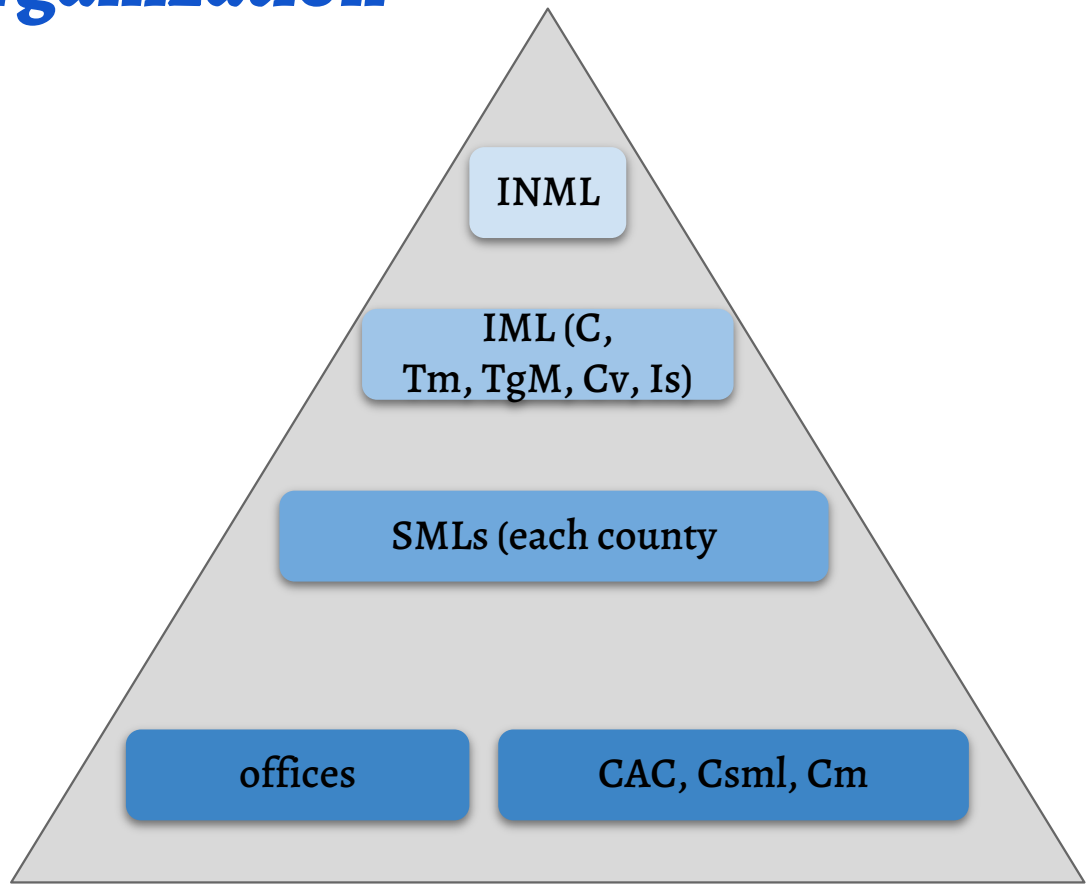
“ medical specialty with legal implications, found at the border between medicine and legal sciences, whose main purpose is to “translate” human biological reality into abstract notions, useful as legal evidence ”

The importance of legal medicine

- own criteria (exclusive competence of the forensic doctor)
  - quantifying the severity of traumatic injuries
  - establishing the criteria for inclusion in the concept of disability
  - how to perform the forensic autopsy
  - age determination based on dental pieces
  - establishing identity based on bites
- interpreting, advising and applying medical/biological knowledge to serve justice:
  - assessing the accuracy of medical documents
  - analysis of the legal consequences associated with the medical management of various pathologies
- explaining medico-legal concepts to doctors of other specialties

- explaining medico-legal concepts to doctors of other specialties
  - postmortem examinations
  - description of traumatic injuries
  - knowledge of the legal rights and obligations of doctors and patients
  - preparing patients to be examined in the medical-legal system
  - evaluation of morphological aspects within the primary competence of medical-legal physicians (domestic violence)
- initiating collaborations with physicians of other specialties to be able to help in forensic cases
  - odontostomatological identification
  - assessing deficits in the provision of medical care

Territorial organization



Areas of activity

- examinations on cadavers or human remains
- psychiatric examinations
- trauma examinations
- genital examinations
- anthropological examinations
- establishing skills for certain activities or professions
- laboratory
- odontostomatological examinations
- bioethics, medical law, verification of authenticity of medical documents

Types of forensic documents

On request

- TRAUMA
- alcohol/drug intoxication (in humans)
- psychiatric – evaluating decisional capacity
- assessment of skills to carry out a profession/job

officially

- those made on request
- DECEASED
- rape
- for identification purposes
- Evaluation to suspend or abort jail time
- psychiatric - evaluating decisional capacity

Principles of drafting medical-legal documents

The principle of unitary methodology

- writing style, examination methodology

Unrestricted access to medical data

- the requested documents must be made available to the legal-medicine doctor
- medical records are always complete
- requested consultations - medical emergencies

Control of medical documents

- internal
- external

Institutul National de Medicina Legala "Mina Minovici"

Nr. A2/4962/14.09.2017

Data eliberării 05.10.2017

CERTIFICAT MEDICO-LEGAL

Subsemnatul, Dr. Alexandrescu Gheorghe, medic primar legist la I.N.M.L. "Mina Minovici" Bucureşti, am examinat la data de 14.09.2017 pe: GOŢIU REMUS MIHAI, în vârstă de 43 ani, domiciliat în: Mun. Cluj-Napoca, , jud. Cluj, legitimat cu C.I.; seria ... nr. ... / C.N.P. ..., care afirmă că: a fost agresat fizic în data de 13.09.2017 în jurul orei 21:30, fiind lovit cu pumnul de către o persoană cunoscută, urmat de lovire de un corp dur. Evenimentul s-a petrecut în pauza publicitară a unei emisiuni TV.

CONSTATĂRI: ora 09:55

Subiectiv:
- acută algii buză superioară.

Obiectiv:
- buză superioară paramedian dreapta, pe faţa vestibulară prezintă o tumefacţie echimotic violacee de 2/1,5/0,3 cm, fluctuentă prezentând central o plagă superficială liniară de 0,5 cm, corespunzător canimului superior 1.3 care nu prezintă mobilitate anormală.
- gambă dreaptă, 1/3 medie, antero-intern prezintă o excoriaţie de 2,5/0,5 cm, longitudinală cu crustă sangvină roşietică discontinuă, uşoare, nepansată; fără deficit motor.

Date din acte medicale:
Copie Fişă de Prezentare nr. 34212 din data de 14.09.2017 a Spitalului Clinic de Urgenţă „Sf. Ioan" din care reţinem:
Consult chirurgical - contuzie hemibuză superioară dreaptă. Excoriaţie faţa anterioară 1/3 medie gambă dreaptă. Afirmativ agresiune.
Recomandări:
- tratament antiinflamator.
- igienă locală şi generală riguroasă.
- reevaluare la nevoie.
Consult ortopedic - Afirmativ victima unei agresiuni în jurul orei 21:30.
Diagnostic: Excoriaţie faţă anterioară 1/3 medie gambă dreaptă. Contuzie buz superioară.
Recomandări:

Forensic odontostomatology

- subdiscipline/discipline distinct from forensic and legal medicine

Objectives:

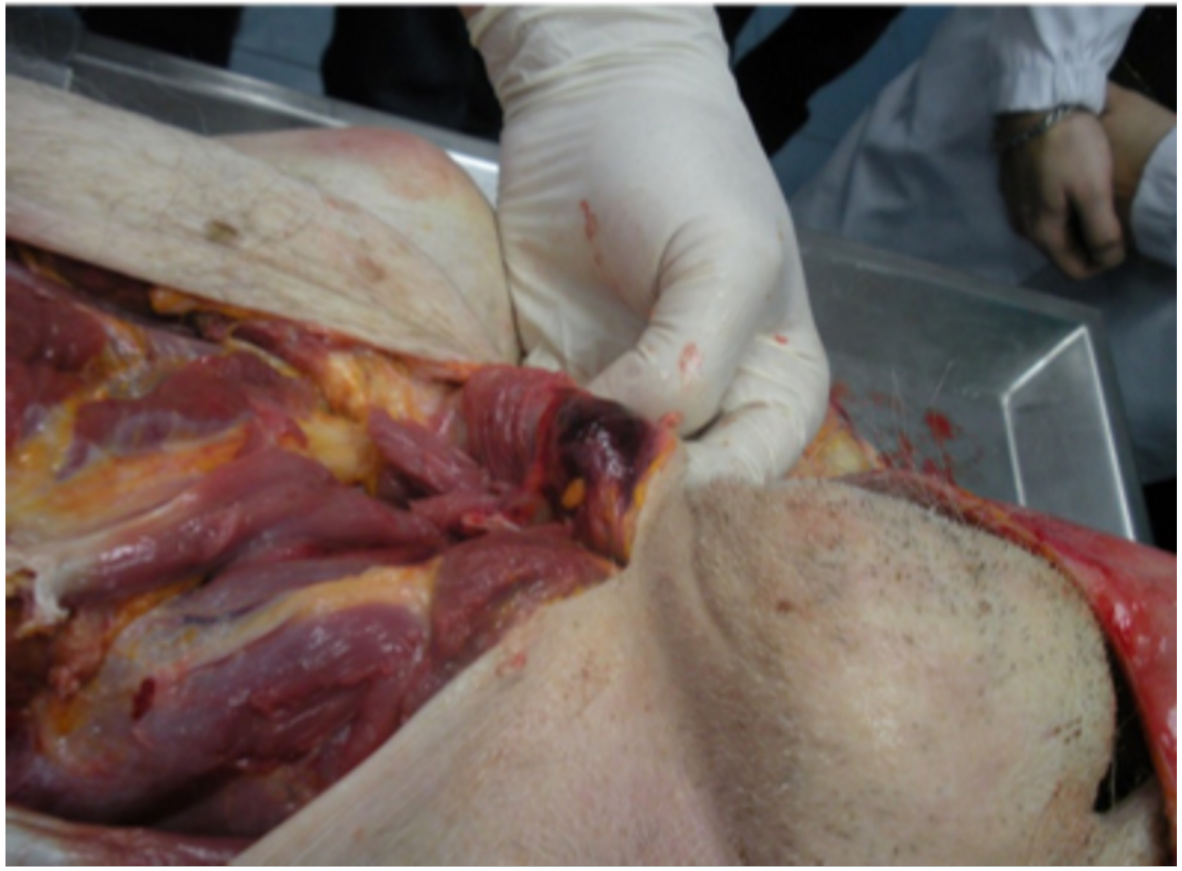
- human identification on dental samples;
- age estimation based on dental samples;
- establishing biological, biosocial, ethnic, racial data based on dental characteristics;
- gender identification on dental samples;
- bite analysis, cheiloscopy and rugoscopy;
- dental and BMF characteristics in abuse against child, domestic violence, terrorism, inhumane treatments);
- jurisprudence and dental bioethics

Forensic thanatology

Definition

The study of phenomena and processes associated with the death of a person (peri- and post-mortem)

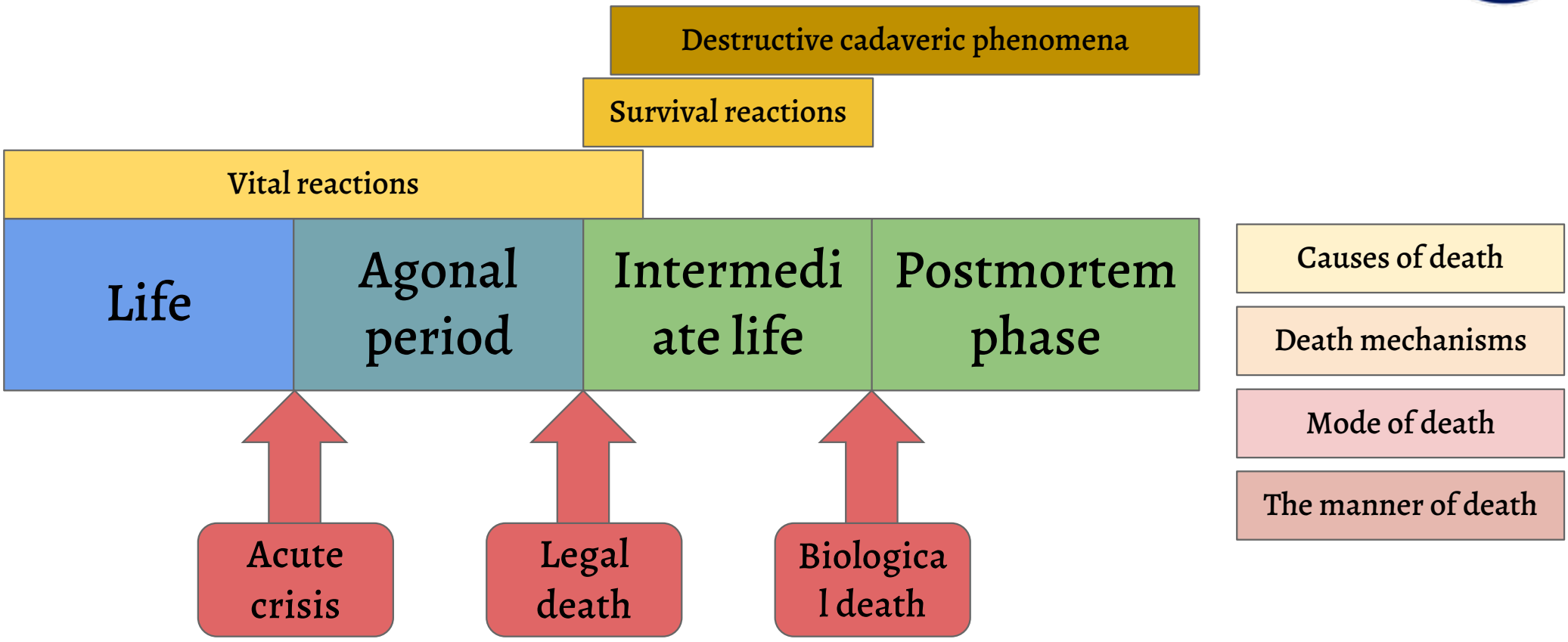
Hemorrhage in the anterior cervical muscles in a case of strangulation



Areas of interest

- the diagnosis of death
- causes of death
- the manner of death
- negative signs of life
- cadaveric signs
- vital reactions
- survival reactions
- traumatic and non-traumatic pathologies
- forensic autopsy

Thanatogenesys

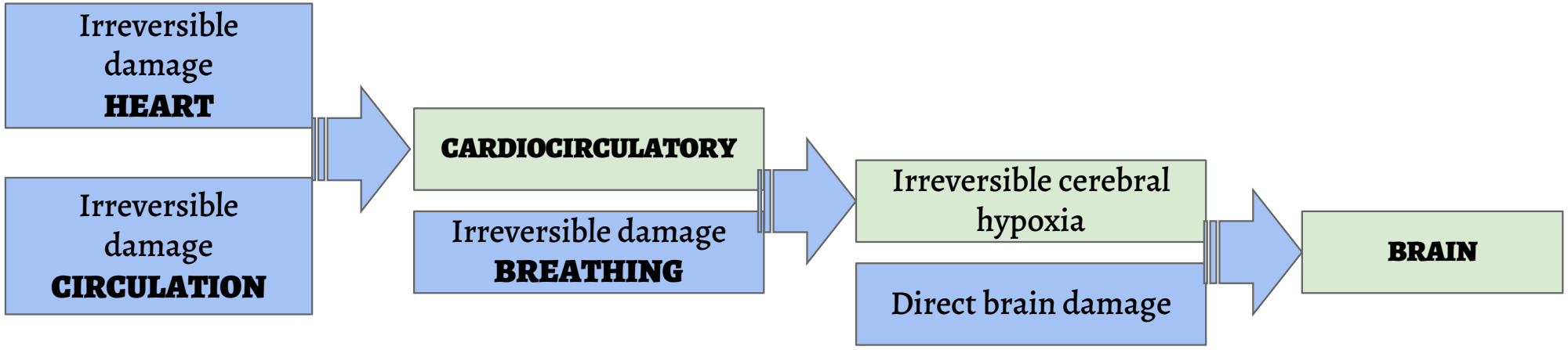


Diagnosis of death

- ***medical*** => biological phenomena associated with the death of a person (thanatogenesis)
- ***legal*** => legal procedures associated with death

Medical definition of death

"permanent loss of consciousness and loss of all truncal functions. These may result secondary to circulatory arrest and/or catastrophic brain damage" (WHO)



Medical criteria of death

- ***brain death criterion*** => there are NO more brain functions of any kind (encephalic, brainstem, diencephalic)
- lower brain death criterion => no more brainstem functions
  - Here we have centers for the respiratory, cardiocirculatory functions, and wakefulness
  - massive destruction => elimination of interconnections with the cerebral hemispheres (except for the visual and olfactory ones)
- circulatory activity criterion => circulatory activity is permanently and irreversibly stopped

legally

- ***ascertaining death*** => making the diagnosis of death
- ***death certification*** => drafting the medical certificate confirming death
- ***declaring death*** => obtaining the death certificate from the town hall
  - the body can then be buried/cremated
  - the person no longer exists in the population register

Death determination - criteria

Cadaveric signs	• minimum 1

Irreversible cessation of cardiorespiratory function	• ***after*** unsuccessful cardiopulmonary resuscitation by specialized personnel, based on specific protocols
	• if resuscitation is performed by non-specialized personnel - continue until:
	  ○ at least 1 cadaveric sign appears or
	  ○ resuscitation is taken over by specialized personnel

Brain death criterion	***ALGORITHM*** I. clinical examination: • deep, flaccid, inactive coma • absence of brainstem reflexes II. absence of spontaneous ventilation, confirmed by the apnea test (at a $PaCO_2$ of 60 mmHg) III. electroencephalographic trace that attests to the lack of cortical electrogenesis ***Repeat tests*** at 6h (adults), 12-48h (children, depending on age) It can ***only be performed by specialized personnel in healthcare facilities***
Certain death	• death is certain, even without the presence of one of the other 3 criteria (e.g. decapitation)

C.N.P.

Județul .....
Comuna/orașul(municipiul) .....
Unitatea sanitară .....

Data înregistrării:
Anul ..... Luna ..... ziua .....

CERTIFICAT MEDICAL CONSTATATOR AL DECESULUI NR. .....

Numele ..... Prenumele ..... Sexul: M / F
Data nașterii: anul ..... luna ..... ziua .....
Data decesului: anul ..... luna ..... ziua ..... ora .....
Starea civilă ..... Naționalitatea ..... Religia .....
Nivelul de instruire ..... Activitatea economică .....
Domiciliul legal: județul ..... comuna / orașul (munic.) .....
Satul(str.) ..... Nr. .....
Domiciliul de reședință: județul ..... comuna / orașul (munic.) .....
Satul(str.) ..... Nr. .....
Locul decesului .....
Cine a certificat decesul (specialitatea medicului) .....

CAUZELE DECESULUI

I. Boala sau afecțiunea morbidă care a provocat decesul
a) Cauza directă (imediată) a) .....
Boala sau starea morbidă care a provocat direct decesul .....
b) Cauze antecedente b) .....
Stări morbide intermediare care au dus la starea înscrisă mai sus (pct. "a") .....
c - d) Starea morbidă inițială c) .....
Boala sau bolile inițiale care au declanșat stările înscrise la pct. "b" și "a" și care constituie cauza / cauzele determinante (c) d) .....
II. Alte stări morbide importante
Stări morbide care au contribuit la deces dar fără legătură cu boala sau starea morbidă care l-a provocat .....

Semnătura și parafa medicului,

.....

17.4; A4; t1

Death certification

- Initial cause of death (Ic) - unique, most remote
- Antecedent causes (Ib) - may be multiple
- Direct cause (Ia) - unique, closest
- II - they pass:
  - favorable causes
  - alternative potential causes of death

Completed: family doctor/ambulance/medical unit nurse, AP, ML

Numele de familie ..... Prenumele .....

Actul de identitate : seria ..... nr. .....

Actul de deces: nr. ..... din .....

Data eliberării ..... Semnătura de primire .....

Sigla

ROUMANIE **ROMANIA** ROMANIA

CERTIFICAT DE DECES

CERTIFICAT DE DECES / DEATH CERTIFICATE

Seria .... Nr ....

DATE PRIVIND DECEDATUL

Cod Numeric Personal

Numele de familie				
Prenumele				
Sexul		Data nașterii		
Locul nașterii		Localitatea		Județul
Domiciliul		Localitatea		Județul
Data decesului		Locul decesului		
		Localitatea		Județul

DATE PRIVIND PARINȚII

TATAL	Numele de familie	
	Prenumele	
MAMA	Numele de familie	
	Prenumele	

Act de deces nr ..... din .....

Înregistrat la .....

Mențiuni .....

L.Ș.

Semnătura .....

Eliberat de ..... Data .....

Declaration of death

It is done by the family, at the City Hall

It needs:

- The medical death certificate
- ID card
- solicitation

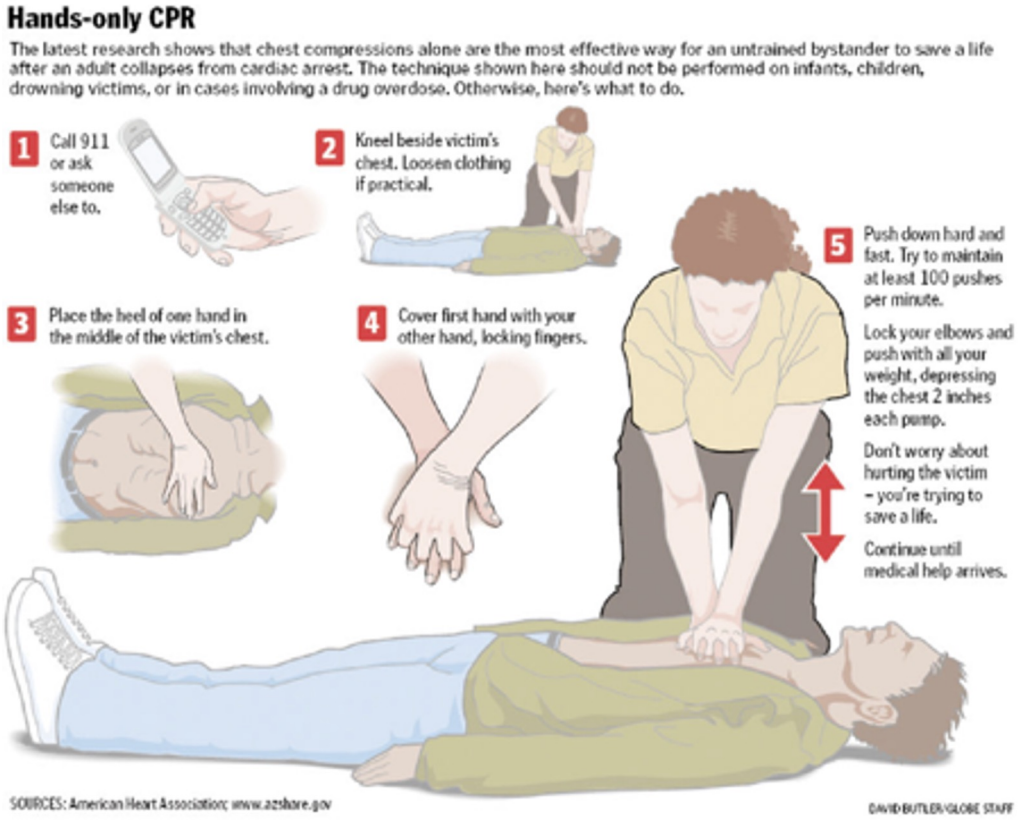
Negative signs of life

The person is unconscious/not breathing/has no cardiac activity, etc.

Examples:

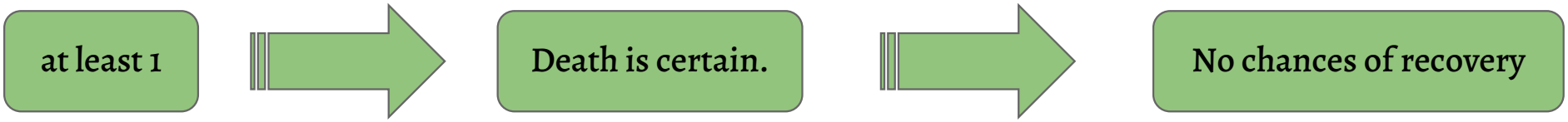
- no tonus (deep coma?)
- respiratory arrest (drowning, cardiorespiratory arrest, food bolus obstruction)
- circulatory arrest (vagal syncope, cardiorespiratory arrest, complete atrioventricular block)
- no reflexes (neurological pathologies, chemical coma – e.g. alcohol inhibits the vomiting reflex)
- ocular changes – pupillary areflexia (intoxications, neurological pathologies)
- suspension of brain activity (some anesthetics - isoflurane, cardiac arrest)

Negative signs of life



- may suggest (but not diagnose) death
- Their presence requires:
  - exclusion of reversible causes (hypothermia, poisoning, resuscitable cardiac arrest)
  - initiating a set of mandatory therapeutic measures (cardiopulmonary resuscitation, antidotes etc.)
- If no reversible causes are identified, resuscitation measures are continued until:
  - cadaveric signs appear OR
  - resuscitation is taken over by a specialist
- CPR
  - can be successful - the person lives
  - unsuccessful - death is noted

Signs of real (cadaveric) death

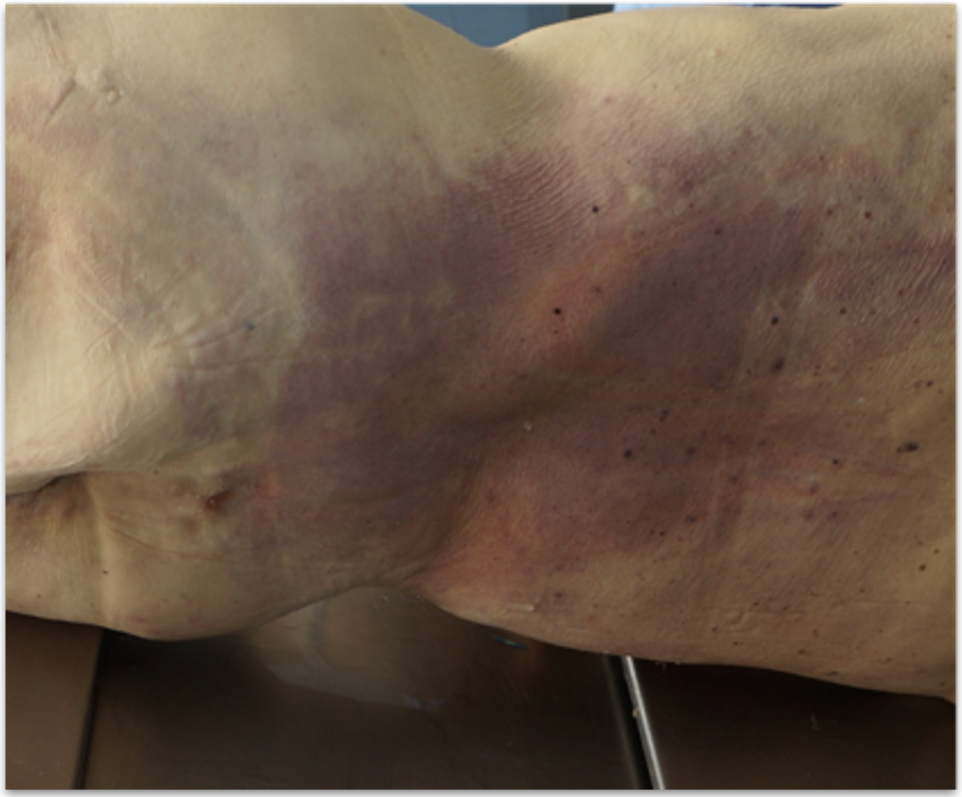


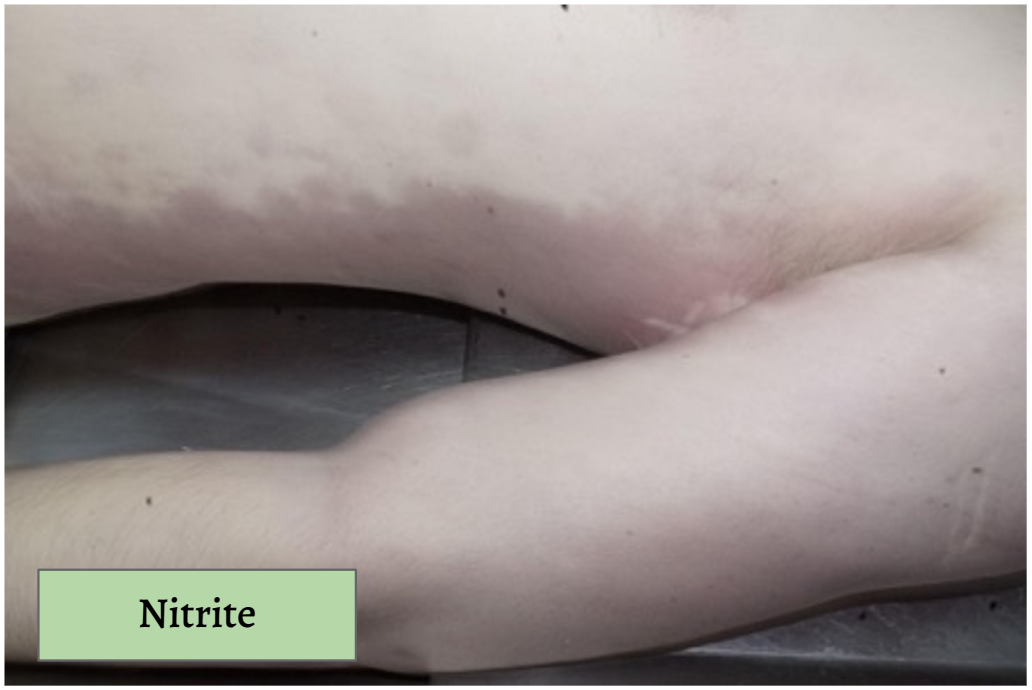
Classification

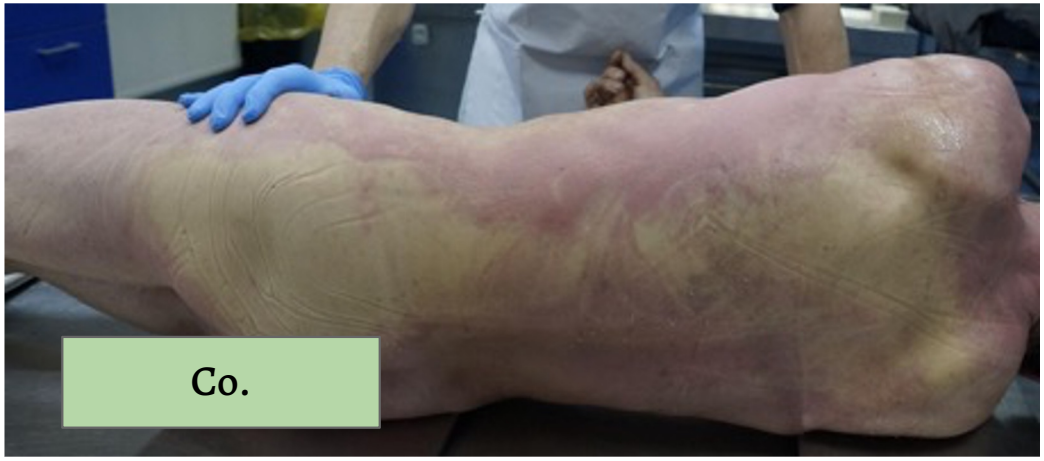
- early (<24h): lividity, rigidity, cadaveric cooling, dehydration, autolysis, hypothermia
- late (>24h):
  - destructive: putrefaction, destruction by insects and other animals
  - Conservative
    - natural: mummification, lignification, freezing
    - artificial: embalming, cryopreservation

Lividity

- the downward accumulation of blood, under the action of gravity, in the absence of circulation
- morphological:
  - slope areas - large, reddish-purple, polycyclic, confluent spots
  - sloping contact areas - cadaveric pallor (blood leaks into neighboring areas)
- stages:
  - hypostasis (<12h);
  - diffusion (12-18h)
  - imbibition (>18h)




Nitrite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Hypothermia

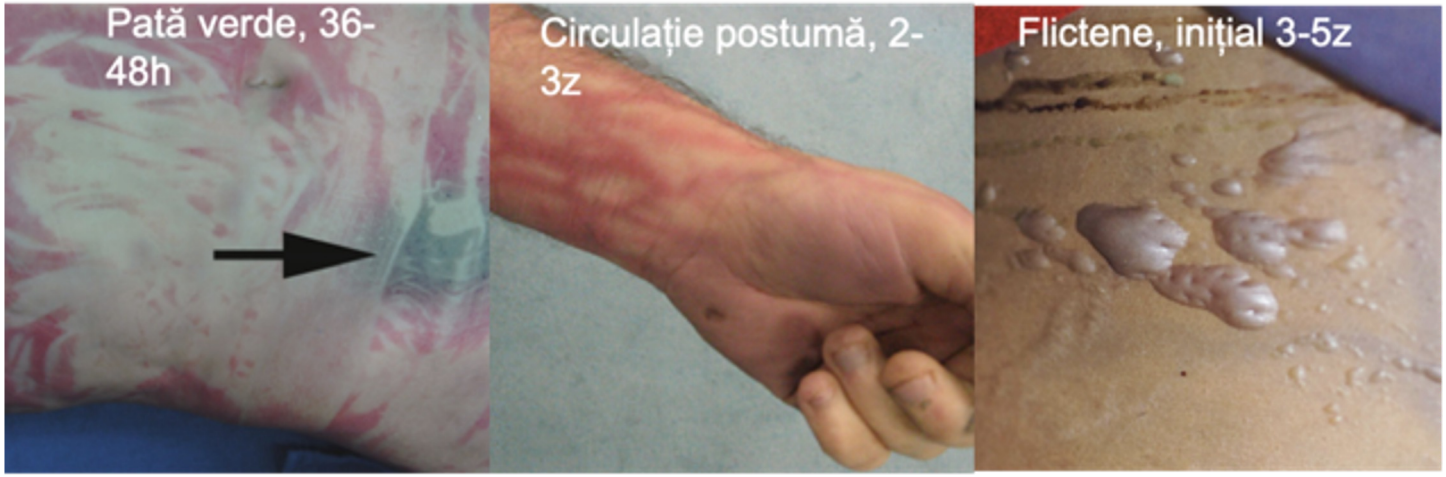
rigidity

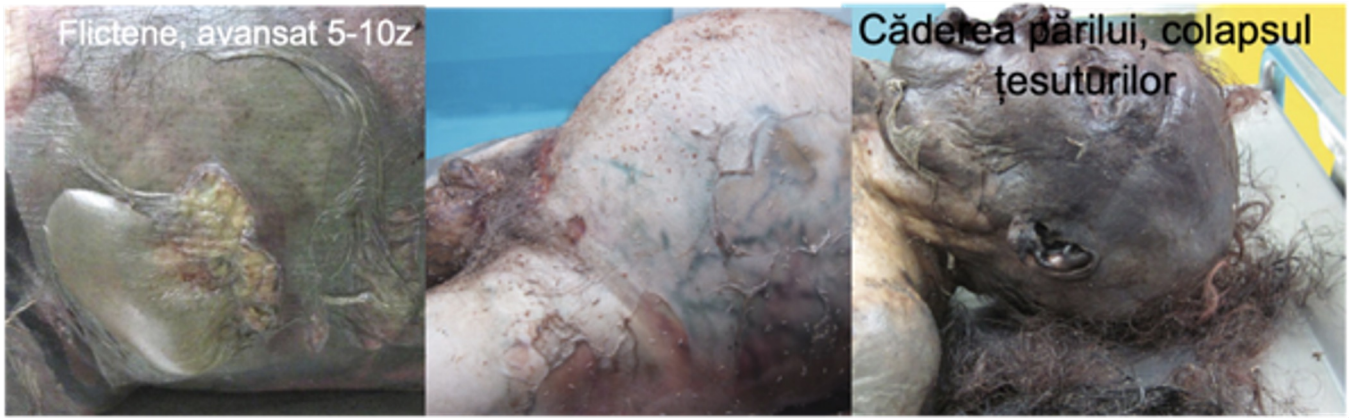
- immediately postmortem - muscle flaccidity (complete abolition of tone);
- subsequent:
  - decreases the amount of ATP
  - anaerobic glycolysis
  - pH decrease
  - actinomyosin coagulation (pH =6.6-6.3)
- characterized by:
  - increasing muscle mass consistency
  - decreased joint mobility

Stages:

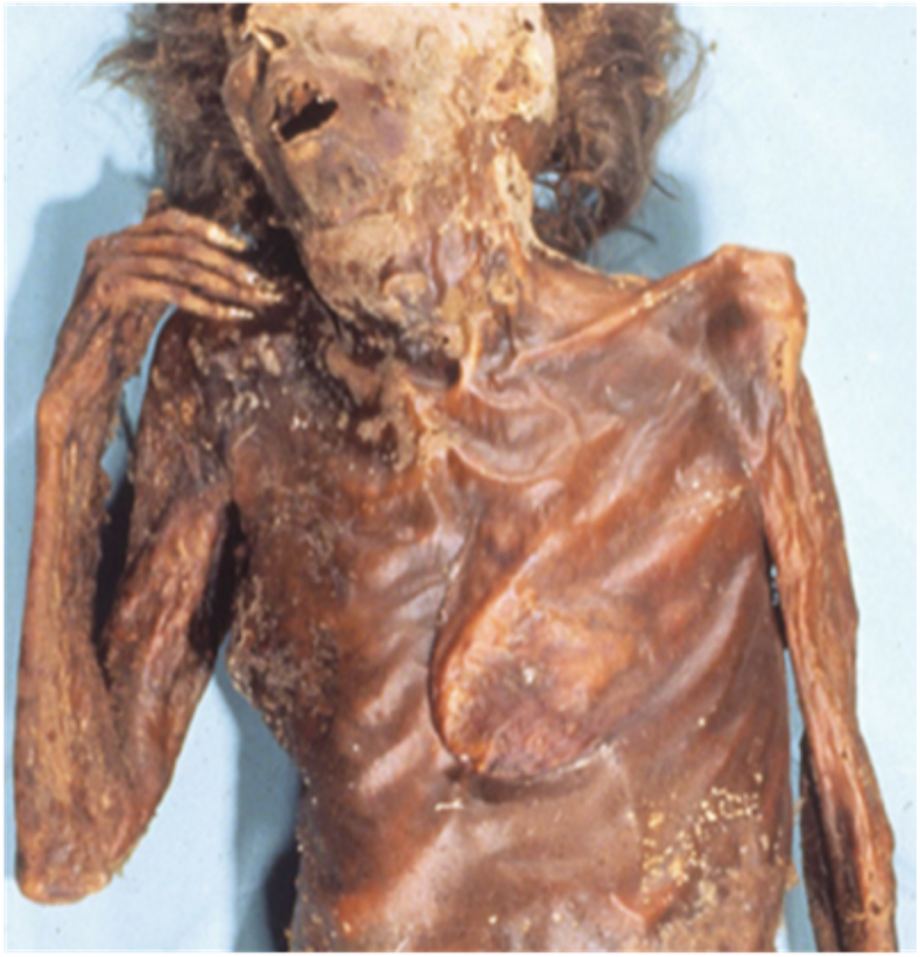
- onset (<24h): craniocaudal onset, recovers after being defeated
- generalization (24-48): does not recover after being defeated
- resolution (>348h)

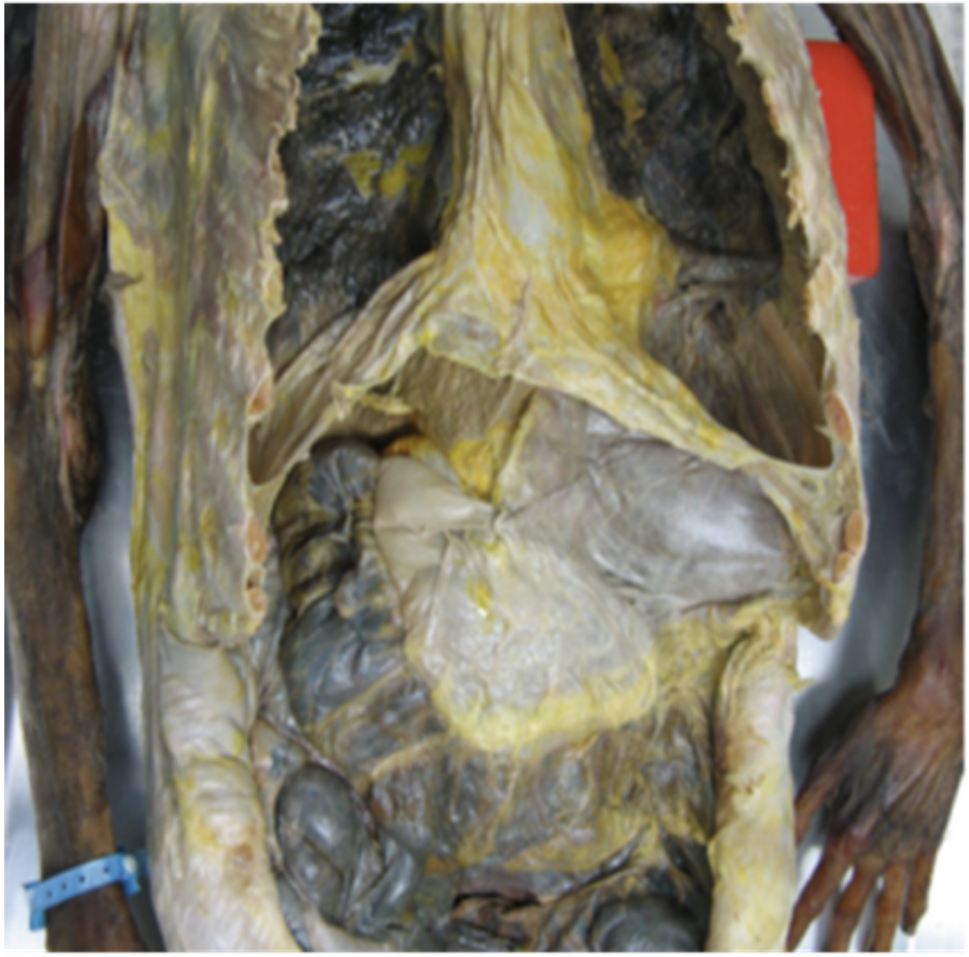
putrefaction



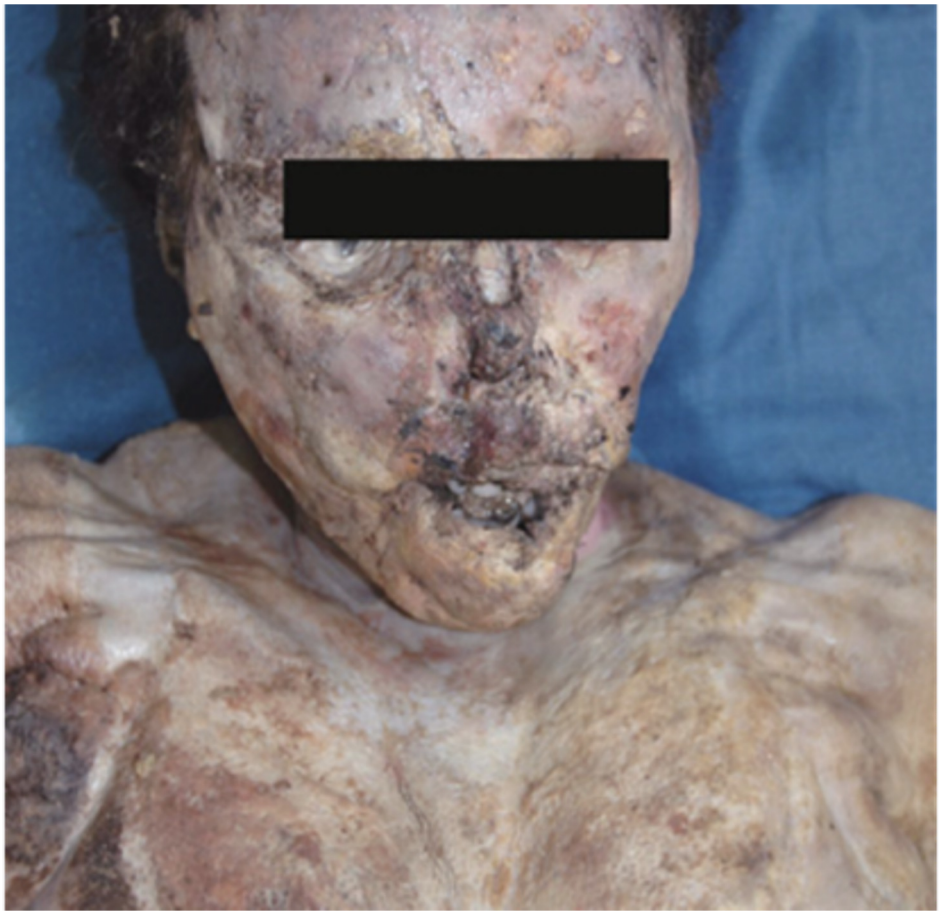


Mummification



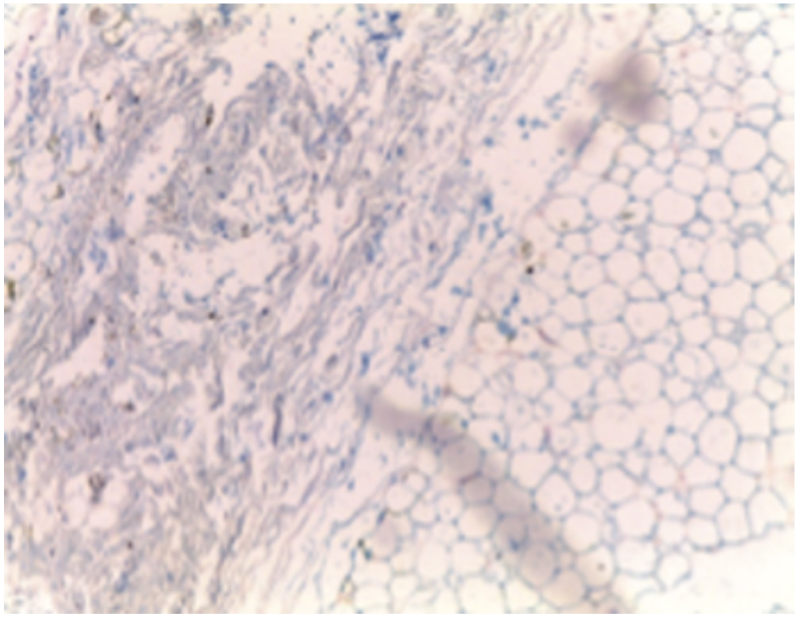


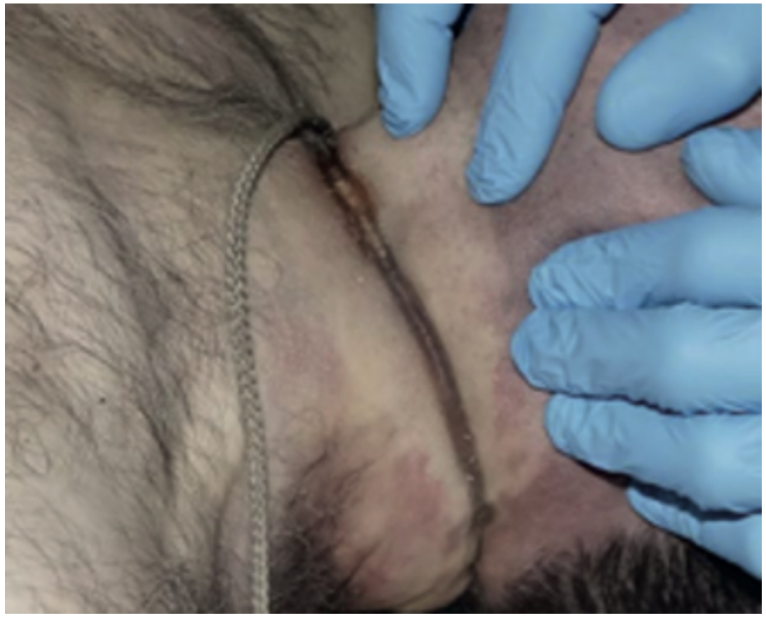
Adipocere

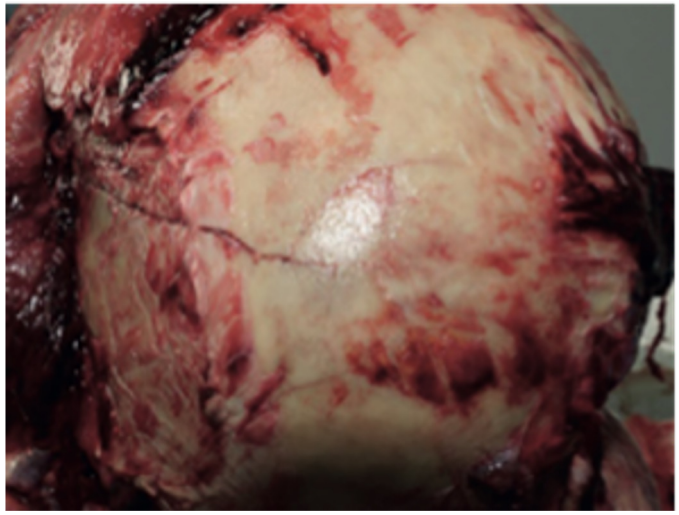


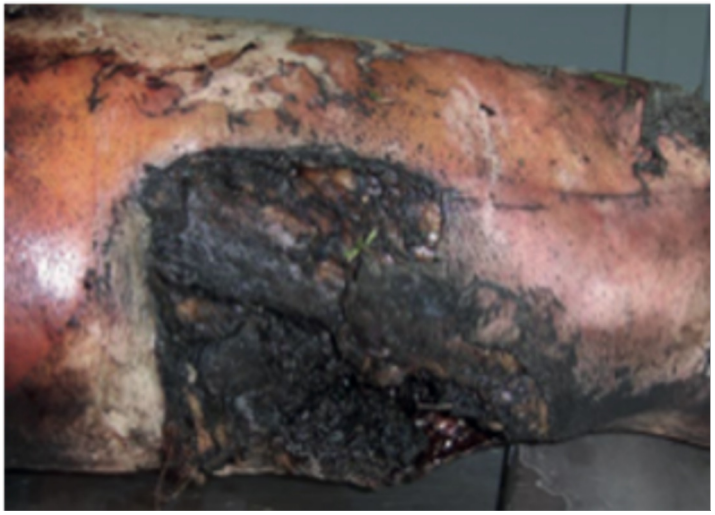
Vital reactions

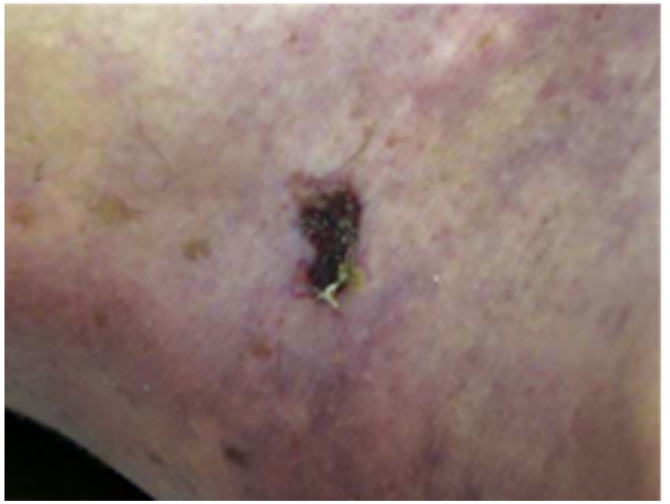
- Were the identified injuries produced ante or postmortem?
  - covering up a crime
  - water body transportation
  - the action of animals on the corpse, etc.
- vital reaction -> diagnoses antemortem injury
- types:
  - local (at the site of action of the traumatic agent): bruise, hematoma, hemorrhage
  - general (the reaction of the whole organism to a traumatic agent): e.g. in hypothermia -Vishnevsky spots appear on the stomach, activation of heat shock proteins in the brain, etc.
  - specific (characteristic of certain causes of death): electric mark in electrocution, hanging groove in hanging, etc.)











Survival reactions

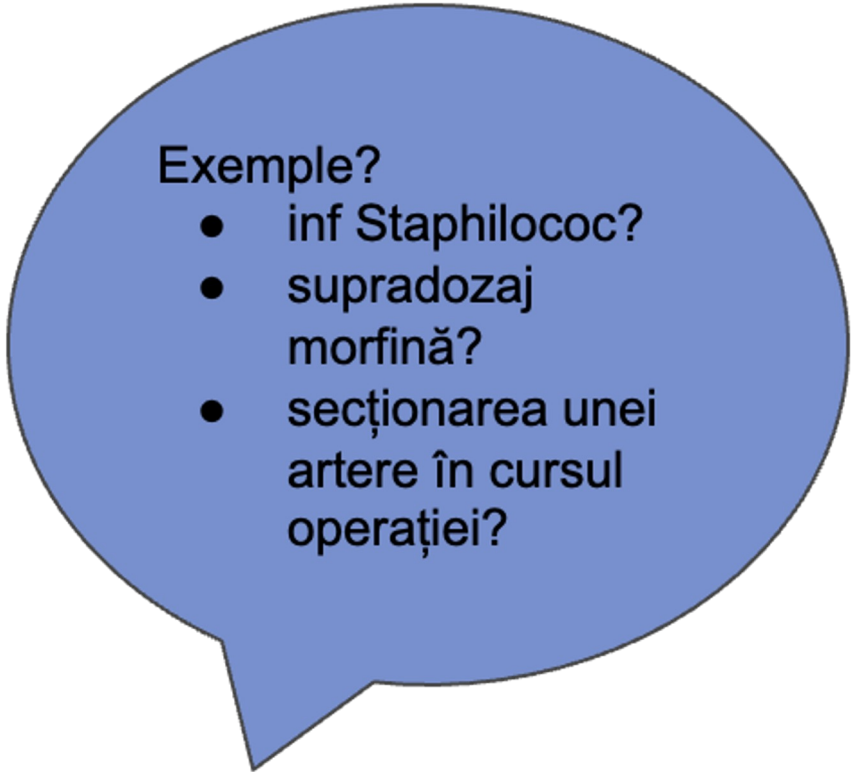
- they occur postmortem, as a result of the persistence of cellular/molecular processes in various tissues/organs after death has occurred, according to WHO definition
- allow the collection of tissues/organs from the deceased (cornea 24-30h, kidneys 20-24h, heart 15-30 min, liver 10-12h)
- examples:
  - cilia of the respiratory epithelium: movements in saline solution 5hPM
  - leukocytes: mitoses 5-8h; some have phagocytic capacity up to 30h
  - sperm: motility decreases faster than vitality; allows fertilization of the egg if collected up to 24 hours PM
  - pupil: movements by pharmacological stimulation 4-8hPM
  - uterus: contractions 4-6hPM
  - sweat glands: sweating approx. 8hPM

Forensic autopsy

When is it necessary?

Violent death

- death caused by the action of a traumatic agent:
  - mechanical
  - physical
  - chemical
  - biological
- death caused by the inaction of a person who had a duty to act
  - ex: infanticide by leaving the newborn in the cold



Death suspected of being violent

- there are reasonable suspicions that it was caused by the action of mechanical, chemical, physical, biological traumatic agents
- death occurs during a duty mission or at the headquarters of a legal entity
- repeated deaths in series or simultaneously
- deaths occurring in isolated places
- death of people on substitution treatment (drugs)
  death of people in care in institutions specialized in providing care if they are not known to have documented, potentially fatal diseases

Cause of death unknown

- death occurs suddenly, abruptly, rapidly and unexpectedly (sudden death)
- the death occurs in a person whose health is checked periodically by a doctor and who is not known to have any potentially fatal diseases
- the identity of the corpse cannot be established due to the lack of valid identity documents or if it is in an advanced state of decomposition that does not allow the assessment of the causes of death or identification based on the external physical appearance,
- death occurs in people without health insurance who are not registered with diseases with significant lethal potential;

There is a reasonable suspicion that the death is associated with the commission of a crime

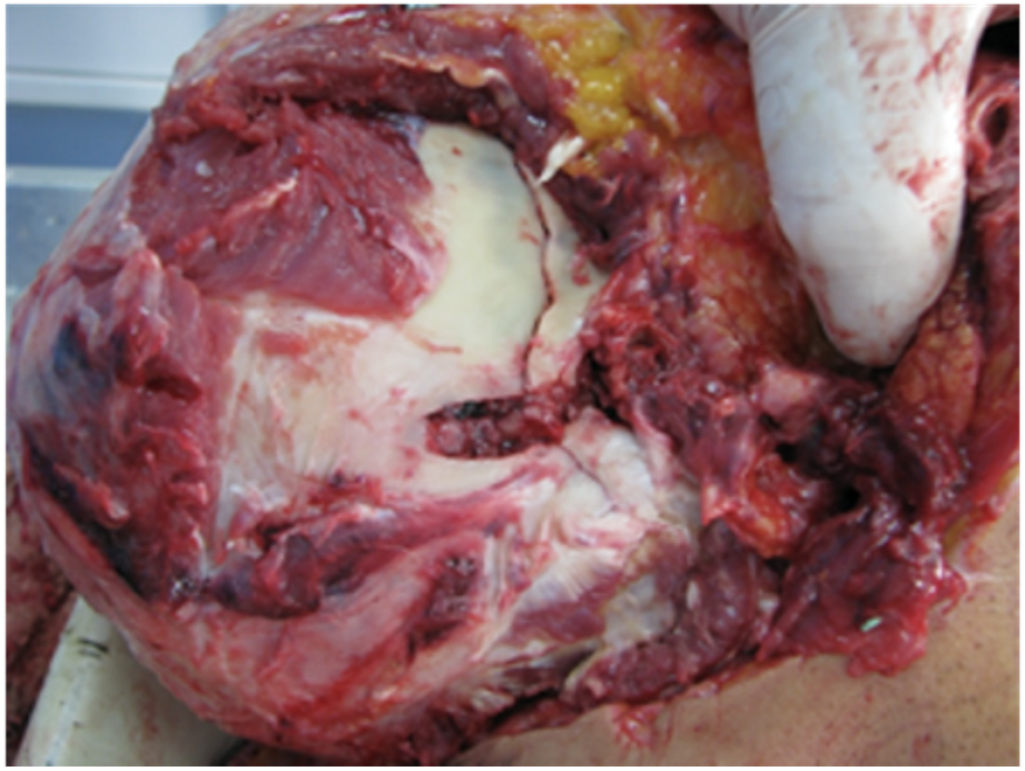
- any of the situations presented above
- if there are reasonable suspicions that the death may be linked to deficiencies in the provision of medical care
- if there are reasonable suspicions that the death may be linked to the application of occupational safety or health protection measures.

Why is it necessary?

- determines the manner of death
  - it is determined, if forensic autopsy is mandatory, ONLY after it is performed
  - differentiated from situations of mandatory forensic autopsy, which MANDATES, as an obligation, the forensic atusopty, primarily for establishing the manner of death
- determines the causes of death
- evaluate causal associations
- establishes the potential involvement of traumatic injuries in thanatogenesis
- identify the deceased
- establishes the date of death
- others (poisoning, medical errors, etc.)

Features

- requires official request (police, prosecutor's office)
- to be done only by legal-medicine doctors, in forensic institutions
- is complete (#pathology)
- must answer to the questions of the police/prosecutor



Craniocerebral gunshot wound with eccentric fracture lines

CAUSATION

General: the connection between a cause and an effect

LM: the connection between:

- traumatic injuries and their consequences
- deficits in the provision of medical care and their consequences

Main components

- **cause**: the element that generates a morphological, morphofunctional or functional change in the organism (reversible or irreversible, temporary or permanent)
  - single/multiple
  - violent/nonviolent
- **effect**: body modification
- **causality** => pathophysiological explanation of how to get from cause to effect

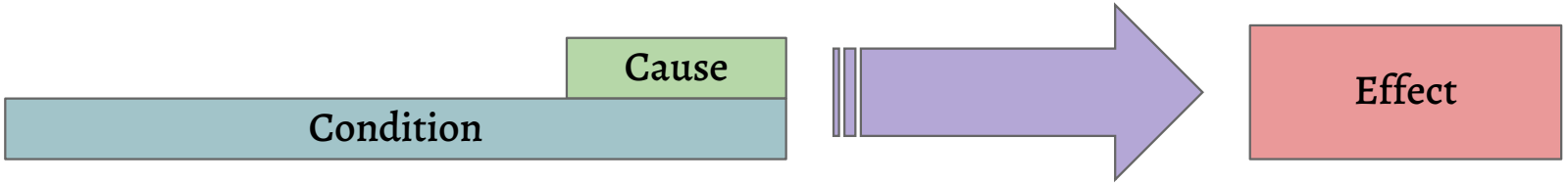
Optional components

- conditions => pathologies present prior to the moment of action of the cause (permanent or with long evolution), which aggravate its effects
  - internal: age, sex, vascular malformation
  - external: toxic environment, chronic CO poisoning
- circumstantial factors => modulate the action of the cause, with episodic effect
  - internal: intraoperative hemorrhage, hypertension flare-up
  - external: hypothermia, acetic ethanol intoxication.
- triggering factors => circumstantial factors that act (relatively) simultaneously with the moment of action of the cause

Causal chains - direct unconditional

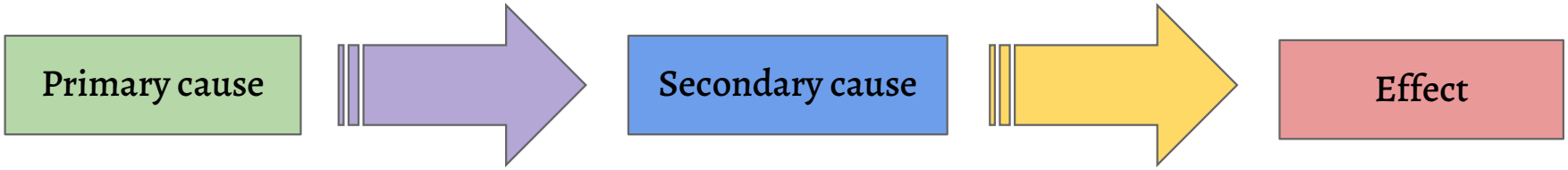
- cause => necessary and sufficient for the production of the effect
- spatial/temporal concordance
- the effect is not significantly aggravated by previous conditions or circumstantial factors

Causal chains - direct conditional



- cause => necessary BUT NOT sufficient for producing the effect
- spatial/temporal concordance
- the effect is significantly aggravated by previous conditions or triggering factors

Causal chains - indirect



- primary cause => necessary BUT NOT sufficient for producing the effect
- secondary cause => sufficient BUT NOT necessarily necessary
- the secondary cause is NOT an expected complication in the pathophysiological evolution generated by the primary cause
- if there are CONDITIONS, establishing the type of LC (DC/I) => depending on the predominance in the evolution of the condition or the secondary cause