

**MINISTRY OF PUBLIC HEALTH OF UKRAINE  
LVIV DANYLO HALYTSKY NATIONAL  
MEDICAL UNIVERSITY  
GENERAL SURGERY UNIT**

**METHODICAL GUIDELINES**  
for 3<sup>rd</sup> – year students of the medical faculty

**MODULE 2**  
**SURGICAL INFECTION. MORTIFICATION. FUNDAMENTALS OF THE  
CLINICAL ONCOLOGY. CURATION OF THE SURGICAL PATIENTS.**

**SEMANTIC MODULE 5**  
**SURGICAL INFECTION.  
MORTIFICATION.**

*Topic:*  
*Mortification. Necrosis. Gangrene. Ulcers. Fistula. Foreign bodies.*

**Duration** of lesson - 2 hours

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AIM: To determine the basic clinical, laboratory, radiological, endoscopic attributes of disease; to acquire algorithm and principles of diagnostics, treatment of necrosis and ways of their prophylaxis.

To learn to behave in operational block and dressing rooms with the purpose of prophylaxis of occurrence hospital infections.

PROFESSIONAL MOTIVATION: The doctrine about necrosis leaves far for borders of surgery and finds the display in everyone without exception to clinical discipline. In an organism of the person constantly there are processes of extinction of cells and their neogenesis: peeling of skin' cells, an epithelium of the upper respiratory ways, destruction of blood cells. Their place occupy new cells, and function of bodies is not broken. Therefore the deep and correct comprehension of an etiology, a pathogenesis, questions of diagnostics and treatment of necrosis is a key to successful struggle against many difficult diseases and allows in certain to carry out a measure their prophylaxis.

Work of the medical personnel of a surgery block and dressing rooms should be directed on prophylaxis of occurrence of an infection and faultless performance of rules of an asepsis.

#### BASIC LEVEL:

**Necrosis.** Death of sections of tissues or organs during the body's lifetime is known as necrosis. Necrosis may be a result of a direct destruction of tissues by strong acids, etc. Necrosis caused by disorders of the blood circulation and disturbance in tissue nutrition is often observed. Disorders of the blood circulation may be due to local injury to vessels caused by confusion, frostbite, vascular spasm produced by the vasoconstrictor nerves, or may be the result of systemic disease — vascular changes, for example, in atherosclerosis. Necrosis is also observed in cases in which the trophic innervation of some region has been disturbed during various diseases and lesions of the nervous system (for example, bedsores of injuries to the spinal cord, perforating ulcer of the foot in injuries to the nerves of the legs, etc.).

The various forms of necrosis we shall dwell on the form caused by injury to the tissues. This form most frequently occurs as a result of circulatory disorders

caused by injury, rupture, core in pressure and torsion of vessels. Similar results may be produced by ligation of the vessels of some organ or part of the body, if no collateral circulation develops through the extended communications between the other vessels (through anastomosis).

Necrosis may be a result of arrest of arterial circulation and more rarely, of disorders of the venous outflow. Thrombosis and embolism may also lead to necrosis.

**Gangrene.** Embolism and occlusion of vessels may give rise to necrosis of a part nourished by the given artery, and in case of occlusion of a major artery nourishing an entire extremity—necrosis of the extremity (gangrene). In thrombosis blood circulation is arrested more slowly than in embolism. This situation favors development of collateral circulation and gangrene develops less frequently- if a large artery has been occluded by an embolus, there is usually not enough time for collateral circulation to develop and necrosis proceeds very rapidly and violently (within a few hours). An enfeebled and exhausted person is more predisposed to gangrene.

Circulatory disorders are not infrequent during changes in the walls of blood vessels (atherosclerosis) in old age (senile gangrene), but necrosis is also observed at a younger age in vascular diseases (obliterating endarteritis or spontaneous gangrene). This disease results from constriction of the vascular lumen caused by spasm and the thickening of its coat until the lumen is completely occluded. Gangrene begins with polar of the integuments, disorders and loss of sensitivity of the tissues, and changes in the coloring of the skin (marble like, darkening). Subsequently a picture of mortification develops.

In some cases the tissues quickly dry up because of evaporation of the fluid (dry gangrene); owing to decomposition of hemoglobin the color of the skin changes, becoming brown and then black. The tissues become dense and hard (mummification).

In other cases, when evaporation from the surfaces rendered difficult or the tissues have developed edema, gangrene runs a moist course. Such gangrene is

accompanied by putrefactive infection of the tissues. The tissues decompose and dirty-red and grey spots, lines and blisters filled with a strongly smelling dirty substance appear on the skin. The process may spread and end lethally, the patient dying as a result of septicemia. Most frequently, however, the dead tissues, become separated from the living tissues; this is known as demarcation, and the line which separates the dead tissues from the living ones is called the line of demarcation. A granulation wall and a fissure separating the living tissues from the dead ones are formed on the borders of the living tissues; the dead tissues may become completely detached and sometimes fall off within a few days or even months (bones). After separation of the dead tissues the wound turns out to be lined with granulations and begins to heal.

Treatment of gangrene consists in eliminating its cause, and moreover its dangerous form - in measures aimed at drying the necrotic tissues and their protection against secondary infection (strictest cleanliness). For this purpose dry aseptic absorbent dressings are used.

In cases of superficial necrosis the separation of the necrotic section is awaited and then the wound is treated according to the general rules for treating granulating wounds. In cases of dry gangrene of extremities the affected extremity is amputated after formation of the line of demarcation. In cases of moist gangrene threatening septicemia amputation not infrequently has to be resorted to. During the incipient stages of spontaneous gangrene the treatment is physiotherapeutic and medicinal.

Narcotics (morphine) must be administered to gangrene patients very cautiously because the pains not infrequently persist for a very long time, the patients get habituated to narcotics and are likely to become addicts.

**Bedsore (decubitus).** Bedsore, it is portions of necrotic tissue formed in places of prolonged compression of the skin and subsequently producing ulcers - superficial or deep (penetrating to the bone) may serve as an example of gangrene. Bedsore is divided into simple and gangrenous dry or with considerable discharge of a purulent and putrefactive character. Bedsore results from long lying in one position, mainly at points subjected to protracted pressure of the body weight, i.e..

in the region of the sacrum, shoulder blades, elbows, heels and in the region of the trochanter, crest of the ileum, elbows, thighs and ankles (in patients lying on a side). Lastly, in some cases bedsores develop in places of contact of the skin surfaces, for example, the inner surfaces of the thighs, at the knee joints, etc., skin under the breasts, etc.

The appearance of bedsores is also favored by an insufficiently even surface on which the patient is lying, for example, creases and crumbs on the sheet and moistening of the skin with urine, pus or other excretions at the points of pressure. Bedsores are formed frequently particularly in thin, emaciated and weak patients, and also during the post-operative period when the patients lie motionlessly because of pain. Appearance of bedsores is also favored by humidity and intertrigo of the skin mainly in patients suffering from rectal and urinary incontinence. Bedsores develop particularly rapidly and easily in a number of diseases of the peripheral and central nervous system, for example, disorders of innervation and injuries and diseases of the spinal cord.

To prevent bedsores, it is necessary carefully to watch the patient's skin. Grave and post-operative patients are placed on a rubber ring, the points of pressure are examined several times a day and the skin is rubbed down with camphor or ethyl alcohol. A bedsore begins with the appearance of a dark or red spot at the point of pressure, after which the portion of the skin turns brown and grows insensitive; the superficial layer of the skin becomes desquamated and a section of necrotic tissues is formed; a purulent process may develop under the necrotic tissues. Treatment of bedsores consists in painting the necrotic portions with iodine tincture, removing the dead tissues and applying dry aseptic dressings; after removal of the dead tissues ointment dressings are applied. Strict cleanliness is required. General treatment consists of improving the patient's nutrition.

**Ulcers.** A granulating surface which appears after injury or a purulent process gradually tends to heal if the surface is not very large. In some cases, however, the tissues of a granulation surface decompose and the wound becomes larger and

sometimes deeper, i. e., an ulcer is formed. The floor of the ulcer may be covered with granulations, but since they scarcely tend to develop and grow, the ulcer does not heal. Ulcers appear in different parts of the body, but most frequently on the shank. Cancerous, syphilitic, tuberculosis, trophic and simple ulcers are distinguished, depending on their causes. Simple ulcers are a result of long-continued thermal, mechanical or chemical stimulation which injures the granulations and impedes healing. Ulcers may also be due to low resistance of the body to stimuli, as a result of different diseases. Trophic ulcers are due to disorders of the regulating influence of the nervous system on tissue nutrition. They may appear as a result of affections of the central nervous system, as well as disorders of peripheral innervation, and reflexes during stimulation of other parts of the nervous system.

## STUDENTS' INDEPENDENT STUDY PROGRAM

### I. Objectives for Students' Independent Studies

You should prepare for the practical class using the existing textbooks and lectures. Special attention should be paid to the following:

**Theme** Necrosis. The reasons and conditions of development. A clinical picture. Diagnostics, treatment. Separate kinds of necrosis (a gangrene, ulcers, fistulas). A clinical picture. Treatment. Prophylaxis.

1. To learn an etiology, a pathogenesis and kinds of necrosis.
2. A clinical picture, principles of diagnostics and treatment of necrosis.
3. An etiology, a pathogenesis of separate kinds of necrosis. Clinics, diagnostics and treatment of gangrenes, ulcers, fistulas.

### II. Tests and Assignments for Self – assessment

Multiple Choices.

Choose the correct answer/statement:

1. The indication to urgent surgical treatment of an acute thrombophlebitis of superficial veins is:  
A. Varicose disease.

- B. Posttrombophlebitic syndrome.
  - C. Young age of patients.
  - D. Necrotic changes.
  - E. An acute ascending thrombophlebitis.
2. Trophic ulcers of the medial surface of lower third of shin arise as complication of:
- A. Obliterating atherosclerosis.
  - B. Obliterating endarteritis.
  - C. Elephantiasis.
  - D. An acute thrombophlebitis.
  - E. Varicose disease.
3. Symptoms of a transmissible ischemia is characteristic for:
- A. Posttrombophlebitic syndrome.
  - B. An obliterating atherosclerosis.
  - C. An osteomyelitis of a femur.
  - D. Varicose disease.
  - E. Embolism of a femoral artery.
4. Violation of blood flow, damage of an intima and a hypercoagulation - is a triad of:
- A. Bazedov.
  - B. Pirogov.
  - C. Virhov.
  - D. Rokitansky.
  - E. Erlih

Real - life situations to be solved:

5. Patient E., 56 years old, was operated concerning a fibromyoma of a uterus. On the fourth day after operation there was an acute pain in a site of the right lower extremity, a body temperature is 39° C. During examination the expressed edema of foot, anticnemions and hips. The skin is tensed, morbidity on a course of deep veins.



What is your diagnosis?

6. Patient N., 64 years old, complains of a pain in gastrocnemius muscles at walking through everyone of 200 meters. The pain ceases after a short-term stopping.

How this sign refers to as?

### III. Answers to the Self-Assessment:

1. E;
2. E;
3. B;
4. C;
5. Acute right-side ileofemoral thrombosis.
6. Symptom of a transmissible lameness.

### IV. References:

#### Essential reading:

1. Gostishchev V.K. General surgery /The manual. – M.: GEOTAR-MED, 2003. – 220p.
2. Lectures prof. B.I. Dmitriev from Odessa State Medical University.
3. Surgery: Text-book for English medium medical students / S.I. Shevchenko, O.A. Tonkoglas, I.M. Lodyana, R.S. Shevchenko. – Kharkiv: KSMU, 2001. – 344p.
4. Kushnir R. Ya. General surgery /Lectures.- Ternopil, Ukrmedknyha, 2005.- 308 p.
5. Butyrsky A. General surgery /The manual.- Simpheropol: publishers CGMU, 2004.- 478 p.

#### Further reading:

1. Oxford handbook of clinical surgery / Edited by G.R. Mc Latchie, D.J. Leaper, 2002.- 930 p.
2. Clinical Nursing Skills and Techniques: basic, intermediate and advanced. The C.V. Mosby Company, 1986.- 1296 p.

V. Students' Practical Activities:

- *Work 1.* To make the individual circuit of diagnostic search, to analyze results of objective research. To determine a role and a place of laboratory and instrumental diagnostics in formation of diagnosis.
- *Work 2.* To create and prove the plan of individual treatment;
- *Work 3.* To offer the basic methods of prophylaxis of occurrence of necrosis.

VI. Seminar Discussion of Theoretical Questions and Practical Work:

VII. The initial level of knowledge and skills is checked by the decision of situational problems (tasks) from each theme, answers to tests such as "Step", constructive questions etc.

**Students must know:**

- Concept about necrosis.
- Kinds of necrosis.
- Concept about lymphostasis.
- Concept about alternating lameness?
- Classification of acute arterial insufficiency (according to V.S.Saveljev).
- Classification of chronic arterial insufficiency (by V.T.Zajtsev).
- Classification of chronic venous insufficiency (by M.I.Kuzin).
- Classification of lymphostasis according to N.F. Driuk.
- The basic differences of humid and dry gangrene.
- Concept about fistula.
- Concept about stoma.
- Concept about exogenic decubitus.

**Students should be able to:**

- to make the individual circuit of diagnostic search;
- to analyze results of objective research;
- to determine a role and a place of laboratory - instrumental diagnostic methods in formation of diagnosis;
- to plan and prove the plan of individual treatment;

- to offer the basic methods of prophylaxis of occurrence of necrosis.
- to carry out wet cleaning operational and dressing rooms;
- to carry out the control of quality of cleaning of a surgery block;
- to prepare toolkit for sterilization.
- to prepare a little table for instruments and a dressing material;
- to assist during dressings;
- to perform work of the dressing - room nurse.