



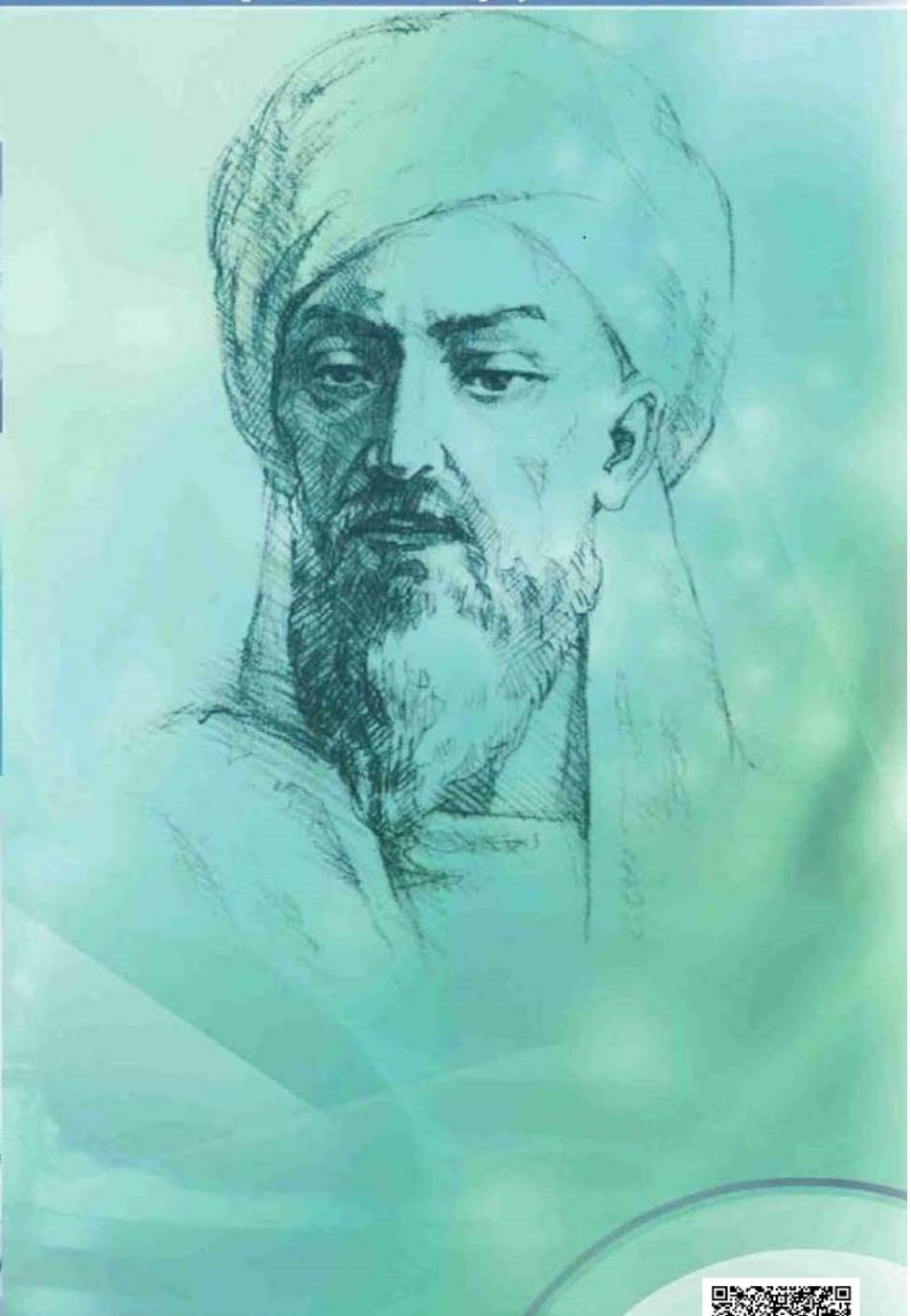
New Day in Medicine  
Новый День в Медицине

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## НОВЫЙ ДЕНЬ В МЕДИЦИНЕ

### NEW DAY IN MEDICINE

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**CURRENT VIEWS IN THE DIAGNOSIS AND TREATMENT OF PATIENTS WITH  
DIABETIC FOOT SYNDROME**

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✓ **Resume**

*The diabetes mellitus is one of the most serious medico-social problems of our time relating to the priority directions of national health systems of all countries. One of dangerous chronic complications of DM is the syndrome of diabetic foot. A heavy outcome of a ulcer of feet is amputation of the lower extremity, which at patients with DM is carried out 10-30 times more often in comparison with all population. The remote lethality at patients with critical ischemia of the lower extremity (CILE) at DM in the first year about 20% and in five years of 40% - 70%. The carried-out analyses of the latest literary data to us allowed to draw the following conclusions: 1. DFS remains an urgent problem of surgery at which to 85% disability occurs, about 20-30% the lethality rates. 2. At diagnosis of DFS more the electroneuromyography, a X-ray contrast angiography, a transdermal polyarography and MRT affected extremities efficiently. 3. Early diagnosis of a disease and correction of complications with prevention of critical ischemia of the lower extremity promotes an reduction of terrible complications, such as gangrene of the lower extremity which comes to the end with amputation of an extremity. 4. The combined defeat of small and large vessels occurs at most of patients with a diabetes mellitus that is the reason not of efficiency of treatment using stenting and surgical intervention of arteries of the lower extremity. 5. Classification of DFS by Wagner (1981) is more optimal for practical surgery.*

**Key words:** diagnostics and treatment of diabetic foot syndrome, modern surgery.

**СОВРЕМЕННЫЕ ВЗГЛЯДЫ В ДИАГНОСТИКУ И ЛЕЧЕНИЕ ПАЦИЕНТОВ С  
СИНДРОМОМ ДИАБЕТИЧЕСКОЙ СТОПЫ**

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✓ **Резюме**

*Сахарный диабет является одной из серьезнейших медико-социальных проблем нашего времени, относящихся к приоритетным направлениям национальных систем здравоохранения всех стран. Одним из опасных хронических осложнений СД является синдром диабетической стопы. Тяжелым исходом язвенного поражения стоп является ампутация нижней конечности, которая у больных с СД проводится в 10-30 раз чаще по сравнению со всем населением. Отдаленная летальность у больных с КИНК при СД в первый год около 20% и через пять лет 40% - 70%. Проведенные анализы последних литературных данных нам позволили сделать следующие выводы: 1. СДС остаётся актуальной проблемой хирургии, при которой до 85% встречается инвалидность, около 20-30% встречается летальность. 2. При диагностике СДС более эффективным способом является электронейромиография, рентгеноконтрастная ангиография, чрескожная полярография и МРТ пораженной конечности. 3. Ранняя диагностика болезни и коррекция осложнений с профилактикой критической ишемии нижней конечности способствует уменьшению грозных осложнений, таких как гангрена нижней конечности который завершается ампутацией конечности. 4. У большинства больных сахарным диабетом встречается сочетанное поражение мелких и крупных сосудов, что является причиной не*

*эффективности лечения с применением стентирования и хирургических вмешательств артерий нижней конечности. 5. Классификация СДС по Wagner (1981г) является более оптимальным для практической хирургии.*

*Ключевые слова: диагностика и лечения синдрома диабетической стопы, современная хирургия.*

## **ДИАБЕТИК ОЁҚ СИНДРОМИ БЎЛГАН БЕМОРЛАРНИ ТАШХИСЛАШ ВА ДАВОЛАШДА ҲОЗИРГИ ҚАРАШЛАР**

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### **✓ Резюме**

*Қандли диабет ҳозирги замоннинг тиббий ижтимоий муаммоларидан бири ҳисобланиб, бутун жаҳон соглиқни сақлаши тизимини асосий йўналишиларидан ҳисобланади. Қандли диабетнинг сурункали оғир асоратларидан бири диабетик оёқ-товор синдромидир, бунинг оқибатида кўпгина беморларда оёқлар ампутацияси бажарилади. Қандли диабетли беморларда бу кўрсаткич 10-30 баробар юқори. Қандли диабет билан касалланган, оёқларида критик ишемияси мавжуд беморларнинг ўлим кўрсаткичи бир йилда 20%, беш йилда 40-70% га етади. Кўплаб адабиётлардан олинган анализга кўра қўйдагича хулоса қилиши мумкин: 1. Диабетик оёқ-товор синдроми ҳозирги замон хирургиясининг актуал муаммоларидан бири бўлиб, 85% ҳолатларда ногиронлик, 20-30% ҳолатларда ўлим кузатилади. 2. Диабетик оёқ-товорни диагностикасида асосий текшириши усуллари: электронейромиография, рентгенконтраст ангиография, териаро полярография ва МРТ лар бўлиб ҳисобланади. 3. Касалликни эрта аниқлаши, критик ишемиялар профилактикаси асоратларни олдини олишига ва ногиронликни камайтишига олиб келади. 4. Қандли диабетли беморларда майдада ва ўрта калибрдаги томирлар зарарланади, шу сабабли оёқ қон - томирларида бажариладиган стентлаш ва жарроҳлик амалиётлари ноэфектив ҳисобланади. 5. Диабетик оёқ-товор синдромининг Wagner (1981г) бўйича классификацияси амалий жарроҳликда энг мақбулидир.*

*Калит сўзлар: диабетик оёқ-панжса синдроми диагностикаси, даволаши, замонавий хирургия.*

### **Relevance**

*The diabetes mellitus is one of the most serious medico-social problems of our time relating to the priority directions of national health systems of all countries. According to the experts World Health Organization, the total number of patients with a diabetes mellitus making 120 million people in 1996 by 2025 will increase to 250 million [5,23].*

*DFS occurs about 8-10% of patients with a diabetes mellitus. In a multicenteral research, the organized European Study Group on Diabete sand the Lower Extremity (Eurodiale) it is shown that among for the first time the addressed patients in 51% of cases the DFS neuropathic form is diagnosed (among them with the infected ulcers there are 27%), in 31% — a neuroischemic form and with signs of infection of an ulcer and at 18% — ischemic. Ulcers can be formed on any part of foot, but about a half is formed on a bottom surface (including fingers) and the others in other areas. [19, 22, 23]*

*Heavy outcome of an ulcer of feet is amputation of the lower extremity, which at patients with DM is carried out 10-30 times more often in comparison with all population. After the first amputation, the risk of repeated amputation and death considerably increases. Despite existence of the drafted protocols and standards, desirable high performance of treatment of ulcers at DFS does not manage to be reached now. Treatment of DFS in most cases remains long, labor consuming and highly expensive. According to the research Eurodiale with participation of 1000 people from DFS which are observed in specialized clinics of several countries of Europe, the median of terms of healing of ulcers in the field of a front part of foot made 147 days, in average – 188 days and in a heel zone – 237 days [23,24,4].*

The submitted review of literature is devoted to the description of the practice existing now and perspectives of use of innovative methods of treatment of patients with DFS.

**The purpose of our research was** - studying modern opinions of world scientists in diagnosis and treatments of patients with a syndrome of diabetic foot and to reveal optimal variants of diagnosis and treatment.

The modern classifications used in the different countries of the world are given below[25].

#### **Classification by Meggitt-Wagner**

This classification is created in 1976 B. Meggitt and F.W. Wagner entered into broad clinical practice in 1981. Wagner's classification is applied in practice to ulcer depth assessment at a syndrome of diabetic foot [25,13].

Table 1

#### **Classification by Meggitt-Wagner**

<b>Degree</b>	<b>Definition</b>	<b>Description</b>
<b>0</b>	Risk for foot	Wound defect is absent, but there is a xeroderma, dry callosities, deformations of joints of fingers and/or feet
<b>1</b>	Superficial ulcer	Full destruction of skin
<b>2</b>	Deep ulcer	The wound defect affecting skin, a hypodermic fatty tissue, sinews, but without injury of a bone
<b>3</b>	Abscess	The wound defect affecting skin, a hypodermic fatty tissue, sinews and a bone
<b>4</b>	Limited gangrene	Necrosis at the level of fingers or foot
<b>5</b>	Extensive gangrene	Foot necrosis with system signs of an inflammation

#### **Classification of the Texas university**

Classification is widely applied as in routine practice, and research works as includes ulcer depth assessment, and also an infection and ischemia, which are major factors of risk of amputation. [18].

Table 2

#### **Classification of the Texas university**

<b>Stages</b>	<b>Degrees</b>			
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>A</b>	Full epithelialization to or after an ulcer	Superficial ulcer defect without injury of sinews, capsules of a joint or a bone	The ulcer defect injuring a sinew or the capsule of a joint	Ulcer defect damaging bone or a joint
<b>B</b>	+ Infection	+ Infection	+ Infection	+ Infection
<b>With</b>	+ Ischemia	+ Ischemia	+ Ischemia	+ Ischemia
<b>D</b>	+ Infection and ischemia	+ Infection and ischemia	+ Infection and ischemia	+ Infection and ischemia

#### **P.E.D.I.S.**

Classification is developed for the characteristic of the patients participating in research projects. As a rule, it is used at a stage of set of patients in scientific research and is a basis for assessment of criteria of inclusion and an exception of the following criteria [22, 18].

**PERFUSION**— blood supply

**EXTENT/SIZE**— the area/size

**DEPTH/TISSUE LOSS** — depth

**INFECTION** — an infection

**SENSATION**— sensitivity

## Etiopathogenesis

Earlier was considered, that all lesions of feet at DM are a consequence of involvement of vessels. Since the middle of 1970 – the 1980th years more and more data that at completely safe blood-groove the diabetic neuropathy (DN) can be the cause of trophic ulcers and other necrotic defeats of feet [7,14] collected. For today DN, macro - and a microangiopathy are considered as the main mechanisms of late complications of DM. However, though defeat of a microcirculator bed (microangiopathy) can be revealed in microvessels practically of all fabrics, the importance of these changes in different bodies was various. It is conventional that the diabetic microangiopathy leads to damage of a retina of an eye and renal balls. Data of researches of a microcirculator bed of extremities are less unambiguous. The assumption that changes of a wall of capillaries create obstacles for diffusion of gases was not confirmed. In this regard it is recognized that the diabetic microangiopathy is not capable in itself to cause a necrosis of fabrics and trophic ulcers of feet (J.Bowker, 2001). The diabetic macrovascular disease morphologically represents the atherosclerosis having a number of features at sick DM. DM is powerful risk factor of atherosclerosis. This complication (as well as DN) can as bring sufferings to the patient, and to lead to development actually by DFS[14,16].

Proceeding from dominance in a pathogenesis of this or that of the listed factors, allocate 3 main forms of a syndrome of diabetic foot [1,6]:

- Neuropathic form (60–70%):
  - without osteoarthropathy;
  - with a diabetic osteoarthropathy.
- The neuroischemic (mixed) form (15–20%).
- Ischemic form (3–7%).

The main reason for development of DN – action of chronically increased glucose level in blood on nervous cells, mainly, on axons of peripheral neurons. DN in itself is not capable to cause a necrosis of fabrics, but it leads to development of trophic ulcers by various ways. So, touch distal polyneuropathy leads to sensitivity loss that leads to unnoticed and often severe mechanical, chemical or thermal injuries of feet, wearing footwear by the patient which injures his feet. The slowed-down healing of wounds at diabetes, and also mechanical load of a wound when walking is led to a trophic ulcer [6,2].

Motor distal polyneuropathy, promoting deformation of fingers at the expense of an atrophy of interosseous muscles of foot, creates supertension zones on skin when walking. In these zones sites of a hyperkeratosis (callosity), under them – hematomas, which quickly suppurate, are soon formed. Autonomous neuropathy at a part of patients leads to development of a diabetic osteoarthropathy (Sharko's foot) with heavy deformation of feet and an overload of sites of foot, unprepared to basic function. Besides, autonomous neuropathy causes a xeroderma, sweating disturbances, etc. A consequence of vegetative neuropathy which can be characterized as an autosympathectomy is calcification of a mussel of arteries which is often called Menkeberg's sclerosis. Display of vegetative neuropathy takes place at 25% of sick DM and is defined radiographic, but is quite often mistakenly treated as existence of obliterating atherosclerosis. Autonomous neuropathy leads to strengthening of a blood-groove in superficial vessels of skin that causes the increased temperature of integuments of feet, the strengthened blood filling and a contouring of veins of skin, even in horizontal position of the patient. These changes are a consequence of formation of arteriovenous shunts on which the arterial blood, passing a capillary network, is dumped in a venous bed, leading to the actual decrease in a capillary blood-groove. The xeroderma is a consequence of avtomnomny neuropathy, on dry sites of skin cracks which turn into trophic ulcers at accession of an infection, especially against the background of ischemia of an extremity [14,1].

The analysis of results of bacteriological researches showed that in it is purulent - the necrotic centers at foot patients with a diabetes mellitus have a mixed aerobic-anaerobic flora in 87,7% of cases, only aerobic – in 12,3%. Associations of microorganisms in a suppurative focus included from 2 to 14 species of aerobic, optional and anaerobic and obligate and anaerobic asporous bacteria [12,15].

*The diabetic osteoarthropathy*, developing together with diabetic neuropathy, is one of its manifestations. The most expressed changes of bone structures and the copular device take place on foot and often are called "joint" or "Sharko's foot" [2,10,12].

Stages of development of a diabetic osteoarthropathy:

- 1- existence of a foot edema, hyperthermia and hyperemia;
- 2- formation of deformation of foot; radiological bone changes in a type of osteoporosis, bone destruction, fragmentation of bone structures are defined;
- 3- the expressed deformation of foot, existence of spontaneous changes and dislocations;
- 4- formation of ulcer defects; at infection perhaps rapid development of gangrene. Existence at the patient of neuropathy can mask spontaneous fractures of bones of foot which are diagnosed only at radiological inspection. The greatest efficiency of therapeutic influence is possible at the 1st and 2nd stages.

### **Clinical diagnosis of DFS.**

Are necessary for definition of the DFS clinical form and tactics of maintaining the patient [7,13]:

- careful collecting anamnesis;
- survey of legs;
- tool assessment of DPN;
- tool assessment of a macrovascular disease;
- assessment of a condition of bone structures of the lower extremities;
- bacteriological research separated from a wound.

### **DIAGNOSIS OF DIABETIC NEUROPATHY**

Assessment of the neurologic status - enters a complex of inspections assessment of three of its main types of sensitivity - vibration, temperature, tactile, and also a research of tendon jerks; for receiving integral assessment of expressiveness of neuropathy it is possible to use a scale of the neuropathic dysfunctional account (NDS) [1,11,14]; decrease in sensitivity, first of all in distal sites of the lower extremities is characteristic of diabetic neuropathy.

For assessment of tactile sensitivity use as cotton wool fibers, a hook and monofilament of 10 g (5.07 Semmes-Weinstein) now. Tactile sensitivity is considered not broken if the patient feels touches of fibers of cotton wool on all surface of a research. A threshold of disturbance of tactile sensitivity, that level from which the patient begins to feel a touch is considered.

For assessment of a threshold of painful sensitivity a number of researchers uses a neurologic needle or a cogwheel. Painful sensitivity is considered not broken if the patient feels pain on all surface of a research. Level from which the patient begins to feel pain from a prick is considered a threshold of disturbance of painful sensitivity.

The thermoesthesia is estimated by means of objects with various temperature (heat conductivity). The norm is considered if the patient can call warm a flask with the water which is warmed up to 35-36 °C and cold - a flask with water at a temperature of 28-32 °C. In an interval between 28 and 32 °C most of people can distinguish changes of temperature with an accuracy of 1 °C. It is necessary to investigate both types of a thermoesthesia (both cold and thermal) as different types of receptors are involved in them [3,26].

Assessment of vibration sensitivity is offered to be carried out with use of the graduated neurologic tuning fork with a frequency of 128 Hz or a biotensiometer. At use of a tuning fork a normal indicator at which the patient ceases to feel vibration is 7 UE and above, it is moderately reduced at values 5-7 UE, is considerably reduced at value 4 UE below. Normal values of vibration sensitivity correspond to indications of a biotensiometer of 7-9 V, sensitivity is moderately reduced at 10-25 V and is considerably reduced at values more than 25V. A number of studies confirmed that definition of a threshold of vibration sensitivity is especially valuable in diagnosis of moderate or subclinical neuropathy and identification of patients with high risk of development of DFS.

Symptoms of painful neuropathy are most often associated with defeat of a thermoesthesia. Reduction of the threshold of a painful thermoesthesia is the indicator of hypersensitivity which can be observed at initial changes and be a precursory symptom to DPN [2,7].

Easing or lack of Achilles and-track reflexes is observed at 70% of sick DM with diabetic neuropathy [7]. Achill a reflex is broken more often than knee. These reflexes have the greatest predictive value for development of ulcer and necrotic defeat of feet therefore it is necessary to carry out quantitative



assessment of neurologic disturbances at this level [2,18].

"The gold standard" of assessment of function of a peripheral nervous system is the electroneuromyography, which allows to determine the speed of carrying out an impulse by nerve fibril. Such diagnostic method is especially important for detection of asymptomatic neuropathy [7].

## DIABETIC ANGIOPATIYA'S DIAGNOSIS

**Doppler sonography and segmented doppleromanometry** allows to define extent of ischemic defeats, level and extent of occlusion, and also to estimate a condition of a collateral vascular bed. The fixed Doppler signal is used for measurement of segmented systolic pressure and the analysis of the Doppler curve which is written down on a tape. Bigger objectification of measurement is promoted by calculation of indexes, i.e. relative indicators. The ankle-brachial index (a ankle index of pressure) — ABI calculated as the relation of arterial systolic pressure in a front or back tibial artery to this indicator in a humeral artery is most often used. Normal ABI makes from 1,0 to 1,5. Decrease in this indicator 1,0 provides on damage of an artery proximal or in the place of measurement below, increase in an index to 1,3 speaks about existence of neuropathy [20,26]. Higher figures of systolic pressure and ABI on a shin and foot at a diabetes mellitus are connected with decrease in elasticity of tibial arteries and arteries of feet (at the expense of Menkeberg's sclerosis) which counteract a compression of vessels a cuff. In this regard measurement of ABI at sick DM is less informative test in extremity ischemia degree assessment, than in the general population. The received results not always reflect a clinical picture of a disease. Sometimes ABI values at sick DM do not differ from normal even at the III—IV degrees of ischemia of an extremity. In this situation informative is a measurement of the manual systolic pressure (MSP). The average cover of manual arteries usually remains intact that allows to receive reliable results of a research. It is normal of the design and estimate documentation slightly below, than in a humeral artery, and makes 60% or more from the expected systolic pressure in shin arteries. However not at all sick DM it is possible to perform measurement of the design and estimate documentation because of trophic changes of distal department of foot [7].

1. **The standard tredmil-test (loading test)** is carried out within no more than 5 minutes or before emergence of discomfort in heart, shortening of breath, emergence of an asthma or severe pain in legs. The tonometer cuff for determination of pressure in shin arteries imposed before inspection remains on the patient during all research. At once after the termination a stress - the test, in 2,5 and 5 minutes measurement of pressure in arteries of a shin is performed [7].

2. **Ultrasonic duplex scanning.** Advantage of a method is the possibility of noninvasive obtaining the image of a vessel in real time with registration of a Doppler curve in the chosen site of a vessel in any plane. The method allows to determine diameter of a vessel and thickness of its walls, to visualize additional an echoes in a gleam, to estimate hemodynamic indicators - linear and volume speeds of a blood-groove, resistance indexes.

### 3. **Methods of stimulation of muscarinic receptors of an endothelium:**

chemical stimulation of muscarinic receptors of an endothelium acetylcholine which is entered into an artery and causes an endothelium - an independent vasodilatation measured by means of a venous occlusion plethysmography [8].

- mechanical stimulation of an endothelium the raised blood-groove which is estimated on change of diameter of an artery (more often than a humeral artery) by means of ultrasound of high resolution.

4. **The Transcutaneous oximetry (TscO<sub>2</sub>)** belongs to microhemodynamics assessment methods. Transcutaneous voltage measurement of oxygen allows to estimate a functional condition of vascular system, i.e. existence of an adequate collateral blood-groove, to define degree of ischemia of fabrics, to make a right choice between a conservative and operational method of treatment. Determination of Transcutaneous tension O<sub>2</sub> allows to estimate weight of disturbances of a blood-groove, level is lower than 20 mm Hg. it is characteristic of critical ischemia.

5. **X-ray contrast angiographic research.** With its help it is possible to define precisely localization, extent, degree and character of a stenosis, plurality of occlusal damages of the main arteries of the lower extremities, to estimate a condition of a collateral bed, to predict character and volume of reconstructive operation, and also to exercise control of efficiency of treatment and surgical intervention.

Also recently the magnetic and resonant angiography which has high resolving power [26, 7] gains distribution.

**6. Measurement of the ankle-brachial index (ABI)** which is through the arterial pressure relation - (artery of lower leg) to the arterial pressure (a humeral artery). API values normal fluctuate from 0,9 to 1,1. ABI values are lower 0,6 testify to critical ischemia of an extremity. It is necessary to remember that in connection with existence at many patients of arteriosclerosis of Menkeberg, arteries have a rigid wall, the arterial pressure is distorted that leads to overestimate of ABI and its unauthenticity.

**7. Radionuclide diagnosis** allows to estimate a blood-groove condition in vessels of large and average caliber, arterioles and capillaries of feet, shins, and also to reveal disturbances of venous outflow [25]. The specified method is based on registration in dynamics of levels of radioactivity in vessels of feet, shins and knee joints.

**8. The transdermal polarography** allows to investigate microhemocirculation and the oxygen mode of fabrics at obliterating diseases of vessels including at a diabetic angiopathy of the lower extremities, and to carry out objective assessment of efficiency of medical actions. The method is harmless to the patient and can repeatedly be applied.

## DEFINITION OF THE CONDITION OF BONE STRUCTURES

### 1. X-ray analysis of bones of feet and shins.

Radiological signs at a diabetic osteoarthropathy (DOAP) are described as symptoms of five "D": joint distension, dislocation, debris, disorganization (destruction with function loss), increased density [21]). Unfortunately, the radiological method yields positive takes only at loss of bone substance more than 20 — 40%, so, is ineffective at early stages of development of DOAP.

At a diabetes mellitus the x-ray morphometry, densitometry and a photon absorptiometry allows to give deeper assessment of extent of damage of a bone tissue. The most complete information about a condition of a bone tissue is given by a method of a x-ray computer tomography and an osteoscintigraphy.

**2. MRT** allows to differentiate accurately inflammatory diseases of a bone tissue (osteomyelitis) from DOAP [19,11] (decrease in a signal from a bone, despite the kept pulse sequence).

**3. Scintigraphy of a skeleton with introduction of Tc99m.** Of bones, groans and knee joints carried out Scintigraphy after intravenous administration of Ts99m.Ts-metilendifosfonat according to the way of diagnosis of inflammatory processes of bones of foot and knee joints developed by us. Criteria for evaluation of data of an osteoscintigraphy were: the area, total activity of the center of an inflammation, and also coefficient of asymmetry of activity of the left extremity in relation to right.

## BACTERIOLOGICAL RESEARCH OF WOUND SEPARATED

Crops separated from a wound have paramount value at selection of adequate antibacterial therapy. It is known that purpose of the drug "blindly" is effective only in 50% of cases. At assessment of microbial contamination a critical level, it is considered to be value of 105 microbial bodies on 1 g of fabric. Features of a microbial landscape at the DFS various forms are revealed. So, at a neuropathic form golden staphylococcus is most often allocated, in 73% of cases microbial associations with *Klebsiella pneumoniae* are frequent, *Enterocoecus faecalis*. In case of insufficiency of arterial circulation gram-negative flora (52%) - enterobacteria, proteas, *Pseudomonas aeruginosa* and *colibacillus* meets [7, 26] more often. at assessment of microbial contamination a critical level it is considered to be value of 105-106 microbial bodies on 1 g of fabric [2,15].

### General principles of treatment of DFS

Treatment of sick DFS it has to be performed jointly, specialists of endocrinologists and surgeons using modern methods of treatment of DM.

Adequate antibacterial therapy, which is shown to patients with a contaminated wound, belongs to the general principles of treatment of DFS, it is long the existing ulcer defect, and also a wound of the big size. Emergence against the background of morbidity therapy the unpleasant smell plentiful separated, bleeding of granulation tissue, reduction in the rate of healing confirm a reinfection. The choice of drug is based on results of a bacteriological research of wound separated.

Duration of antibacterial therapy at patients with DFS as a rule, exceeds the average recommended courses that is connected with change of a blood-groove, decrease in the general and local immunity.

**Table 3**  
**Differential diagnosis of the neuropathic and ischemic DFS forms**

Neuropathic	Ischemic
Dry skin, sites of a hyperkeratosis in zones of excessive pressure	Skin color pale or cyanotic, skin of an skin atrophic
Characteristic deformation of feet, fingers, ankle joints (is specific)	Deformation of foot, fingers, has no specific character
The pulsation on arteries of feet is kept	The pulsation on arteries of feet is lowered or is absent
Painless ulcer defects in points of excessive pressure	Acral necrosis, are sharply painful
Lack of subjective symptomatology or symptoms characteristic of DPN	The alternating lameness or rest pains

**Table 4**

**Clinical features of a neuropathic and ischemic ulcer**

Sign	Neuropathic ulcer	Ischemic ulcer
<b>Localization</b>	Zones of the raised mechanical loading (a projections of the heads of metatarsals, distal phalanxes of fingers)	Zones of the worst blood supply (acral): fingers, heel, side surface of I, V metatarsophalangeal joints, anklebones
<b>Bottom</b>	It is naked or covered with a soft fibrinous plaque	It is covered with a black or brown scab
<b>Amount of exudate</b>	Considerable	Scanty (a dry necrosis of skin) in the absence of an infection
<b>Morbidity</b>	It is uncharacteristic (appears at an active wound fever)	Expressed
<b>Surrounding skin</b>	Often hyperkeratosis	Atrophic. it is thinned; the hyperkeratosis is uncharacteristic, deposits of fibrin around an ulcer are possible

#### **Therapy of ischemic and neuroischemic ulcer defects**

Most predictively, extent of disturbance (stenosis/occlusion) of an arterial blood-groove is important for the speed and probability of approach of full healing of ischemic or neuroischemic ulcer defect.

Therapeutic actions for improvement of a blood-groove at patients with critical ischemia, unfortunately, are ineffective. The researches of the last years devoted to use of various doses of drugs of group of a pentoxifylline showed not only its inefficiency, but also significant increase in probability of retinal bleedings.

Only the drugs of prostaglandins E appointed in adequate doses can influence the forecast of chronic arterial insufficiency of the III—IV stage (Fontaine's classification — Pokrovsk — Lerish). However these drugs are capable to improve only a collateral blood stream therefore are ineffective in cases of clinically significant stenosis and critical ischemia of the lower extremity [1,15].

Thus, in recent years method of the choice of treatment of critical ischemia became surgical, such as stenting or ballooning of arteries. Developments of the last years allow to recover a blood stream almost at all levels of defeat, up to foot arteries. However a small amount of the centers of vascular surgery becomes a barrier of availability of this method of therapy. The purpose of local therapy — attempt of deduction of increase in the extent of defect by drying of an ischemic ulcer. To the forefront, there is a use of dressing materials with use of aqueous solution of iodine. *Use alginate, hydrocolloid at hydrogel, hydrocellular bandages, gels and ointments contraindicated (!).* Local surgical treatment is inexpedient and in most cases leads to increase in ulcer defect.

### **Treatment of neuropathic ulcer defect**

Extremely important link an inclination of ulcer defects of feet at patients with DM is unloading of the affected extremity (or parts of an extremity). Wearing orthopedic footwear even of very high quality will not give the expected effect and it is contraindicated with ulcer defect.

If the ulcer is located in a front part of foot (fingers, in a projection of heads of metatarsal bones), unloading "semi-boot" is used (fig. 2, a). Its design allows the patient to move on the affected extremity, at the same time loading from a front part of foot is moved to the calcaneal area.

At an arrangement of ulcer defect on calcaneal area or in a middle part of foot wearing an unloading boot is not possible. Unloading of the affected extremity is carried out by means of crutches and carriages. However when walking on crutches load of other extremity amplifies that in turn can lead to emergence of ulcer defect. A modern way of unloading is the individual retaining bandage(IRB) [8,4].

Use of standard dressing means (for example, ointments and gauze bandage) does not yield desirable result. Salve dressings are incapable to adsorb a wound discharge, it is rather on the contrary, considerably complicate its outflow. Besides, gauze dressing materials stick to granulating fabric that considerably injures it when changing a bandage. The listed factors extend healing terms therefore at sick DM with ulcer defects of feet use atraumatic bandages.

Among modern clinical physicians there is an opinion on substantial increase of costs of treatment of ulcer defects when using modern medical dressing means. This opinion is often used as an argument in favor of refusal of their use. However in the analysis of expenses it is noted that the cost of medical bandages not much more (for only 12 — 15%) exceeds the cost of sterile bandage and napkins [4,17]. It is known that rather inexpensive medical bandages (both import, and domestic) generally from group atraumatic when which using the risk of side effects from the wrong use by patients in the conditions of out-patient treatment is minimum are put into practice.

The Adsorption capacity of dressings is different. The greatest volume of adsorption is possessed by calcicginal dressings. Their bacteriostatic and haemostatic effects are described, most often they are used to impart cicatricial wounds to the wound. Hydrocellular dressings are used to treat superficial ulcers [17,3].

Hydrocolloid dressings have a small adsorbing ability, moisturize the ulcer and stimulate purification (autolysis). Hydrogel binding and hydrogels have similar properties, but more pronounced moisturizing effect. It is advisable to use them in the treatment of defects with a necrotic scab.

There are adsorbing bandages on the basis of absorbent carbon which are applied in wounds with massive fetid separated.

The modern dressing material has to be atraumatic to a wound and the healthy skin surrounding it, to have the adsorbing activity, to provide gazo-and heat-exchanging processes, to interfere with secondary infection.

### **Conclusions**

1. DFS remains an urgent problem of surgery at which to 85% disability occurs, about 20-30% the lethality rates.
2. At diagnosis of DFS more the electroneuromyography, a X-ray contrast angiography, a transdermal polyarography and MRT affected extremities efficiently.
3. Early diagnosis of a disease and correction of complications with prevention of critical ischemia of the lower extremity promotes an reduction of terrible complications, such as gangrene of the lower extremity which comes to the end with amputation of an extremity.
4. At the majority the percent of patients with a diabetes mellitus occurs the combined defeat of small and large vessels that is the reason not of efficiency of treatment using stenting and surgical intervention of arteries of the lower extremity.
5. Classification of DFS by Wagner (1981) is optimal for practical surgery.

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