



THE NATURE AND FREQUENCY OF DAMAGE TO THE ARTERIAL BASINS IN DIABETIC FOOT SYNDROME

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Abstract

Purpose: to test in detail the nature and frequency of damage to different arterial basins in patients with diabetic foot syndrome.

Material and research methods: The research method consisted of a anamnesis, questionnaire and study of examination protocols in 154 patients. The treatment results and anamnestic data of 154 patients with purulent-necrotic lesions on the legs against the background of diabetic foot syndrome during their initial visit to the department of purulent surgery at the multidisciplinary polyclinic of Tashkent Medical Academy in the second quarter of 2021.

Results and its discussion: Based on the obtained results, we can say that in most observations, the main type of blood flow remained at the level of the femoral-popliteal segment (in 73% of patients), but a decrease in its speed was monitored (the main variable blood flow). During the analysis of the data obtained on the duration of diabetes, the largest number of patients with ischemic symptoms in the myocardium was found in patients with type 2 diabetes for 9-12 years (35.7%). was found to be observed during brain injury. The same period was recorded in 42.8% (12 patients) cases.

Conclusions: When symptoms of diabetic foot syndrome are found, multifocal damage to arterial vessels occurs with the development of ischemic lesions of the relevant organs and systems. In patients with diabetic gangrene of the lower extremities against the background of type 2 diabetes lasting more than 10 years, critical ischemic events in the heart were recorded in 27.3% of cases and in the brain in 18.2% of cases.

Keywords: diabetes mellitus, diabetic foot syndrome, purulent-necrotic lesions.

Importance

The main factors in the formation of purulent-necrotic lesions in diabetic foot syndrome (DFS) are neuropathy and ischemia, but in most cases, the peculiar dangerous course of the purulent-necrotic process on the foot greatly complicates the situation in terms of developing a treatment strategy. Most experts recommend





paying special attention to identifying diabetic angiopathy and its correction to prevent further possible complications [1,11].

Occlusive-stenotic lesions of the main and peripheral arteries of the lower extremities have a number of significant features in patients with diabetes mellitus (DM), especially those who develop diabetic foot syndrome: distal localization, young age of patients, multisegmental and bilateral lesions, relatively frequent occurrence in women [3, 5]. Ischemia of the lower extremities in patients with diabetes may be difficult to detect or diagnosed late due to severe neuropathy, when there is often no pain, intermittent claudication, or neuropathic pain predominates [4, 9].

Today, the prevalence of asymptomatic chronic arterial insufficiency of the lower extremities (CALF) among patients with type 2 diabetes mellitus is at least 2 times higher than in the general population and amounts to 23.5-73.8% [6,7]. In modern literature there is information about the frequency of ischemic events in the brain (12.3%) and heart (21.7%) in patients with diabetic foot syndrome. Simultaneous multifocal damage to the arteries of organs and systems significantly worsens the results of treatment of patients with gangrene of the lower extremities due to diabetes [8, 10].

In generally, the peripheral arterial bed reacts to external and internal factors in the body, regardless of the location of the pathological focus. At the same time, the functional and morphological structure of small arteries is disrupted simultaneously, thereby leading to larger-scale changes in the tissues associated with circulatory disorders [2,4]. Unfortunately, at present, information about the frequency, development and characteristics of lesions of the arterial basins of various organs and systems in patients with type 2 diabetes mellitus, who already have signs of diabetic foot syndrome, is extremely insufficient and requires a modern approach to solving the problem.

In this regard, the purpose of our study was to study the nature and frequency of damage to various arterial basins in patients with diabetic foot syndrome.

Material and research methods

The research method was a survey of patients, anamnesis of the disease and the study of examination materials and inpatient treatment from other clinics in 154 patients.

This study analyzed the results of treatment and anamnestic data in 154 patients for the second quarter of 2021 with purulent-necrotic lesions of the feet against the background of type 2 diabetes mellitus upon initial visit to the purulent department at the multidisciplinary clinic of the Tashkent Medical Academy. The overwhelming majority of patients (96.1%) had type 2 diabetes mellitus who received insulin routinely. The average duration of the examined patients was 9.6 ± 2.3 years. The age





of the patients ranged from 23 to 88 years (mean 65.2 ± 2.7 years). Among these patients, 95 (61.6%) were men and 59 (38.4%) were women. Of the clinical forms, the neuropathic form of diabetic foot syndrome was diagnosed in 51 (33.1%) patients, neuroischemic - in 78 (50.6%), ischemic - in 25 (16.2%). The research method was a survey of patients, anamnesis of the disease and the study of examination materials and inpatient treatment from other clinics in 154 patients.

A typical instrumental method for assessing the state of macrocirculation was ultrasound duplex scanning of the arterial vessels of the lower extremities, brachycephalic and carotid arteries, performed on an ultrasound duplex system Acuson-128 XP/10 (Acuson, USA) using a standard method with a linear sensor with a frequency of 7-15 MHz. Qualitative assessment was based on determining the presence and type of blood flow in the arteries of the leg and foot, with blood flow assessed as main altered, main unchanged and collateral. The presence and level of stenosis and occlusion of the arteries, the degree of narrowing of the artery, the extent of the lesion and the exact location of the affected segment were determined. The most adequate research method for deciding to perform revascularization operations on the peripheral arteries of the lower extremities and examining other arterial territories was contrast multispiral computed angiography, as a result of which a clear individual treatment strategy for patients with this nosology was developed.

Results and its discussion

In our study, in most of the observations, the main type of blood flow remained at the level of the femoral-popliteal segment (73%), but a decrease in its speed was observed (the main variable blood flow). At the level of the popliteal-tibial segment, the main variable blood flow was not detected in 81 (52.7%), in the anterior and posterior tibial arteries - 94 (61.4%) and 45 (29.5%), 75 (48.6%) were present in the dorsal artery of the foot and 71 (46.1%) were not identified.

In the distal parts of the leg arteries, the following quantitative blood flow parameters were determined: peak systolic velocity (PSV), mean diastolic velocity (MDV), time-averaged maximum blood flow velocity (TAM), volumetric blood flow velocity (VF), resistivity index (RI), pulsatility index (PI). In patients with the neuropathic form, no quantitative or qualitative disturbances of the main blood flow were detected.

In the presence of compensated ischemia, in 42 (27.3%) patients, the shape of the blood flow spectrum retained "Gothic" systolic peaks. Quantitative parameters of peripheral blood flow: PSV - 36 ± 5.3 ; MDV - 19.1 ± 3.2 ; TAM - 13.1 ± 0.6 ; VF - 47.2 ± 5.1 ; RI - 0.49 ± 0.02 ; PI - 0.76 ± 0.03 .

In critical limb ischemia in 56 (36.3%) patients, the shape of the blood flow spectrum was characterized by the absence of acute systolic peaks and was smooth with low



systolic and high diastolic components. Quantitative parameters of blood flow were significantly reduced: PSV - 5.4 ± 0.4 ; MDV - 3.01 ± 0.3 ; TAM - 1.38 ± 0.4 ; VF - 3.8 ± 0.3 ; RI - 0.18 ± 0.01 ; PI - 0.26 ± 0.02 .

In 31 (20.1%) cases, thickening and increased echogenicity of the walls of the distal arteries due to calcification, pronounced diffuse thickening of the intima-media complex to the complete loss of differentiation into layers were detected. The X-ray picture revealed the presence of mediocalcinosis in 16% of patients (additional research methods are required to determine treatment tactics). The ankle-brachial index (ABI) was also determined by ultrasound, but its reliability for assessing and determining the degree of ischemia in diabetic foot syndrome due to the severity of mediocalcinosis of the arteries of the foot is questionable.

Of 154 patients with type 2 diabetes mellitus lasting over 10 years, critical ischemic attacks occurred on the hearts in 42 (27.2%) cases, and on the brain in 28 (18.2%) cases.

88 (57.1%) patients underwent duplex scanning of the carotid and brachycephalic arteries, which revealed occlusive-stenotic changes of varying degrees and localization in 71 (80.1%) patients. According to ECG data, signs of coronary heart disease (CHD) were detected in 53 (60.2%) cases of the studied patients.

Analysis of the data obtained on the duration of diabetes mellitus revealed that the largest number of patients with critical ischemic events on the myocardium of the heart were observed in patients suffering from diabetes for 9-12 years (35.7%), brain damage during this period was observed in 42.8% (12 patients) cases (Fig. 1).

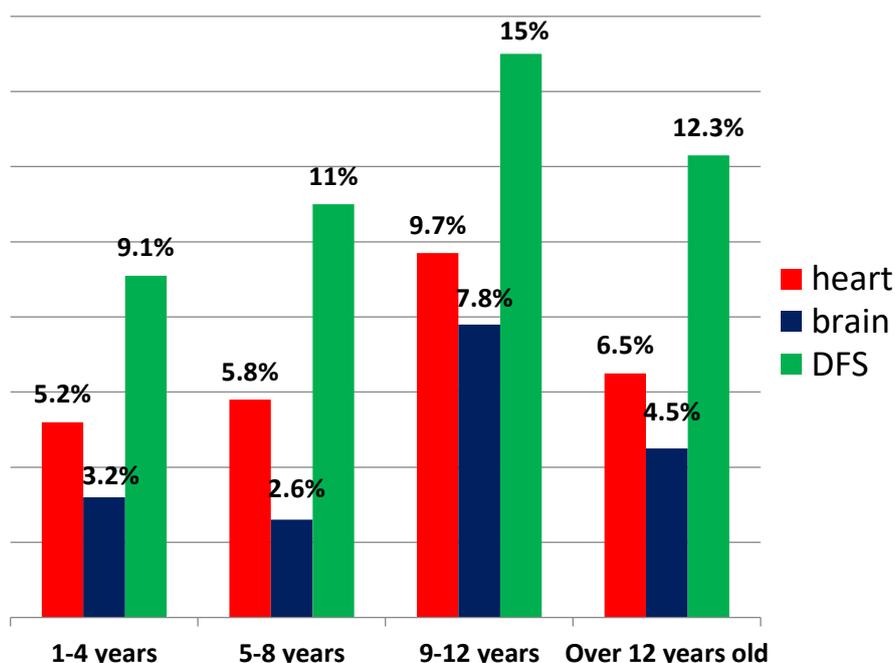


Fig.1. The nature of damage to the arterial basins in DS, depending on the duration of DM.



Due to trophic disorders in the foot against the background of severe ischemia or neuropathy of the lower extremities, out of 154 patients, 84 (54.5%) had a history of visiting doctors or receiving hospital treatment before admission to our clinic.

It should be noted that of the patients who suffered acute myocardial infarction or acute coronary syndrome during the entire period of diabetes mellitus, in 4.6% (7 patients) of cases, a repeated cardiac ischemic attack was observed in the anamnesis before the appearance of trophic changes in the foot. In patients who came with purulent-necrotic processes on the foot, repeated ischemic attacks of the brain at the same time were detected in 6 (0.9%) cases.

During the analysis of the data obtained, it was revealed that critical limb ischemia was observed in 67 (43.2%) patients who made up the “critical” group with the threat of limb loss. Of the patients with critical and subcompensated ischemia, 23 (14.9%) patients were admitted to the hospital with gangrene of the foot (grade 5 according to Wagner).

From the data obtained, it was revealed that the number of patients with trophic changes in the foot due to neuroischemia increases with the duration of diabetes mellitus. At the same time, in 15% (23 patients) who applied to the hospital, the duration of diabetes mellitus was about 10 years and these patients mainly had a neuroischemic form of diabetic foot syndrome (Fig. 1). This, in turn, shows that during these periods, patients with diabetes most often experience decompensated disturbance of peripheral arterial circulation with the addition of severe polyneuropathy.

Thus, an analysis of damage to the arterial basins in patients with purulent-necrotic lesions of the lower extremities against the background of diabetic foot syndrome showed that very often (51.6%) critical ischemic events in the lower extremities are preceded by critical ischemic attacks of other vital organs and systems. In particular, with a duration of type 2 diabetes mellitus of more than 10 years in 154 patients, a retrospective analysis of anamnestic data revealed the presence of ischemic clinical events of the heart in 42 (27.3%) cases, the brain in 28 (18.2%) cases. In terms of the development time of these critical ischemic attacks, the most dangerous were 9-12 years.

Discussion

Analysis of the results of patients with arterial lesions of organs and systems shows that the largest number of patients with purulent-necrotic lesions of the lower extremities have ischemic attacks from the myocardium. 4.9% of cases had recurrent coronary ischemic attacks.





The study of the causes of arterial damage to organs and systems in patients with purulent-necrotic lesions of the lower extremities against the background of type 2 diabetes mellitus made it possible to propose a thorough examination and correction of glycemic levels. Adequate assessment and identification of the frequency of occlusal-stenotic changes with the level of damage to predict damage to the arterial basins from other organs and systems, in our opinion, is only possible by conducting a comprehensive examination of patients, taking into account a number of modern objective data.

Conclusions:

1. Against the background of diabetic foot syndrome, there is multifocal systemic damage from other arterial systems (heart, brain) with purulent-necrotic lesions of the lower extremities, and ischemic clinical symptoms of the corresponding organs and systems develop.
2. In patients with gangrene of the lower extremities against the background of type 2 diabetes lasting more than 10 years, damage to the arterial basins was recorded in 45.5% of cases at the same time: in 27.3% of cases, respectively, from the arterial vessels of the heart and 18.2% of the brain.
3. The data presented above once again show the need for a thorough study of the nature, severity and frequency of occlusive-stenotic lesions of arterial basins in diabetic foot syndrome in order to improve the quality of life of this group of patients and prevent complications from target organs.

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