

Endovascular Surgery of Patients with Diabetic Foot Syndrome and Multiple Macroangiopathy

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SUMMARY

This article shows the results of revascularizing operations in 110 patients with diabetic foot syndrome complicated by various macroangiopathies. After 6 months after revascularizing operations, all patients found a reliable increase in all the indicators of the doppler of the foot vessels in 1, 2 and 3 groups, but it was the least pronounced in patients with 3 groups ($p < 0,005$). The support function of the foot when discharge from the hospital is preserved in 94.2% (48 patients). During the subsequent 6 months, the repeated operations of the small diameter of the foot took 7.3% (3 patients) of patients. After 6 months after discharge, the support function of the foot was stored in all patients of the main group available for observation.

Keywords: Type 2 Diabetes Mellitus; Diabetic Foot Syndrome; Endovascular Surgery

Background

Diabetes mellitus type 2 (DM 2) acquires the nature of the noncommunicable pandemic in the 21st century and the most dangerous consequences of this disease are its various complications [1]. In Russia, currently more than 12 million patients suffer from DM type 2 [2]. According to the forecasts of the World Health Organization's experts, by 2040, the DM type 2 will be detected from each tenth adult and will reach 642 million people [3]. One of the most common and significant cases of complications is the endothelium dysfunction, which leads to tissue hypoxia and cardiovascular pathology: the disease of the peripheral arteries (DPA), which opens the atherosclerosis of the lower limb arteries [4-8]. The International Diabetic Federation recommends considering the possibility of revascularization, regardless of the results of determining the change in skin blood flow, if the diabetic ulcer does not heal for 6 weeks after its formation [Gurieva IV, 2016; Brownrigg JR, et al. [4,5]]. In cases where, as a result of therapy, it is not possible to achieve recovery of direct blood flow, it is advisable to use biotechnological products: Dermal equivalents, non-oral

matrix proteins, stem cells, growth factors [Bartsch T, 2005; Goudie EB, 2012; Barshes NR, 2013; Baltzis D, 2014].

Cell therapy is actively used in the treatment of DPA. So, for example, Kirana S, et al. (2012) against the background of the introduction of stem cells, an increase in oxygen voltage was established, indicating the improvement of microcirculation and healing ulcers. However, we did not meet in the available literature of data on a comprehensive assessment of multiple complications of DM type 2, characterized by the development of diabetic retinopathy, chronic kidney disease, diabetic encephalopathy, cardio-vascular pathology of various degree in combination with diabetic foot syndrome (DFS). Currently, there are practically unexplored disorders of microcirculation in the pathogenesis of the DFS development with neuroischemic or neuropathic components.

The Aim of Investigation

To study endovascular management of patients with diabetic foot syndrome and multiple macroangiopathy Material and

methods: We retrospectively included 110 diabetic patients (78.5 ± 15.8 years, 90 males and 35 females, who were referred to our centre for diabetic foot syndrome from January 2019 to December 2021 years.

Patients were Distributed to 4 Groups

- 1 group - patients with DM 2Type and the neuroischemic form of the DFS with diabetic retinopathy 1 degree (DR 1 stage), chronic ischemia of brain vessels 1 stage (CIBV 1st), chronic heart insufficiency 1 stage (CHI 1st), chronic kidney disease I-II stage (CKD I-II) - 25 patients,
- 2 group - patients with DM 2 type and neuroischemic form of the DFS with DR 2, CIBV 2, CHI-2, CKD III- 30 patients,
- 3 group - patients with DM 2 type and neuroischemic form of the DFS, DR3, CIBV-3, CHI -3, CKD-IV-V - 30 Patients.
- 4 group - patients with DM 2 Type and the neuroischemic form of the DFS without macrovascular complications, 25 patients.

Healthy volunteers (n = 20) will make a group of control. All patients were evaluated by the team of cardiologists, surgeons and diabetologists in order to assess presence of multiple macroangiopathy and eventual need for diabetic foot syndrome revascularization. Research methods included: biochemical (bilirubin, straight, indirect, lipid spectrum, ALT, AST, coagulogram, blood sugar, glycated hemoglobin, urea, creatinine, calcium, alkaline phosphatase in blood and instrumental investigations: ECG, MRI of foot, Doppler of Main Vessels Foot, Ultrasound of Internal Organs, angiography, ophthalmological investigations. Statistical calculations were carried out in Microsoft Windows software using Microsoft Excel-2007 and Statistica Version 6.0, 2003 software packages. The data obtained are reflected in the form $M \pm M$, where M is the average value of the variation row, M is the standard error of the average value. The accuracy of the differences between independent samples was determined by the Mann-Whitney and Student method.

Results

For Diabetic foot interventions the preferred approach was ipsilateral femoral antegrade in 85/110 patients (77.2%) and contralateral cross-over in 15/110 patients (13.6%) and popliteal retrograde + femoral antegrade in 10/110 patients (9.0%). Before performing revascularizing operations, all patients with a neuroischemic form of diabetic foot syndrome were detected a significant decrease in all indicators of the doppler of the foot vessels in 1, 2 and 3 groups, but it was the most pronounced in patients with 3 groups

($p < 0,005$). In our investigation Balloon angioplasty was performed in 70 legs : the procedure was successful in 68/70 legs with an immediate success rate of 97.1% and a significant improvement in TcPO₂ and ABI with ulcer healing in 65/70 legs (92.8%). Freedom from major amputation was 79.4% at a mean follow-up of 2.8 ± 1.2 years (range 1 to 3 years) whereas survival was 86%.

After 6 months after revascularizing operations, all patients found a reliable increase in all the indicators of the doppler of the foot vessels in 1, 2 and 3 groups, but it was the least pronounced in patients with 3 groups ($p < 0,005$). The support function of the foot when discharge from the hospital is preserved in 94.2% (48 patients). During the subsequent 6 months, the repeated operations of the small diameter of the foot took 7.3% (3 patients) of patients. After 6 months after discharge, the support function of the foot was stored in all patients of the main group available for observation.

Conclusion

On the data of our results, endovascular management of diabetic foot syndrome patients seems to lead to a high success of this patients.

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