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Revascularization of pedal arteries for critical limb ischemia

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Abstract

Objective: To analyze the results of revascularization of pedal arteries in patients with CLI.

Material and methods: From January 2008 to September 2017 in the Department of Vascular Surgery of Lviv Regional Clinical Hospital reconstructions of pedal arteries were performed in 41 patient with CLI. Middle age was 65 years (62,97%), men presented majority - 34 (83%), women, accordingly, - 7 (17%).

Results: Reconstructive operations on pedalarteries often remain as only chance to avoid amputation in patients with CLI. However, both mentality of surgeons and technical complications, predefined by the geometrical parameters of the reconstructed vessels and also anatomical features of shunt positioning, lead out from wide therapeutic introduction. During the period of supervision major amputations were performed in 5 (12,2%) cases, in 28 (68,3%) tissue loss was limited to the necrectomies and minor amputations.

Conclusions: 1. Revascularization of pedal arteries is an efficient technique in cases of CLI due to distal OSL. 2. Shunt patency rate is better when popliteal artery is used as the source of blood supply, while no dependence on the distal anastomosis location was detected.

Keywords: Occlusive–stenotic lesions, reconstructive operations, pedal arteries, critical limb ischemia

Introduction

Atherosclerosis is a common condition and a leading cause of morbidity, disability and mortality. According to epidemiological studies the prevalence of atherosclerosis affecting lower limb arteries is 3-10% in the general population and up to 15-20% in persons over 70 years^[1].

Critical limb ischemia (CLI) develops in 35-65% of patients with occlusive stenotic lesions (OSL) of femoro-distal arterial segments^[2, 3]. CLI leads to disability and can significantly affect quality of life, patients cannot avoid amputation and the associated changes in lifestyle^[4]. Therefore, revascularization of pedal arteries is often the only chance to avoid amputation due to chronic CLI. Typically atherosclerotic lesion affects multiple segments, and morphological prerequisites are rarely ideal for distal reconstructive surgery^[5]. Therapeutic approach present a challenge in current vascular surgery, and the rate of disability does not tend to decrease despite the broad experience and implementation of novel techniques. The technique of revascularization is determined by the condition of pedal arteries: return of circulation at least in one of them usually provides sufficient blood supply and eliminates ischemia^[6].

Hence, the choice of surgical technique in cases of critical leg ischemia due to OSL of tibial and pedal arteries presents a problem, which undoubtedly requires further investigation.

Study objective

To analyze the results of revascularization of pedal arteries in patients with CLI.

Material and methods

41 patients underwent reconstructive surgery of pedal arteries due to CLI in Vascular Surgery Department of Lviv Regional Clinical Hospital between January 2008 and September 2017. Mean age was 65 (62.97%), most patients were male – 34 (83%), with 7 (17%) being female accordingly.

Of note, while male patients prevailed, almost all patients were nicotine-dependent. More than one third of patients had arterial hypertension, diabetes mellitus; one patient out of five had hyperlipidemia. The prevalence of overweight was significantly lower. Most patients had 2-3 risk factors, including usually the elderly age, hypertension, gender and nicotine dependence.

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Comorbidities were mostly represented by cardiovascular conditions: ischemic heart disease in approximately one third of patients, history of myocardial infarction in 7 cases (16.3%), ischemic stroke in 8 cases (19.5%). Over half of the patients had obstructive pulmonary disease. One patient out of ten had gastrointestinal conditions, predominantly history of gastric or duodenal peptic ulcers.

Presence and type of arterial lesions and circulatory changes were assessed by ultrasound duplex scanning (USDS); X-ray angiography was deemed necessary and performed in order to identify indications for reconstructive surgery in the majority of patients with CLI due to distal disease.

In 40 cases (97.5%) atherosclerosis was identified as the primary condition, while in 1 case (2.5%) it was obliterating endarteritis. 27 patients (65.8%) were diagnosed with diabetes mellitus as a comorbidity. In most cases, i.e. 33 patients (80.5%), CLI presented with ulceration or gangrene, while rest pain was present only in 8 patients (19.5%).

All patients were operated under epidural anesthesia using 1% lidocaine solution. The effect of 'absence during surgery' was achieved with sodium oxibutyrat, diazepam or propofol.

Types of reconstructive surgery are given in table 1.

Table 1: Types of reconstructive surgery on pedal arteries

Type of surgery	Number
Femoral-pedal	9
Popliteal-pedal	9
Femoral-plantar	11
Popliteal-plantar	10
Posterotibial-pedal	1
Sequential (from shunt)-pedal	1
Total	41

Reconstruction was performed using autogenous segments of reversed great and small saphenous veins. In most cases the shunts were placed in the lower leg in extra-anatomical fashion. In 8 cases (19.5%) revision procedures were performed due to thrombotic reocclusion of previous reconstructions. Distal arteriovenous fistulae were formed in 8 cases (19.5%).

Results and discussion

Reconstructive surgery mainly remains the only chance to avoid amputation in patients with CLI due to distal arterial lesions. However, broad implementation of this technique is hampered both by surgeons' views and by the technical complexity originating from geometry of vessels being reconstructed and the anatomical and topographical challenges in placing the shunt. During the follow-up period high amputation was performed in 5 cases (12.2%), and minor amputations or necrectomy was performed in 28 cases (68.3%). Generally, 36 patients (87.8%) had their limbs preserved. Popliteal artery as the source of blood supply was associated with better patency rates when compared with femoral artery. No statistically significant relation between the distal anastomosis location and the patency rate was detected.

Conclusions

1. Revascularization of pedal arteries is an efficient technique in cases of CLI due to distal OSL.
2. Shunt patency rate is better when popliteal artery is used as the source of blood supply, while no dependence on the distal anastomosis location was detected.

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