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Arterialisation of great saphenous vein in situ for limb salvation: a case report

Vena saphena magna in situ arterializacija gebstint koja: atvejo aprašymas

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Abstract

Critical lower limb ischemia in the absence of distal arterial circulation presents an urgent situation, which must be treated immediately if we want to save the foot or limb from amputation.

The reduced arterial flow in these situations is not adequate to provide metabolic requirements of lower limb even in rest.

According to Fountain these patients are classified in Class III or in Class IV.

Approximately 14%–20% of patients with critical lower limb ischemia are unsuited for distal arterial reconstruction and face major distal amputation [1].

Distal venous arterialization is a unique procedure in which the venous bed is used as an alternative conduit for perfusion of peripheral tissues of lower limb.

Patients with critical lower limb ischemia can be treated by arterialization of great saphenous vein.

Case report

In the present article, we describe the first case of in situ arterialization of great saphenous vein performed in Macedonia in treatment of critical below-knee ischemia.

Maintaining the great saphenous vein in situ allows the arterialization of the foot venous arch with one anastomosis without removing the vein of its original bed.

Conclusion

Distal revascularization of the limb with critical ischemia, by creating a reverse flow with in situ saphenous vein arterialization must be seriously considered as an attempt for salvage of the foot or below-knee without distal arterial run-off.

Key words: arterialization of vein, great saphenous vein, limb ischemia.

Introduction

In critical ischemia without arterial run-off, one of the treatment options to enable revascularization is to turn the course of the flow reversely through the venous system to treat rest pain, to promote healing of the ulcers or to salvage the limb from amputation [2].

Atherosclerosis obliterans (AO), especially associated with diabetes mellitus, thromboangiitis obliterans (TO) in most cases, and popliteal artery aneurysms with distal bed thrombosis are conditions that justify the indication of this procedure [2].

We present a case when we use distal venous arterialization as a unique procedure in urgent treatment of critical ischemia of lower limb in which the venous bed is used as an alternative conduit for perfusion of peripheral tissues.

Case report

In our report, we present a case of 52 years old male patient, with acute onset of pain in right foot, three hours before admission to our surgery ambulance.

The pain was follow up with cold foot and below-knee of the right limb.

In spite of this, he has diagnosed arterial hypertension and signs and symptoms of weakened circulation in lower extremities, trophic changes on the right foot and presence of several small wounds.

He is smoker for thirty years.

Patients have had medical history for previous surgical procedure of resection of an aneurism of the popliteal artery on the right limb.

On the examination we do not palpate arterial pulsation in popliteal pit and on foot, but patient has good pulsation on a. femoralis communis.

Patient was advised by vascular surgeon to make color-doppler ultrasound and after receiving the results

from this examination to do (computed tomography) CT angiography of abdomen and lower extremities.

Doppler ultrasound

Lower part of the superficial femoral artery and popliteal artery were completely occluded.

However, arterial circulation of common femoral artery, deep femoral artery and upper 2/3 of the superficial femoral artery have neat ultrasound sonograms.

We examined absent arterial pulsation on popliteal artery and retromaleolar and dorsal artery of foot.

Patient was follow up immediately to CT angiography on lower abdomen and lower extremities with intravenous administered contrast.

CT angiography findings

CT angiography on native series only detected artificial material in projection of popliteal artery in right limb without presence of significant calcification in projection of large blood vessels of lower extremities.

On the arterial contrast phase made CT series we could examined neat hemodynamic of the common femoral artery, deep femoral artery and in upper 2/3 of the superficial femoral artery of right limb.

Arterial circulation of distal 1/3 of superficial femoral artery, popliteal artery and both arteries of the right below-knee have been with significantly compromised circulation without any hemodynamic visualization with lots of thrombembolic masses.

On right below-knee we examined weak collateral circulation on the part of separation of posterior tibial artery.

On venous phase of CT examination, circulation in deep and superficial venous system in left lower extremity was adequate.



Figure 1. 3D reconstruction of arterial phase of lower limbs



Figure 3. 3D reconstruction of venous phase of venous circulation



Figure 2. 3D reconstruction of arterial phase of performed CT scan with anatomical view on lower limb arterial anatomy

In right limb we find out inadequate circulation in superficial and deep venous system, situation that could be result from bad arterial flow in right foot.

After receiving the findings from CT angiography we concluded that only procedure that could be done in this case is to try to perform in situ arterialization of great saphenous vein in order to save right limb from amputation despite unsatisfactory deep and superficial venous system of right limb.

Preoperative we done additional routine laboratory examination, pre operative anesthesiology examination and we intravenously administered 5 000 IU heparin.

Once again preoperative in operating room, we had performed color-doppler ultrasound on the venous system of right limb in order to once again recheck the both venous systems for presence of thrombus and to perform mapping of collateral branches of great saphenous vein in right limb in order to close all these branches intraoperative.

We do not have visualized any large thrombus on both venous systems on performed second color-doppler ultrasound.

Patient was operated in spinal anesthesia.

Treatment

Indication for surgical treatment was established, in order to save the limb.

We start the procedure with separation of confluence of great saphenous vein into femoral vein on the right limb.

We proceed with small separate incisions of the right limb to identify previously mapped collateral branches and we performed ligation and resection of these branches.

We have ligated and resected all collateral branches within three incisions.

The point of the beginning of great saphenous vein near medial malleolus has been identifying and on this point we open the great saphenous vein.

In order to ensure arterial flow via vein, on this point we insert a valvulotome in great saphenous vein and we destroyed all valves from point of entrance to previous ligated entrance of great saphenous vein into femoral vein.

When we performed destruction of great saphenous vein valves, we do not verified any large thrombotic masses to evacuate with valvulotome from the vein.

In order to ensure the arterial flow on the dorsal part of the foot, we complete the destruction of valves at the level of first interdigital space and ensuring the exit point from dorsal venous arch via system of small saphenous vein.

After preparing the vein, we continue the procedure with preparation of place for anastomosis on the common femoral artery.

We create the anastomosis between great saphenous vein and the artery using continuous 6.0 polypropylene sutures.

Per operative we noticed presence of pulse and trill in the dorsal venous arch as well as weakened pulsation in proximal part of small saphenous vein.

Postoperative, patient was admitted in Intensive care unit and we administered continuous heparin therapy with 25 000 IU / 24 hours in first four with targeted APTT over 60 seconds.

After four days patient was transferred on surgical department and we switch the anticoagulant therapy on low molecular weight heparin with dose of 1 mg/kg body weight.

On second postoperative day we performed control color Doppler ultrasound with satisfactory arterial circulation in great saphenous vein and in dorsal venous arch of the right foot.

Fifth postoperative day we performed CT angiography of both lower limbs with satisfactory circulation in superficial veins of operated lower limb.

Discussion

Arterialization of the great saphenous vein present new surgical procedure in order to try to save the below-knee and lower limb from amputation in situation when surgeon have diagnosed critical ischemia in the absence of distal arterial bad.

Achieving good surgical outcomes are related to precise indication, good preoperative investigation and adequate surgical technique [2].

We follow up patient for six months after surgery, with excellent postoperative results.

Postoperative controls were more frequent having in object that this was our first case.

Thropic changes on right limb were in regression, and small wounds on right foot were healed 2 weeks after surgery.

Patient have not experience new pain in right leg after walking distances of two kilometers.

The presence of pulse and thrill in the dorsal venous arch is mandatory, as well as the maintenance of the foot veins from the malleolar anterior perforating vein, and the integrity of the deep venous system, which functions as an "escape route" for the blood hyper flow generated by the AV fistula [2].

A meta-analysis comprising seven papers gathered a total of 228 patients with 231 treated extremities and a 71% success rate with healing of lesions, minor amputations and improvement of pain at rest: 140 cases of OA and 91 cases of TO26 [3].

Conclusion

Decision for performing arterialization of great saphenous vein for limb salvation in patients with critical isch-

emia should be considered as necessary and adequate option for treatment in patient when other techniques will not provide good postoperative results.

Small number of performed procedure of venous arterialization in literature does not have impact on making conclusions with strong recommendations.

Every performed procedure should obtain adequate follow up of the patient in order to measure the results

from operative procedure and to collect necessary information in order to improve the technique and to share information on global level.

Arterialization of the venous system of the foot should be considered as first choice for salvage of the limbs where the absence of distal arterial bed leads to critical ischemia.

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