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CASE REPORT

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Ilio-Deep Femoral Bypass – an Alternative Treatment Strategy to Critical Limb Ischemia (CLI)

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ABSTRACT

Background: Critical limb ischemia is considered the most severe form of peripheral artery disease. High morbidity and mortality rates are associated with this pathology due to poor economic management of complications. **Case summary:** A 68-year-old female patient underwent a routine Doppler ultrasound which revealed the obstruction of both the common and superficial right femoral arteries, as well as the right deep femoral artery. In this case, an iliofemoral bypass was performed using the right deep femoral artery as the outflow artery. **Conclusion:** Revascularization of the deep femoral artery has a reasonable chance of preserving the ischemic lower limb whenever the common and superficial femoral arteries suffer major atherosclerotic blockages.

Keywords: deep femoral artery, iliofemoral bypass, preservation of the ischemic limb, superficial femoral artery

INTRODUCTION

In cases of critical limb ischemia (CLI), bypass surgery for limb salvage is an established treatment. Patients who suffer of CLI have a very bad prognosis, with up to 40% of them progressing to major amputation within six months, while most of the patients lose their limbs if there is any attempt of revascularization. Using either endovascular means or open surgery, these patients have to undergo revascularization if their limbs are to be salvaged.[1,2]

In current practice, the common femoral artery (CFA) is considered to be the preferred run-off for the use of bypass in the treatment of CLI. However, there are situations in which neither CFA nor the superficial femoral artery (SFA) are usable options, due to obstruction, severe calcification, or previous interventions suffered at this level.[3]

Although the deep femoral artery (DFA) is well acknowledged as an outflow vessel for reconstruction, data are lacking concerning the suitability of the DFA as an inflow site for distal bypass.[4]

The sartorius muscle is used when localization of the DFA is desired. The DFA is divided into three zones. The proximal zone extends from the origin of the DFA to the origin of the LCFA, the distal region of the DFA is divided into two areas, and the middle area extends from the LCFA to the second perforating branch and is located in the distal femoral triangle. The distal area is the area beyond the second perforating branch, located distally to the tip of the femoral triangle. This segment of the artery is located between the adductor longus and magnus. The origin of DFA is located between 1 and 8.5 cm (average 5 cm) below the inguinal ligament.[4]

CASE PRESENTATION

In this report we describe the case of a 68-year-old woman admitted to the Vascular Surgery Clinic of Târgu Mureș, who presented with stage 4 Fontaine peripheral arterial disease. Doppler ultrasonography also revealed occlusion of the right CFA. Both superficial and deep femoral arteries were occluded. Also, the patient presented major lateral malleolar ulceration. As comorbidities, she had arterial hypertension stage 3, osteoporosis, post-thrombotic syndrome, glaucoma, and eating difficulties. The woman had also undergone a previous surgical intervention, a thrombendarterectomy of the same arteries, using Fogarty catheter and Le Maitre Ring Dissector, 4 years prior to current presentation, in 2017.

SURGICAL PROCEDURE

The surgical intervention started with a 10 cm single longitudinal incision in the Scarpa triangle, extended both proximally and distally, with slow dissection of the soft tissue, until the DFA was exposed. After adequate systemic heparinization, proximal and distal control of the involved artery was attained. The segment of the artery which was occluded was removed through a classic endarterectomy and, after sharp division of the proximal and distal ends of the atherosclerotic plaque, the intimal flap was secured with 7-0 polypropylene suture to avoid dissection of the artery. The artery was cleared of any debris, clots, or residual materials through irrigation with heparinized saline. Subsequently, a part of the great saphenous vein was harvested, reversed and sutured between the iliac artery and the DFA (Figure 1). A drain was inserted during closure, without applying negative pressure to the closed wound. A peri-arterial sympathectomy was also performed. Postoperative anticoagulant was routine, the patient was administered 2500 units of unfractionated heparin every 4 h, intravenously, for the first 24 h after surgery. She also received Clopidogrel 75 mg immediately after the procedure, and once a day beginning with day 2. At the end of day 1, the pulse was palpable only at the left posterior tibial artery. Regarding the laboratory tests, the levels of neutrophils, monocytes and basophils were elevated, while hemoglobin and lymphocyte values were low. Before hospital discharge, the patient was prescribed sulodexidum, pentoxiphiline, and acenocumarol. The patient agreed to the publication of her data, and the institution where the patient had been admitted, approved the publication of the case.

FIGURE 1. Ilio-deep femoral bypass

DISCUSSIONS

The first bypass using the DFA in the literature was reported in 1964 by Farley *et al*. Stable and Wilson also reported a similar procedure, but the indications for using this particular method have not been clearly established so far.[5] It is current practice to use the CFA for either the origin or the distal site of bypass grafts addressing the lower extremity. If significant occlusive disease is affecting the CFA or the origin of the DFA, the proximal DFA can be used for arterial reconstruction. When these bypasses fail, limb-threatening ischemia often occurs. A secondary arterial reconstruction, required to save the limb whenever the first procedure had failed, can be technically demanding and is more likely to be complicated by wound problems.[6,7]

There are cases when neither CFA nor SFA can be used, due to obstruction, severe calcification, or previous dissection. The DFA tends to be spared from severe atherosclerosis, and when the disease is present, it tends to be localized at the origin or proximal portion, especially in patients without diabetes. In non-diabetic patients, severe lesions will usually be confined to the CFA and SFA, with involvement of the origin of the DFA seen in only 1% of patients. Thus, the rest of the DFA is usually disease free. The incidence of severe, synchronous atherosclerotic lesions in both the DFA and the SFA is infrequent, and is seen in only 7% of patients undergoing angiography.[8,9]

Access to this artery is possible through various incisions and approaches; therefore, sites of previous dissection or ongoing infection can be avoided. Thus, the DFA is today accepted as an important inflow and outflow site in vascular reconstruction. The DFA has also been successfully used as an intermediate site for sequential bypass.[10]

In the present manuscript, we have described a simple and reproducible technique for crural bypass in patients whose CFA and SFA are unavailable as inflow sites. It is common to find obstruction of the CFA and the proximal DFA, either by prior operations or by the progression of atherosclerotic lesions. The standard approach to the often patent, distal portions of the DFA involve tracing the artery from its origin and then progressing distally with the exposure. This is often rendered difficult or impossible because of prior operative scarring or ongoing wound infection. This prompted us to develop surgical techniques for approaching the distal, previously undissected portions of the DFA directly, through un-scarred tissue layers. These distal portions of the DFA could then be used as the site of run-off for a secondary arterial bypass, designed to save an ischemic extremity.[11,12]

The use of the distal DFA, via the direct approaches herein described, avoids the scarred and potentially infected groin and thigh areas. This may facilitate the operation, by allowing the use of a previously undissected artery. By using an inflow site located more distally in the thigh, a shorter segment of graft is necessary. This is particularly important in patients requiring a bypass to the infragenicular popliteal artery or to a crural artery, but in whom available autologous vein length is insufficient because of prior surgery, localized superficial vein thrombosis, or other reasons.[9,12]

One of the most common complications, namely occlusion, is directly related to the material used for the graft, given the need for a longer graft. It is preferable to use saphenous vein grafts, as in our case, but synthetic ones can also be used, when the length and diameter of the saphenous vein is not sufficient, but the latter has a much higher complication rate, so it is preferable to avoid its use.[13]

Perhaps the main advantage of the posteromedial route is that it facilitates dissection around arteries and may reduce the incidence of wound complications. Another advantage is the possibility of using the same skin incision to expose the distal zone of the DFA and to harvest the proximal segment of the great saphenous vein. In contrast, the anterolateral route, lateral to the sartorius muscle, would require an additional skin incision.[14,15]

CONCLUSIONS

Revascularization of the deep femoral artery is an important method of maintaining the viability of an ischemic lower extremity, avoiding dissection in a scarred groin and shortening the length of the harvested vein required to perform an autogenous bypass. Therefore the use of a distal deep femoral artery as an outflow artery may increase the percentage of patients who can benefit from a successful arterial reconstruction.

CONFLICT OF INTEREST

Nothing to disclose.

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