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Case Report Open Access

Axillofemoral Bypass for Critically Ischemic Lone Lower Limb: A Mercy Trial in a Final Exam or a Simple Remedy for an Impending Disaster?

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Abstract

Critical limb ischemia with rest pain and/or tissue loss is a serious sequel of occlusive aortoiliac disease (AID) inevitably leading to amputation unless a timely successful revascularization is performed. The most effective therapy is aorto (bi) femoral bypass while endovascular intervention has an increasing role in lesions of favorable anatomy. However, there is a group of poor risk patients with co-morbidities who neither tolerate a major aortic surgery nor being suitable for endovascular therapy. For such patients, extra-anatomical bypass such as axillofemoral bypass, first used in 1963, emerges as an effective alternative. Herein, we describe the case of an Iraqi male, 65 year old with critically ischemic lone lower limb due to total occlusion of infra-renal aorta with a very poor distal runoff who underwent a successful axillofemoral bypass that relieved his pain and saved his single lower limb. The graft was patent 5 months following the operation as shown by Doppler ultrasonography (DUS) though longer follow up was not available. In conclusion, axillofemoral bypass is relatively a simple operation for a serious disease. Limb loss was inevitable in this patient without this "mercy trial". The alternative choice was either amputation or a major aortic surgery with a doubtful benefit and a definite morbidity.

Keywords: Critical limb ischemia; Extra-anatomical; Axillofemoral; Bypass graft; Limb salvage; Amputation

Introduction

Critical chronic lower limb ischemia is a serious manifestation of atherosclerotic aortoiliac disease (AID) which needs an aggressive therapy to avoid limb loss. The revascularization of ischemic lower limb (s) is best achieved via aorto (bi) femoral bypass performed through a transperitoneal or retroperitoneal approach as this operation gives higher survival rates, better graft patency and associated with lower hospital mortality [1-4]. Endovascular intervention is an attractive method which is increasingly employed nowadays to treat critical lower limb ischemia associated with lesions of favorable anatomy [4]. However, severe occlusive AID cannot be treated by such techniques [3]. Aortic reconstruction is a major undertaking with many potential complications and therefore, the poor risk patients may not tolerate it. The alternative choice is the extra-anatomical bypass in which blood flow to lower limb arteries is restored using synthetic grafts anastomosed to arteries outside the abdomen such as the ipsilateral or contra-lateral axillary artery or the contra-lateral femoral artery. Extra-anatomical bypass is a less invasive procedure which can save threatened limbs in patients deemed to be high risk for aortic surgery [1-6]. Moreover, it has a place in the management of infected aortic grafts and aortoduodenal fistulae [5].

Axillofemoral bypass was introduced by Blaisdell, et al. [1-2] and shortly followed by axillo (bi) femoral bypass reported by Sauvage and Wood in 1966 [5]. Although the patency rate of this type of bypass is inferior to aortofemoral bypass and the perioperative mortality is higher, its results are still acceptable and reasonable [4].

Herein, we describe the case of an Iraqi male, 65 year old with critically ischemic lone lower limb due to total occlusion of infra-renal aorta with a very poor distal runoff who underwent a successful axillofemoral bypass that relieved his rest pain and saved his single lower limb. The operation is technically simple and safe but effective in properly chosen patients. The relevant literature is reviewed to know the current indications and results of this old yet still viable operation.

Case Report

A man of 65 admitted to Cardiothoracic and Vascular Surgery Department, Sulaimaniyah Teaching Hospital (STH), Sulaimaniyah, Iraq on November 1st 2009 because of severe rest pain in left foot of 6 months duration. He was a known case of peripheral arterial disease (PAD) for 3 years and had right above knee amputation 2 years earlier due to advanced ischemia. He used to smoke heavily for many years. Both femoral pulses were impalpable. Blood tests revealed a normal lipid profile but high blood sugar that required insulin therapy for control. Chest radiograph and ECG were normal. Color Doppler Ultrasonography (CDUS) and transradial aortography (Figures 1a and 1b) revealed total occlusion of abdominal aorta (AA) just below renal arteries with very poor distal run off. As a limb-saving procedure, the patient accepted exploration of left femoral artery for possible revascularization. We planned to use a technique of low morbidity avoiding a major surgery in this patient. In preparation for axillofemoral bypass, we did CDUS of left brachial artery and a normal triphasic blood flow was seen.

Procedure

1. Under general anaesthesia and in supine position with abduction of left upper limb.
2. A short vertical left groin incision was made. The left superficial femoral artery (SFA) was isolated. It was thick walled but has

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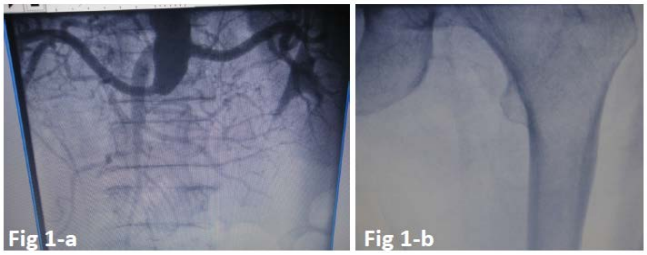

Figure 1: a) Abdominal aortography showing total occlusion of infra-renal AA. **b)** Very poor distal runoff.

a lumen. Arteriotomy revealed weak flow. Local thrombo-endarterectomy was done in preparation for distal anastomosis.

3. A short incision was made below the middle third of left clavicle. Incision of clavi-pectoral fascia. Pectoralis major muscle fibers were splitted. The axillary artery was isolated from axillary vein and brachial plexus. The acromio-clavicular branch was ligated and divided. Pectoralis minor muscle was divided to improve exposure (Figures 2a-2c).

4. A 6 mm PTFE graft was anastomosed proximally end to side to axillary artery using continuous 5-0 Polypropylene suture. A good pulsatile flow was obtained in the graft. Minor bleeding from the suture line was controlled by pressure (Figures 2d-2f).

5. A subcutaneous tunnel was made using a long artery forceps along the lateral chest and abdominal wall in mid-axillary line. Three stab incisions were made to recover the graft. The 40 cm graft was not enough to reach the groin; therefore, additional piece of similar graft was sutured to the initial graft using continuous 6-0 Polypropylene (Figure 2g).

6. The distal anastomosis was made to SFA end to side using 6-0 Polypropylene. There was a palpable pulse in SFA distal to the anastomosis (Figures 2h and 2i).

7. After checking the hemostasis, Redivac drains were placed in upper and lower wounds and all wounds were closed in layers.

The postoperative course was uneventful. The graft was patent 45 days postoperatively (Figures 3a and 3b).

Discussion

Apart from severe rest pain, the reported patient was in danger of losing his lone lower limb due to severe ischemia. Impalpable femoral pulse and poor distal runoff was a main obstacle to any sort of revascularization. Searching for a solution for this problem, we elected to explore the femoral artery first to know whether it is graftable or not. Non-opacfied artery on arteriography does not necessarily imply an occlusion but it could be the result of under perfusion. Although, SFA was thick walled with feeble blood flow, removal of atheroma by thromboendarterectomy provided the patient a site for distal anastomosis.

The inflow vessel could be either the abdominal aorta proximal to the obstruction or an extra-anatomical site such as the contra-lateral femoral artery or the unilateral axillary artery. To perform aorto-femoral bypass graft, we ought to access the abdominal aorta through a transperitoneal or retroperitoneal approach; both represent a major surgical intervention. In contrast, an extra-anatomical bypass intervention would avoid such a major operation and its potential morbidity [1-8]. Femoro-femoral cross over graft was not feasible as right femoral pulse was impalpable. However, the ipsilateral axillary artery was a good option as clinical assessment and CDUS proved its patency.

The operation is characterized by its relative simplicity as both axillary and femoral arteries are easy to explore even under local anaesthesia [3,8]. Although axillo-femoral bypass is usually performed under general anaesthesia [3], there are few reports describing the use of local anaesthesia [3].

Fortunately, the patient was relieved from rest pain and his single lower limb could be saved by this operation. The graft was patent 5 months following the operation as shown by DUS though longer follow up was not available.

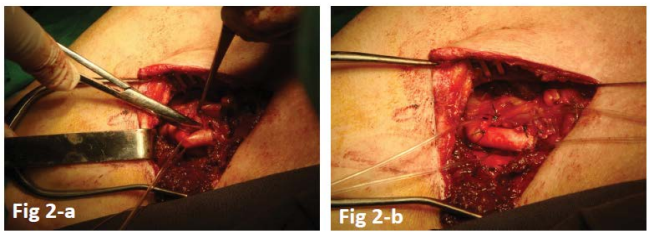

Figure 2: a) Isolating the axillary artery. **b)** First part of axillary artery isolated.

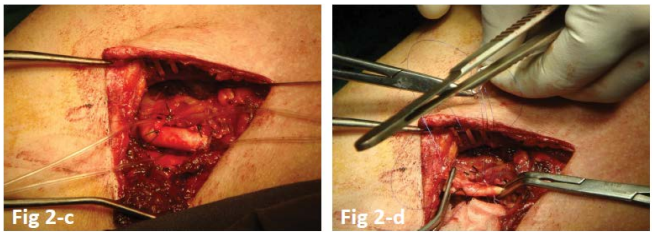

Figure 2: c) Pectoralis minor muscle divided. **d)** Parachute technique in proximal anastomosis.

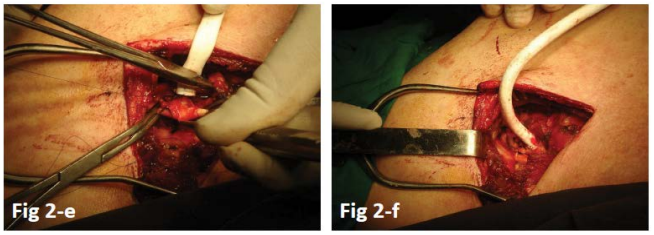

Figure 2: e) Doing proximal anastomosis. **f)** Proximal anastomosis completed.

Figure 2: g) Tunneling the graft. **h)** Distal anastomosis completed.

Figure 2: i) Procedure nearly finished.

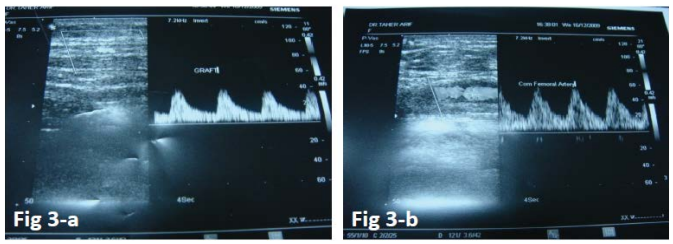

Figure 3: a) Doppler ultrasonography 45 days postoperatively showing a patent graft. **b)** and a normal flow in common femoral artery.

The 5-year primary patency rate of axillo-femoral bypass varies widely from 57 to 74% which is relatively lower than that of aorto-femoral bypass (70 to 89%) [2,4]. However, this is an accepted reasonable result as the patients who receive axillo-femoral bypass usually have a reduced life expectancy due to the associated co-morbidities [4]. Avoidance of amputation in a previously ambulant patient is a major achievement and it is great to live several months or few years with intact legs [2]. Unlike the already bedridden terminally ill patient with ischemic leg to whom amputation may not pose a big problem, saving the limb of the ambulant patient is crucial and worth-trying.

Corbett et al. reported no operative mortality from axillofemoral grafting [2]. The relatively higher hospital mortality of axillofemoral bypass compared to aortofemoral bypass reported by some authors [4] is due to the associated co-morbidities rather than the operation itself.

In view of the clear advantage of aorto-femoral bypass in the treatment of AID, axillo-femoral bypass is currently used only in high risk patients with a very short life expectancy (less than 5 years) and when endovascular therapy is not possible [4]. Furthermore, it has a definite role in the management of infected aortic grafts and aorto-duodenal fistulae [5].

In conclusion, axillo-femoral bypass is a relatively simple operation for a serious disease. Limb loss was inevitable in this patient without this "mercy trial". The alternative choice was either amputation or a major aortic surgery with a doubtful benefit and a definite morbidity.

Informed Consent Statement

The patient gave his verbal and written informed consent.

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