FEMORO-POPLITEAL ARTERY BYPASS SURGERY WITH AUTOLOGOUS GREAT SAPHENOUS VEIN GRAFT : 1ST TIME EXPERIENCE IN CHITTAGONG MEDICAL COLLEGE HOSPITAL

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Summary

Peripheral arterial disease affects with loss of limb if untreated. For decades, arterial bypass has been regarded as one of the trustworthy and effective methods for treatment of atherosclerosis in lower limbs. A 65 year old male patient was treated for a worsening short distance intermittent claudication in left calf muscle. Clinical examinations identified occlusion of the superficial femoral artery. Peripheral Angiogram (PAG) revealed popliteal artery had good calibre with distal run off. Left superficial femoral artery to popliteal artery bypass was performed on the patient with autologous reversed great saphenous venous conduit. Post operative course was uneventful. The pulses of the dorsalis pedis and posterir tibial arteries in left leg regained and remain strong. The Ankle Brachial Index (ABI) increased from 0.60 to 1.09. As far as arterial bypass in lower limb is concerned, the efficacy is usually not so desireable because of lack of vascular substitutes, insufficient availability of autologous vessels and also the scarcity of skilled vascular surgeon. Therefore, it becomes our long-lasting desire to find out a safe and endurable graft conduit and also to establish vascular surgery in a city where this type of surgery was absent previously. We have recently succeeded in performing femoro-popliteal bypass surgery in Chittagong Medical College Hospital (CMCH). Probably this was the first successful femoro-popliteal bypass surgery with autologous great saphenous venous conduit for chronic arterial occlusive disease of lower limb in this hospital.

Key words:
Femoropopliteal bypass; Great Saphenous vein; Atherosclerosis; Epidural anesthesia.

Introduction

Atherosclerosis is the most common cause of Chronic Arterial Occlusive Disease (CAD) of the lower extremities. The arterial narrowing or obstruction that occurs as a result of the atherosclerotic process reduces blood flow to the lower limb during exercise or at rest. A spectrum of symptoms may range from intermittent claudication or pain at rest to ulceration and gangreene. Intermittent claudication denotes pain that develops in the affected limb with exercise and is relieved with rest. This pain usually occurs distal to the arterial narrowing or obstruction. Since the superficial femoral and popliteal arteries are the vessels most commonly affected by the atherosclerotic process, the pain of intermittent claudication is most often localized to the calf [1]. The distal aorta and its bifurcation into the two iliac arteries are the next most frequent sites of involvement. Narrowing of these arteries may produce pain in the buttocks or the thighs as well as the legs [2].

Epidemiological studies indicate that up to 5% of men and 2.5% of women 60 years of age or older have symptoms of intermittent claudication. Symptoms of intermittent claudication should be viewed as a sign of systemic atherosclerosis. This explains why, patients with intermittent claudication have a threefold increase in cardiovascular mortality [2, 3]. The symptoms of chronic arterial insufficiency of the lower extremities progress rather slowly over time. Thus after 5 to 10 years, more than 70% of patients report either no change or improvement in their

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symptoms, while 20% to 30% have progressive symptoms and require intervention, and less than 10% need amputation [4, 5].

The goals of treatment in patients with chronic arterial insufficiency of the lower extremities are two. First, with respect to the affected limb or limbs, the goal is to eliminate ischemic symptoms and prevent progression to vascular occlusion. Accepted treatments include conservative measures such as exercise, risk factor modification, and pharmacological therapy, as well as invasive treatment, which include interventional radiological procedures such as angioplasty or stent insertion and surgical treatment such as endarterectomy, bypass grafting or amputation. The second goal of therapy in patients with intermittent claudication is to prevent cardiovascular complications (ie, stroke, myocardial infarction and death), which may result from widespread atherosclerosis. At present the best treatment for this indication appears to be aspirin, 75 to 325 mg daily [6]. Peripheral arterial disease affects 4-15% of adult population worldwidely [7].

Case Report

A 65 year-old man presented with worsening short-distance claudication in left leg calf muscle. His medical history included mixed dyslipidemia. The patient was a smoker with 10 sticks /day for last 40 yrs. He is a diabetic, normotensive. He also had an inferior Myocardial Infarction (MI) four years back.

Upon examination, the patient had a temperature of 37˚C and a heart rate of 88 beats/min. Blood pressure and oxygen saturation were normal. Examination of respiratory system was unremarkable. Heart sounds were normal with no murmurs. Abdomen was soft and non-tender. A detailed peripheral vascular examination demonstrated presence of femoral artery pulse in both lower limbs but absence of popliteal artery, Arteria Dorsalis Pedis (ADP) Posterior Tibial Artery (PTA) pulses in left lower limb but all are present in right side. There was no tissue or hair loss in left side.

A Duplex vascular scan of lower limb vessel was performed & found that on the left side, blood flow is normal with triphasic wave form clear window up to lower part of common femoral artery. Below that level (From origin of superficial femoral artery) blood flow is grossly diminished with biphasic wave form in the popliteal, anterior & posterior tibial arteries. Distal flow is maintained with collaterals. Lumens of the arteries are filled with atherosclerotic plaques.

CT angiogram confirmed the occlusion. Subsequently, a PAG (Peripheral Angiogram) also confirmed complete occlusion of Superficial Femoral Artery (SFA) just distal to the profunda femoris artery up to above knee popliteal artery with good distal run off in popliteal, anterior and posterior tibial arteries from collaterals. Coronary angiogram revealed total occlusion of posterior descending artery. Left anterior descending artery and left circumflex artery had less than 30% occlussion. Laboratory tests showed normal blood counts, biochemical markers including liver function tests, amylase, urea and electrolytes and hemoglobin were within the normal range. His Low Density Lipoprotein (LDL) was raised. A chest radiograph and midstream specimen of urine revealed no abnormalities. ECG showed feature of old inferior MI. Echocardigram revealed inferior wall hypokinesia with Ejection Fraction (EF) 55%. The lesion was in femoropopliteal segment, in infrainguinal region, long segment & totally occluded so it was decided that the feasible treatment option would be above knee femoropopliteal bypass with autologous venous graft under epidural anesthesia. Vein mapping of both lower limbs revealed suitable superficial veins and no old or recent Deep Vein Thrombosis (DVT) present. However, Great Saphenous Veins (GSV) were found patent with suitable diameters as venous conduits.

Subsequently, the patient underwent a femoropopliteal bypass surgery in left lower limb with a longitudinal groin incision over the site of femoral pulse under epidural anesthesia at L4-5. Common femoral artery was exposed and proximal control was taken by femoral artery taping. Control of pofunda femoris artery also taken. Then above knee popliteal artery was exposed by a longotudinal incision in lower part of medial side in the left thigh.Control of popliteal artery also taken. Great saphenous vein was harvested from ipsilateral side with small intermittent incisions from knee to groin.

Great saphenous vein was in good caliber and prepared for grafting. Systemic heparinization was done. Distal end of vein was anastomosed with Common Femoral Artery (CFA) as end to side manner.

Testing of vein conduit for patent anastomosis done and passed through a tunnel to above knee popliteal artery. A good site of patent lumen in popliteal artery was identified. The other end of reversed saphenous vein was anastomosed end to side with healthy part of the above knee popliteal artery (Fig 2B).

This consisted of a proximal end-to-side sapheno femoral anastomosis and distal end-to-side saphenopopliteal artery anastomosis. After completion of distal anastomosis dorsalis pedis & posterior tibial pulses regained.

Postoperatively, the patient completed a 2 weeks course of broad-spectrum antibiotic, anticoagulants, and antiplatelate drugs made an uneventful recovery. Patient was advised to visit cardiac surgery OPD initially monthly interval for three months, then 6 months interval & to take care for the management of risk factors (Tobacco use, diabetes, LDL levels, and hypertension).

Fig 1A : CT angiogram of aorta and its terminal branches showing occlusion in Left SFA.

Fig 1B : Exposure of Femoral artery

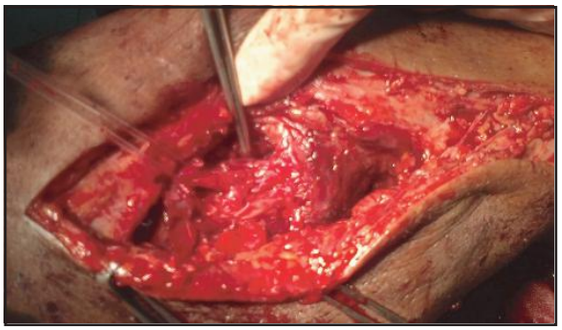

Fig 2 A : Exposure of Popliteal artery

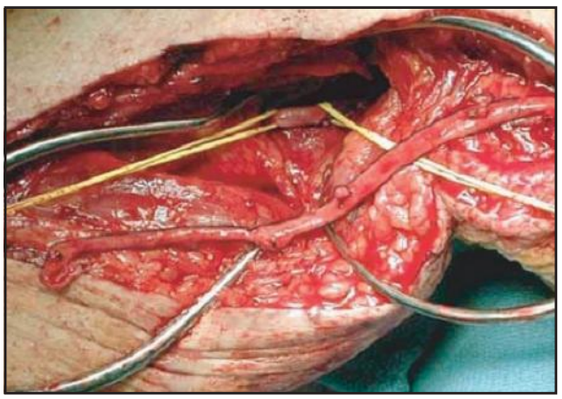

Fig 2 B : Popliteal artery and saphenous venous conduit

Fig 3 : Femoropopliteal bypass (7th POD)

Discussion

Treatment of peripheral arterial disease includes exercise, PTA and surgery [10-12]. Surgery is associated with a higher initial success rate than other treatments, and this benefit is maintained in follow-up [13].

Surgical treatment of intermittent claudication was compared with exercise therapy by Lundgren and coauthors in 1989 [14]. These authors randomly assigned 75 patients with intermittent claudication either surgery alone, surgery combined with exercise training or exercise training alone. After treatment, there were significant increases in Ankle Brachial Index (ABI) and toe blood pressure in the two groups that underwent surgery but not in the group that received exercise alone. All three groups showed significant improvement in calf muscle blood flow and in walking performanc. The magnitude of the improvement was significantly greater in the operation plus exercise group than in those who underwent surgery alone, and the group that under went surgery had greater improvement than the exercise alone group.

In recent years there has been a dramatic increase in the use of interventional radiological procedures for the trearment of acute and chronic lower extremity arterial disease.The advancements in vascular imaging, development of intravascular stents, and the more widespread use of intra arterial thrombolysis made the Percutaneous Transluminal Angioplasty (PTA) more feasible.

Currently, the primary indications for an interventional procedure in patients with lower extremity arterial disease include (i) Incapacitating claudication interfering with work or lifestyle (ii) Limb salvage in patients with limb-threatining ischemia as manifestaed by pain at rest, non healing ulcers and/or infection or gangrene and (iii) Vasculogenic impotence [13].

PTA is an appropriate choice only when two important criteria are met. These include arterial disease localized to a vessel segment <10 cm in length and the availability of a skilled vascular interventionist [15]. When considering PTA, the peripheral vascular tree can be conveniently divided into three regions: iliac, femoropopliteal and infrapopliteal. PTA of the iliac arteries is associated with better long-term success rates than more distal angioplasty [16]. Iliac PTA is useful not only for dilatation of primary lesion but also as an adjunct to definitive femoropopliteal surgery.

PTA in the femoroopliteal region is associated with a higher risk of failure than iliac PTA.Thus, in a case series of 217patients, PTA procedures for femoropopliteal disease, initial success was 90% and 5 year patency rates were 58% [17]. Factors that adversely affected long term patency included diabetes mellitus, diffuse atherosclerosis, limb threatening ischemia, long or eccentric lesions.

A recent analysis evaluating the cost-effectiveness of revascularization procedures for femoropopliteal disease suggests that PTA is the preferred initial treatment in patients with disabling claudication. In those with critical limb ischemia, PTA is better for the treatment of femoropopliteal stenosis, whereas femoropopliteal occlusion is best managed with bypass grafting [18].

A comparison of surgical reconstruction with PTA for treatment of lower extremity was the subject of Veterans Administration Cooperative Study No.199, the results of which were reported by Wilson and coauthors in 1989 [12]. In this study 263 male patients were randomly assigned to treatment by surgery or ballon angioplasty. The surgical group maintained slightly higher success rates in each category (p=.037) with the lower initial success rate of angioplasty.

Surgical treatment of lower limb ischemia has been defined in terms of severity of symptoms. There is general agreement that surgical treatment is indicated to relieve symptoms of limb-threating ischemia, including ischemic pain at rest, ischemic ulcers, and gangreene [19]. In contrast, intermittent claudication is considered only a relative indication for surgical treatment and then only after an adequate trial of nonsurgical therapy.

Both revascularization surgery and amputation are effective treatments for limb threatening ischemia. Revascularization has the obvious advantage of preserving the limb. Since there are no advantages to amputation with regard to operative risk or overall cost, revascularization may be the preferred alternative in nearly all patients, regardless of coexisting conditions. Primary amputation is preferred only in chronically institutionalized, neurologically impaired patients who are permanently nonambulatory [20-23].

It is generally accepted that autologous Saphenous Vein (SV) is the best conduit for infrainguinal revascularization, particularly when the vein is of normal size and free of sclerotic segments. However , many studies have reported acceptable

results with Poly Tetra Fluoro Ethylene (PTFE) grafts for femoropopliteal bypass grafting, particularly in claudicats and when the distal anastomosis is above the knee [6, 9].

The results of treatment of lower extremity ischemia are evaluated by multiple parameters but patency of grafted conduit is most critical factor for hemodynamically sustauned improvement in ABI [24].

Surgical treaqtment of intermittent claudication was compared with exercie therapy by Jonason and coauthors in 1979 [25]. These authors randomly assigned 75 patients with intermittent claudication to either surgery alone, surgery combined with exercise training or exercise training alone. After treatment, there were significant increases in ABI and toe blood preasure in the two groups that underwent surgery but not in the group that received exercise alone. All three groups showed significant improvement in calf muscles blood flow and in walking performance. The magnitude of the improvement was significantly greater in the operation plus exercise group than in those who underwent surgery alone, and the group that underwent surgery had greater than the exercise alone group.

Limb threatening ischemia occurs in elderly patients with multiple severe coexisting diseases. There is appropriate concern by many physicians ragarding the advisability of revascularization surgery, because patient undergoing these major procedures often require multiple transfusions, prolonged hospitalization, intensive care and subsequent procedures to achieve foot healing. Unfortunately, a decision not to perform revascularization of limb threatening ischemia makes amputation virtually inevitable. This is a problem because amputation is in itself a surgical procedure involving risks and length of hospitalization at least equivalent to those of revascularization and with a far less desirable outcome from the patient's point of view.

Several nonrandomized comparison studies have concluded that successful revascularization is consistently less expensive than amputation, with the difference being expalined largely by the increased need for long term care for amputees [20, 21]. Although failure of revascularization followed by amputation is obviously the most expensive sequence, this scenerio is of relatively minor importance since failure of revascularization is infrequent in most series [22, 23].

In addition to increase operative risk, some patients present for consideration of revascularization with far advanced ischemia, including extensive gangrenous lesions of the foot. In the past some surgeons have recommended primary amputation in these patients to avoid a situation in which a patent revascularization procedure fails to produce foot healing. However, More recent studies have demonstrated healing of even extensive ischemic foot lesions using a combination of revascularization, minor foot amputations and reconstructive surgical techniques [25, 26, 27].

Since Kunlin performed the first bypass with an autologous saphenous vein in 1949, bypass grafting has proved to be an effective form of trearment for peripheral arterial occlusive disease [8]. Many studies revealed that saphenous vein is considered to be the gold standard for the femoropopliteal bypasses with a distal anastomosis above or below the knee [9].

We have convincingly demonstrated that if the saphenous vein is available, a venous bypass should be chosen, even for patients with a short anticipated life expectancy (<2 years). When the saphenous vein is absent or not suitable for bypass grafting, PTFE is a good alternative for bypass material.

Conclusion

This is the case report that documents the first femoro-popliteal bypass surgery in CMCH where the procedure was not done before.We believe that the patient for bypass surgery had significantly more advanced disease. Peripheral arterial disease affects with loss of limb if untreated. This, emphasizes that one must consider the patient population undergoing amputation of lower limb without appropriate investigation (PAG) & diagnosis. We should consider all patients of ischemic limb for revascularization procedures. Arterial bypass is one of the effective methods of revascularization in chronic ischemic limbs. A prospective randomized trial is needed to determine the overall better treatment option.

Disclosure

All the authors declared no competing interest.

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