

Hybrid Technique in The Treatment of Critical Lower Limb Ischemia with Chronic Total Occlusive Arterial Disease in Nigeria- Case Report

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Abstract

Critical lower limb ischemia is a clinical condition that is life threatening with impending loss of limb viability, and must be treated urgently to avoid major amputation. Revascularization is the most effective treatment method and can be carried out by surgical or endovascular techniques. For patients with chronic total occlusion of the Superficial Femoral Artery (SFA), amputation could be limited to below the knee using revascularization and below knee amputation. Combining these two approaches into a "hybrid technique" makes it possible to treat patients who were initially billed for above knee amputation. We report on a case of lower limb critical ischemia with chronic total occlusion of the left SFA treated using a combination of endovascular techniques and below knee amputation, in an application of the hybrid technique.

Keywords: Arterial occlusive diseases; Angioplasty; Percutaneous transluminal angioplasty; Lower limb amputation

Introduction

The Inter-Society Consensus for the Management of Peripheral Arterial Disease (PAD) (TASC II), defined Critical Lower Limb Ischemia (CLLI) by the presence of chronic ischemic rest pain, ulceration or gangrene attributable to arterial occlusive disease [1]. Usually, the impairment of peripheral perfusion is a long chronic process that occurs within months or years in relation to age, predisposing factors and cardiovascular risk factors such as cigarette smoking, diabetes mellitus, hypertension, dyslipidemia, chronic kidney disease, hypercoagulable states and hyperhomocysteinemia [2].

This clinical condition is medical emergency and is linked with a high risk of loss of the affected limb [1]. In developed countries, incidence is estimated at 50 to 100 cases in 100 thousand inhabitants per year [3]. It is responsible for increasing morbidity and mortality and consumes considerable social and healthcare resources [3]. It is the number one cause of diabetic limb amputation in Nigeria. Criteria for diagnosis of CLLI are defined as rest pain or tissue loss (ulcers or gangrene) supported by ischemia defined by the hemodynamic criteria of low ankle or toe pressures, or low transcutaneous oxygen (TcO₂) values [4]. Ankle pressure criteria range from <40 to 70 mmHg, toe pressures <30 to 50 mmHg, TcO₂ <20 to 40 mmHg [4].

The best form of treatment for CLLI is revascularization. This could be by surgical bypass or peripheral angioplasty. The second option for critical limb ischemia is amputation when the capability of revascularization is not available. The amputation option is the main treatment option in Nigeria for long due to lack of trained personnel in revascularization and cost of procedure. A Below Knee Amputation (BKA) preserves the knee joint which apart from providing a more

true-to-nature knee joint, also makes the prosthetic limb cheaper. We report a case of hybrid technique of minimizing amputation in Nigeria.

Case Report

The patient was an 82-year-old female diabetic with hypertension and obesity. She had begun to suffer pain in the left foot at rest 40 days earlier. She claimed not to have suffered from claudication previously, but walking was restricted to her home and its immediate surroundings. Her pain improved when the leg was elevated. About 20 days before admission, she developed left foot ulcer that gradually increased in size, and gangrene which involved the entire five toes. Physical examination revealed a left foot cold to touch, cyanosed with transient blanching and no motor deficit but loss of sensation. The femoral pulse was present (+4/+4), but popliteal, posterior tibial and distal pulses were absent. Ankle Brachial Pressure Index (ABPM) was zero (Figure 1).

Doppler ultrasonography showed no Doppler interrogation of the SFA, popliteal and tibial vessels. The electrolytes, urea and creatinine were normal. The FBG was 6.7 mmol on subcut insulin at 12 IU three times daily. The FBC and differentials were normal with PCV of 36%. She had dyslipidemia with TC 250 mg/dL, TC 206 mg/dL, LDLc 160 mg/dL and HDLc 43 mg/dL. She was scheduled for revascularization or hybrid procedure after a review by the orthopaedic surgeon and interventional cardiologist. An informed consent was taken for the procedure.

Procedure

Access was through the left femoral artery ipsilateral regrotade puncture. An 8F sheath was inserted into the left common femoral artery. Procedure contrast was Omnipaque. Arteriography showed evidence of chronic total femoro-popliteal occlusion and absent of

visible flow through the SFA, popliteal and tibial vessels with severe calcifications along the causes of occluded vessels (Figures 2-4).



Figure 1: Gangrene and leg edema before the angiography.



Figure 2: During revascularization of the left superficial femoral artery.

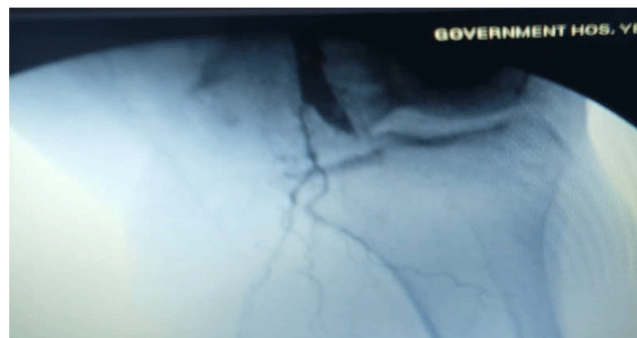


Figure 3: Angiogram showed revascularization to the left popliteal artery.

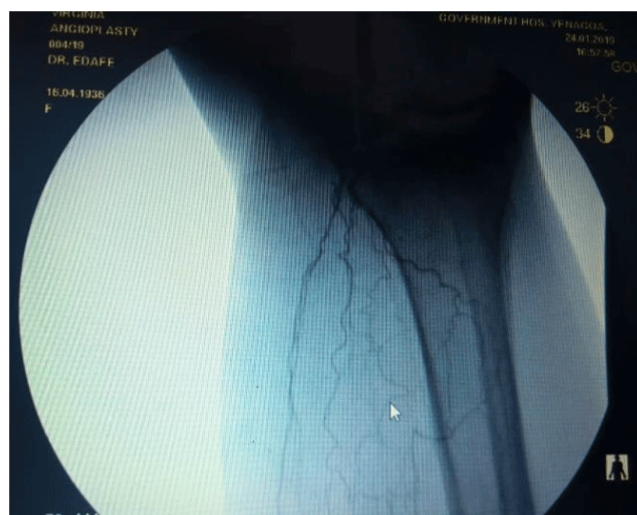


Figure 4: Angiogram showed revascularization to below the left knee.



Figure 5: After below knee amputation.



Figure 6: During stitch removal before discharge.

A JR catheter (4F) was guided with SVC wire (0.018) through the SFA CTO to the popliteal artery lesions. The Cordis EMPIRA NC (13 mm x 9 mm x 139 cm) was passed to give series of dilatations. The cutting balloon (9 mm x 120 mm) was passed for serial dilatation. It was followed with LUTONIX 035 drug eluting balloon (9 mm x 120 mm). This gave a good result with flow from the femoral to the popliteal artery (Figure 2). Below the popliteal could not be accessed with the available wires. The patient was then booked for BKA under spinal anaesthesia the following day using a longer posterior fish-mouth incision and the wound was closed in layers. Post-operatively, patient was stable and stitches were removed on the 14th day (Figures 5 and 6). She was discharged home subsequently.

Discussion

Revascularization of critical limb ischemia by endovascular or surgical by-pass is the ideal treatment of critical limb ischemia [5-8], however clinical practice in Nigeria has been dominated by amputation either as above or below knee for diabetic critical limb ischemia. The reasons could be for lack of man-power and infrastructure. There are few interventional cardiologists or radiologist trained in the vascular techniques for revascularization, and the number of catheterization laboratories in the country is very few. In the south-south Nigeria, there is only one functioning cath-lab serving the states of Bayelsa, Rivers, Akwa-Ibom, Cross Rivers, Delta and Edo states. These states have an estimated population of more than 20,000,000 people by 2012 according to Nigeria government bureau of statistics. The aims of CLI treatment are pain relief, ulcer healing, infection treatment and, obviously, limb salvage. Amputation could offer these to the patients.

Incidence of critical limb ischemia in Nigeria

In Nigeria, most studies on prevalence of PAD were hospital-based. There was varying prevalence from one study to another. The reason in part depended on sample size and stage of disease. A hospital-based study in the southwest Nigeria involved 219 diabetic subjects and of aged 50 - 89 year [9,10]. They reported prevalence of 52.5% among

diabetic subjects. Among those with PAD, 28.7% of were symptomatic while asymptomatic were 71.3% [9,10]. Patients with amputation and diabetic foot disease were included. In another study from Obafemi Awolowo University, Ife, Nigeria enrolled 74 diabetic patients and of age ≥ 52 years. The study demonstrated a prevalence of PAD was 25.7% (using clinical palpation method) and 55.4% using ABPI <0.9 [11]. These patients were with T2DM, with 62.2% having diabetic foot disease. Umuerrri and Obasohan [12], at the University of Benin Teaching Hospital evaluated 388 diabetic patients of aged ≥ 35 years. The study showed the PAD prevalence of 35.5% using ABPI <0.9 [12]. In this study, the ratio of symptomatic to asymptomatic using the Edinburgh questionnaire was 1:7.6 [10]. The incidence of critical limb ischemia in Nigeria is lacking. Most PAD studies from Nigeria looked at the spectrum of the disease from symptomatic to asymptomatic [9-12].

Patients characteristic and anatomical lesions

The management of patients with CLI has continued to be a challenge to physicians dealing with complex vascular disease in Nigeria. Patients with CLI could have extensive arterial occlusive disease and are at higher surgical risk due to their associated severe comorbid conditions. Our patient was diabetic, hypertensive and living with dyslipidemia. This made her to be on optimal medical therapy for the co-morbidities. These co-morbidities seen in Nigerian patients are among the common causes of the critical limb ischemia in the world.

Patients with lower extremity PAD have a significant variability in clinical presentation and in the localization of the disease. The pattern of localization of vascular disease that results in clinically significant sequel ranges from a lesion that is isolated to a single level in the lower extremity arteries to lesions that present themselves simultaneously at multiple levels. Rubertis et al. [13], reported their experience in the infra-inguinal in their patients. Our patient had chronic total occlusion of the SFA, popliteal and tibial arteries.

Surprisingly Sadek et al. [14], found that patients affected by multilevel disease that involved tibial vessels exhibit improved secondary patency compared with those who underwent intervention for lesions isolated to the tibial vessels. In our patient, the tibial vessels were totally calcified and unable to re-vascularize hence the below knee amputation.

In addition, patients with multilevel disease are frequently older, have more comorbidities, and have lower baseline ankle-brachial indices than patients with single-level disease [15]. Our patient was 82 year with multiple co-morbidities.

Need for hybrid approach

The gold standard for the treatment of critical lower limb ischemia is revascularization. This could be achieved with endovascular or surgical by-pass. Patients that are not candidate for total revascularization in critical limb ischemia could benefit from revascularization and amputation. This will minimize the level of amputation as seen in this patient. Our patient was initially advised to have above knee amputation in another hospital, however following discussions between the orthopedic surgeon, interventional cardiology team and the patient, the agreement was to vascularize the limb to minimize the level of amputation, therefore the patient had a BKA. These procedures are well established outside Nigeria. Today, revascularization of critical limb is now done in our center in South-south, Nigeria. Over many decades in Nigeria, amputation played the

leading role for salvaging what is left of a critically ischemic limb. With the availability of interventional cardiologist, cath-lab, stents, endovascular and drug eluting balloons and in our center, there is an emerging paradigm shift from amputation to revascularization and hybrid modalities in our center in Nigeria. Amputation is offered when ischaemic rest pain and/or tissue loss (ulceration, gangrene), and any associated infection cannot be controlled by medical therapy, and when a Multidisciplinary Team (MDT) of vascular specialists has deemed that the blood supply to the leg cannot be restored by means of angioplasty or bypass surgery. Amputations for PAD are commonly undertaken at the following levels: toe, transmetatarsal, trans-tibial (below knee amputation), trans-femoral (known as Above Knee Amputation, (AKA).

Conclusion

Patients who present with critical lower limb ischemia with chronic total occlusive disease in Nigeria and physiologic impairments that preclude total revascularization could receive hybrid therapies of revascularization and amputation for limb salvage in Nigeria. This could minimized the limb loss and level of amputation, preserves the knee joint which apart from providing a more true-to-nature knee joint, also makes the prosthetic limb cheaper.

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