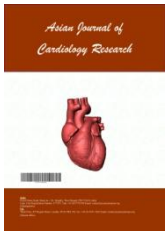

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Rare Case of Complex Bifurcation Stenting in a Patient of below Knee Acute Limb Ischemia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Background: Peripheral arterial disease (PAD) is one of the well-recognized chronic vascular conditions characterized by the compromised blood circulation to the extremities. PAD is due to deposition of cholesterol, calcium associated with endothelial dysfunction. PAD is common in patients suffering from type 2 Diabetes Mellitus and chronic kidney disease. It's very severe stage, coined as acute limb ischemia (ALI) which is described as the acute ischemic rest pain in the lower extremity, ulceration or gangrene and finally leading to the risk of losing limb and sometimes mortality. The various revascularization approaches are used for the treatment of ALI out of which complex bifurcation stenting is a rarely used method. This is the first report on the utilization of a particular method against below knee limb ischemia.

Method: A 50-year-old male presented with severe right side leg pain one day with bluish discoloration in the right foot. The history of the patient was very limited due to severe discomfort during admission, he specified that his right leg felt as it was ''on ice' 'Patient was quickly diagnosed to have acute limb ischemia. Initial Doppler examination of the right lower limb showed an occluded lower part of the popliteal artery and tibio-peroneal trunk. Patient was quickly taken for peripheral angiogram followed by a unique complex first time described bifurcation Culottes stenting for peripheral vascular disease. Post patient improved immediately. Both limbs and life were saved.

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Discussion: ALI (Acute limb ischemia) is a life-threatening situation. Occluded vessels if not treated on time can lead to gangrene and sometimes mortality. Previously, the use of coronary stents for angioplasty has been rarely described. The present study on the use of bifurcation stenting techniques showed a positive impact on the anatomy as well as physiology of the coronary arteries. Moreover, this case study also exhibited that the culottes bifurcation technique is the best way for the management of below knee acute limb ischemia.

Keywords: Peripheral arterial disease; blood circulation; type 2 DM; bifurcation; limb ischemia.

1. INTRODUCTION

Peripheral arterial disease (PAD) is termed as one of the chronic vascular diseases, which is characterized by the compromised blood circulation to the extremities. Its very severe acute stage is coined as acute limb ischemia (ALI), which is described by the presence of ischemic rest pain in the lower extremity, ulceration or gangrene and is attributed to the risk of cardiovascular episodes and death [1]. ALI, acute limb ischemia (a sudden loss of limb perfusion) typically occurs due to the embolus or in situ thrombus. Age, diabetes, family history of cardiovascular disorders, hypertension, high cholesterol, obesity, sedentary lifestyle and smoking, hyper coagulated states, valvular heart disease or atrial fibrillation etc are the major risk factors for ALI [2]. ALI is highly associated with morbidity and mortality [3]. In India, 380 people per 100,000 were reported to have ALI, which might be due to the continuous increment in diabetes cases [2]. However, various approaches such as exercise, pain and ulcer management, revascularization interventions and risk modification techniques are currently used for the better management of ALI [4]. Further, approximately 50-90% of ALI patients will undergo revascularization procedures [5]. Approximately 2–3% of ALI cases are treated by using endovascular revascularization techniques such as angioplasty [6]. However, this technique typically fails to restore blood flow, which might be due to the size of emboli being too small and cannot be accessed by catheter in vessels or due to the thrombus remains attached with vessel wall [7]. Moreover, the below knee angiosome-directed angioplasty showed higher wound healing ability but fails when any straight line flows into the foot. Hence, the hybrid surgical approaches such as iliac stenting and femoral endarterectomy are commonly used to minimize the operative risk [8]. In continuation with these hybrid techniques, bifurcation stenting is typically used against the treatment of ALI while bifurcation stent angioplasty technique is very well described for coronary arteries. Future, this approach is never being carried out in below knee ALI. In the present case study, a complex bifurcation stenting approach is used in a 50-year-old patient with ALI, which involves multiple vessels at below knee level.

2. CASE PRESENTATION

2.1 Patient History

A 50-year-old male patient was diagnosed with severe right side leg pain since one day with bluish discoloration in the right foot. The history of the patient was very limited due to severe discomfort during admission, he specified that his right leg felt as if it was ‘‘on ice’’ with no trauma, fever, or recent illness. The patient's history explained that he was suffering from the known case of type II Diabetes Mellitus (DM) for the last 2 years and the early examination showed afebrile temperature, 110 beats/min pulse rate, 110/70 mm Hg blood pressure, respiratory rate with 20 breaths/min and oxygen saturation (SPO_2) of 98% on room air. Furthermore, systemic examination revealed a cold right lower limb below the knee. Popliteal, dorsalis pedis and posterior tibial arteries were absent on palpation while Doppler test showed abrupt cutoff in distal popliteal arteries just before the trifurcation with non-opacification. The anterior tibial artery, proximal posterior tibial artery and peroneal arteries found with acute thrombosis while the plantar arch was poorly opacified and dorsalis pedis artery was not found opacified.

2.2 Procedure Details

The below-the knee bifurcation stenting was done from right groin with antegrade puncture of superficial femoral artery. The peripheral angiogram showed normal superficial femoral artery, profunda femoris artery, and upper part of popliteal artery while an abrupt cut off of flow in distal popliteal artery & tibio-peroneal trunk was recorded. In the anterior tibial artery proximal 70% stenosis (Fig. 1). In stenting, the occluded tibio-peroneal trunk was crossed with GAIA 3

O14 wire while runs of thrombosuction was done with 7F Thromboster. The post thrombosuction of the percutaneous transluminal angioplasty (PTA) was opened and showed 80% distal lesion, which was stented with a 3.5x23 mm drug eluting stent. The Proximal occluded portion was balloon dilated with 4x15 non-compliant balloon at 10 atmospheres. This procedure was followed by stenting from the tibioperoneal trunk into posterior tibial artery using 4 x 48 mm stent. The shots of angiogram showed retrogradely filling peroneal arteries till the ostium and the peroneal artery was wired through the struts of posterior tibial artery and balloon was dilated with a 2.5x 15 mm balloon. Finally, a 4x32mm stent was deployed through the struts of the previous stent from tibio-peroneal trunk to peroneal artery (Fi.g 2). Further, the alternate balloon dilatation was carried out with wires in posterior tibial and peroneal arteries (Fig. 3) using two 4x12mm compliant balloons (Figs. 4, 5). Proximal optimization technique (POT) of overlapped stents in the tibioperoneal trunk was done using a 4.5x12 mm semi- compliant balloon.

In this peripheral complex bifurcation angioplasty, a modified version of Culotte approach in below knee position was used to cope with the ALI. The sizes of below knee arteries were almost the same as coronary arteries; hence the same coronary drug eluting stents were used. Patients also found that diabetic the drug-eluting stents offer long term freedom from in-Stent restenosis (ISR). Perhaps, Attempt was made to establish a good flow by balloon dilatation of peroneal artery ostium through the struts of posterior tibial artery stent, however it was failed due to tight lesion at the ostium and pinching by the stent struts. Final angiogram shoots showed well flowing Anterior tibial, posterior tibial and peroneal artery with mild thrombus (Fig. 6) but well expanded stents (Fig. 7). Procedure went well with immediate relief of symptoms. Both posterior tibial and peroneal arteries were found with good size and the angle between them was found acute. Finally, the modified Culotte was found to be a good bifurcation technique even in below knee angioplasty.

2.3 Hospital Course

After complex bifurcation stenting, the patient was shifted into the intensive care unit (ICU) where he showed significant improvement in symptoms including total relief of pain and normalization of bluish discolouration of foot. The right leg was warm and bedside doppler showed good flow in dorsalis pedis and posterior tibial arteries. Then next day the patient was shifted in ward and after recovery and was discharged on blood thinners and supportive medications. After the 1 year follow up, the patient was doing well with nicely palpable dorsalis pedis, posterior tibial and he remained hemodynamically stable.

Fig. 1. Anterograde peripheral angiogram showing occluded tibio-peroneal trunk

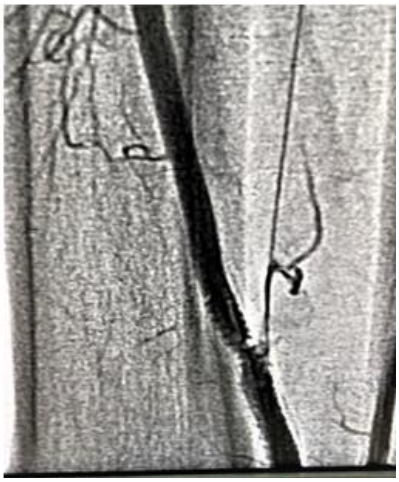

Fig. 2. Wiring of peroneal artery through the struts of posterior tibial artery stent

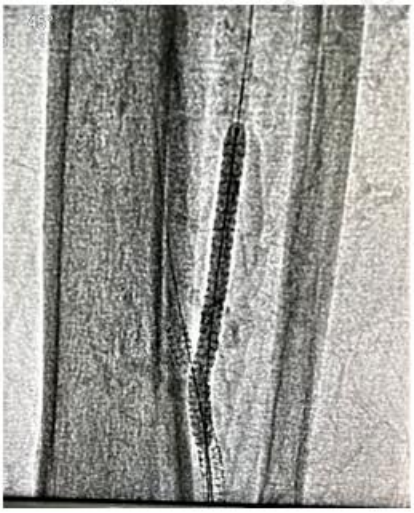

Fig. 3. Stenting of common peroneal artery through the struts of posterior tibial aretery stent

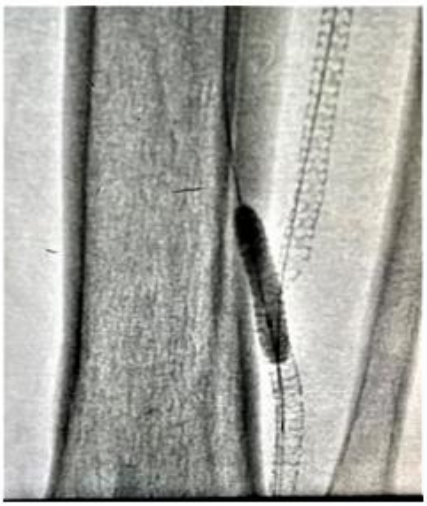

Fig. 4. Post dilatation of posterior tibial artery stent

Fig. 5. Post dilatation of common peroneal artery stent

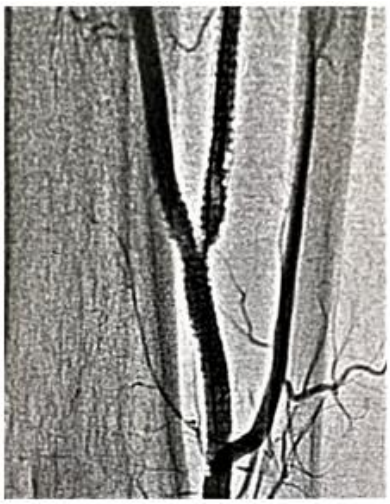

Fig. 6. Check shoot showing well flowing ATA, PTA and peroneal artery
ATA: Anterior Tibial Artery, PTA: Posterior Tibial Artery

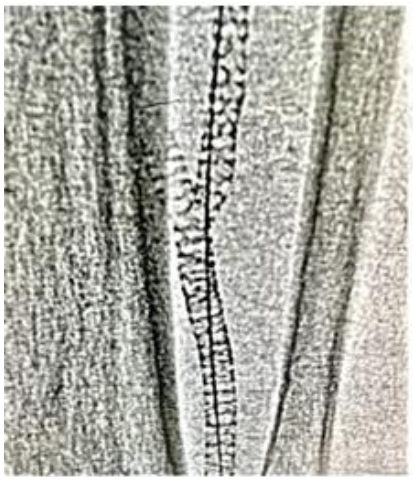

Fig. 7. Well-expanded stents with good bifurcation result following POT.
POT: Proximal Optimization Technique

3. DISCUSSION

Acute limb ischemia is defined as a quickly developing or sudden decrease in limb perfusion, usually producing new or worsening symptoms or signs, and often threatening limb viability.

Acute limb ischemia (ALI) of extremity is mostly related to arterial occlusion, although extensive venous occlusion can lead to extremity ischemia as well (i.e., phlegmasia), but this is very rare. The incidence of acute peripheral arterial occlusion causing acute lower extremity ischemia is approximately 1.5 cases per 10,000 persons per year [9]. The clinical presentation varies from extent of blockage, time since the onset or territory involved. Patients who present later than two weeks after the onset of the acute event are considered to have chronic lower extremity ischemia [2-4].

The management of acute lower ischemia ALI remains challenging for interventionists. Surgical or catheter-based thromboembolectomy and bypass grafting have been the mainstays of therapy for many years [5]. Subsequently, thrombolytic therapy and percutaneous transluminal angioplasty (PTA) have become treatment options for selected patients [10-13]. Below knee angioplasty with coronary drug eluting stents gives good short- and medium-term results while it is rarely used till date. In this case study, the patient after 1 year follow up was found with no symptoms and Doppler suggesting flowing posterior tibial, peroneal and anterior tibial arteries. Timely peripheral interventions can save limbs in acute Limb ischemia.

4. CONCLUSION

This case study finally concluded that the result of complex bifurcation Culottes Stenting with coronary drug eluting stents showed good blood flow in all vessels below the knee even in acute setting.

CONSENT

Written informed consent was acquired from the patient.

ETHICAL APPROVAL

As per International or Institutional standards, written ethical approval has been collected and preserved by the author (s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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