

Chronic limb-threatening ischemia, successful infra popliteal endovascular revascularization: a case report



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ABSTRACT

Introduction: Chronic limb-threatening ischemia (CLTI), a manifestation of peripheral arterial disease (PAD) that is characterized by chronic ischemic pain in the foot, inadequate tissue perfusion at rest more than 2 weeks, non-healing wounds, or gangrene that is attributable to objectively proven arterial occlusive disease. Endovascular surgery has played an important role for revascularization in limb saving.

Case description: 57-years-old man came to the Zainoel Abidin General Hospital emergency room, with a chief complaint of ischemic pain at the right foot since 3 months ago, and being extremely progressive for 10 days. He has no history of smoking and 10-year history of controlled type 2 diabetes mellitus. On the physical examination revealed a stable hemodynamic, an unhealed wound in the right lower limb as well as an open wound size 10cm x 6cm x 4cm. He has palpable femoral pulses but not distal pulses. Peripheral CT angiography obtained a total occlusion at the right anterior tibialis artery (ATA), and no flows at the right dorsalis pedis artery (DPA). Performed a revascularization procedure with endovascular therapy using 3 mm balloon angioplasty with good results along the ATA and DPA. The patient was discharged on the 4th day after surgery. Clinical Evaluation after 2 months showed improvement on pain, good ulcer healing and ready for skin grafting.

Conclusion: The goal of treatment for CLTI is to relieve pain, heal wounds, and preserve a functional limb, with a cornerstone of treatment is timely arterial revascularization. Endovascular surgery in one of the best revascularization techniques for CLTI.

Keywords: Chronic limb-threatening ischemia, endovascular surgery, limb saving, revascularization.

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INTRODUCTION

Chronic critical limb ischemia (CLTI) occurs as a result of reduced arterial blood flow resulting in: (1) ischemic limb pain at rest, (2) non-healing ischemic ulceration, or (3) gangrene. The pathophysiology of CLTI is related to inadequate arterial limb perfusion that is below the threshold needed to meet the metabolic demands of the limb, resulting in resting ischemia with skin breakdown and eventual tissue necrosis.^{1,2} If untreated, gangrene ensues with the eventual loss of the limb (from amputation or mummification) and perhaps life (from sepsis). The optimal treatment for CLTI is prompt revascularization. In selected patients, percutaneous transluminal angioplasty (PTA) is the initial therapy of choice to avoid the morbidity associated with vascular surgery.^{1,3} CLTI is defined as ischemic pain in the foot, non-healing

wounds, or gangrene that is attributable to objectively proven arterial occlusive disease.³

CLTI a manifestation of peripheral arterial disease (PAD) as well as characterized by chronic, inadequate tissue perfusion at rest, is associated with decreased quality of life and substantial morbidity and mortality.^{2,3} Patients with PAD may present with CLTI; however, with increasing life expectancy and the prevalence of diabetes type 2, obesity, and sedentary lifestyles, these estimates are likely to increase.³⁻⁵

However, CLTI occurs from several weeks up to months, but is at the extremely end the spectrum of PAD (Rutherford classification 4-6, Fontaine class III/IV). Yet, importance is because of the much higher risks of limb loss and cardiovascular events than asymptomatic PAD and intermittent claudication. The

worse prognosis demanding more rapid and early decision, a more significant role for wound care, and the immediate use of surgical or endovascular revascularization is mandatory.^{6,7}

The ultimate goal of CLTI treatment is to reduce pain, allow wound healing, improve patient's limb function, prevent limb amputation and reduce mortality. Lower limb revascularization is the first-line treatment in CLTI patients that can tolerate this procedure.^{5,8} Early revascularization is the cornerstone of therapy for CLTI and has a class I recommendation by all professional guidelines, can reduce the rate of amputation.^{8,9} Without revascularization, up to 40% of patients with CLTI will require lower limb amputation by 1 year.¹⁰ The effectiveness of open peripheral bypass grafts and PTA is recognized both in saving the extremities.^{1,5,11}

CASE REPORT

A 57-year-old man presents to the Zainoel Abidin General Hospital emergency room, with a chief complaint of pain at the right foot that was felt since 3 months. The pain is worse with elevation and lessens with dependency. The complaint of pain being extremely progressive for 10 days before came to the hospital. The patient also complains for the wound in the right and the cold on that toes (Figure 1). The patient has no history of smoking and 10-year history of controlled type 2 diabetes



Figure 1. Ischemic Foot on CLTI patients open wound size 10cm x 6cm x 4cm, deeper ulcer with exposed tendon

mellitus. He also has no history of vascular disease and has no family history for the same complaint.

On the physical examination revealed a stable hemodynamic, an unhealed wound in the right lower limb as well as an open wound size 10cm x 6cm x 4cm, deeper ulcer with exposed tendon. He has palpable femoral pulses but not distal pulses. The range of motion of the lower limb was limited. Ankle Brachial Index (ABI) result on the right ankle was 0.7. On this patient revealed for Wound, Ischemia, and Foot Infection (WIFI) classification was $W_2I_1Fi_2$ (212) stage 4. Diagnosed as CLTI on the right foot, the patient underwent debridement surgery first for adequate infection control (Figure 2). Afterward a peripheral CT angiography of lower limb (Figure 3) showed a total occlusion at the right anterior tibialis artery (ATA), and no flows at the right dorsalis pedis artery (DPA).

The patient then planned for a revascularization procedure with endovascular therapy using the balloon angioplasty. With local anesthesia, a puncture of the right femoral artery is performed, carried out Digital Subtraction Angiography (DSA) that showed total occlusion in the right ATA and there was no visualization of the pedis circulatory system on the right foot. Hi torque command wire 0.014" was inserted and

then subintimal cannulated in the right ATA to the pedic circulation. Angioplasty was performed with using of ARMADA 14 balloon with size 2.5 x 200 x 150 along the right ATA lesion until the pedic circulation



Figure 3. Peripheral CT angiography of lower limb, showed (yellow arrow) a total occlusion at the right anterior tibialis artery (ATA), and no flows at the right dorsalis pedis artery (DPA)



Figure 2. Ischemic Foot on CLTI patients after first debridement for infection control. Showed exposed tendon (yellow arrow), deeper ulcer and exposed superficial fascia on tibial bone (white arrow).

was consecutively done with 12 atm balloon inflation pressure for 3 minutes.

Evaluation results using DSA after angioplasty showed right ATA patency to the pedic circulation on the right foot was seen well visualized with TIMI flow 3 (Figure 4). The patient was discharged from the hospital 4 days after the procedure. Followed up after 3 months, he did not complain any ischemic pain at the right foot, as well as the wound showed good results with healed ulcer. It appears on the damage on the leg growing red granulation tissue which indicates that his revascularization was clinically successful (Figure 5).

DISCUSSION

Chronic limb-threatening ischemia (CLTI) is a clinical syndrome defined by the presence artery disease (PAD) in combination with rest pain, gangrene, or a lower limb ulceration >2 weeks duration.¹² Ischemic rest pain is typically described as affecting the forefoot and is often made worse with recumbency while being relieved by dependency. Ischemic rest pain is frequently worse at night and often requires opiate analgesia for management.

It should be present for >2 weeks and be associated with one or more abnormal hemodynamic parameters, combined with hemodynamic evidence of severely impaired perfusion (eg. Absolute AP <50 mm Hg, absolute TP <30 mmHg), it is diagnostic of CLTI.^{12,13}

All patients with rest pain, non-healing foot ulcers/wounds, or gangrene should have vascular testing to assess blood supply and healing potential.¹² Patients with suspected CLTI should be referred urgently to a thoracic cardiac and vascular surgeon specialist. Accurately staging the severity of limb threat is fundamental, and the Society for Vascular Surgery Threatened Limb Classification system, based on grading of Wounds, Ischemia, and foot Infection (WIFI), is endorsed. Objective hemodynamic testing, including toe pressures as the preferred measure, is required to assess CLTI. WIFI provides a comprehensive clinical-grade based on wounds, ischemia, and infection but does not take into account anatomic disease.^{4,12,13}

All patients should be evaluated by a multidisciplinary team dedicated to the treatment of CLTI and with expertise in

both advanced endovascular and open surgical bypass. Vascular technologists are an integral part of the multidisciplinary team in managing complex diabetic patients with CLTI.^{4,13,14} CLTI is usually accompanied by atherosclerotic stenoses or occlusions in multiple segments of arteries



Figure 5. (A) evaluation after 1 months followed up and (B) after 3 months followed up. Showed good results with a healed ulcer. It appears on the wound on the leg growing red granulation tissue which indicates that the revascularization was clinically successful

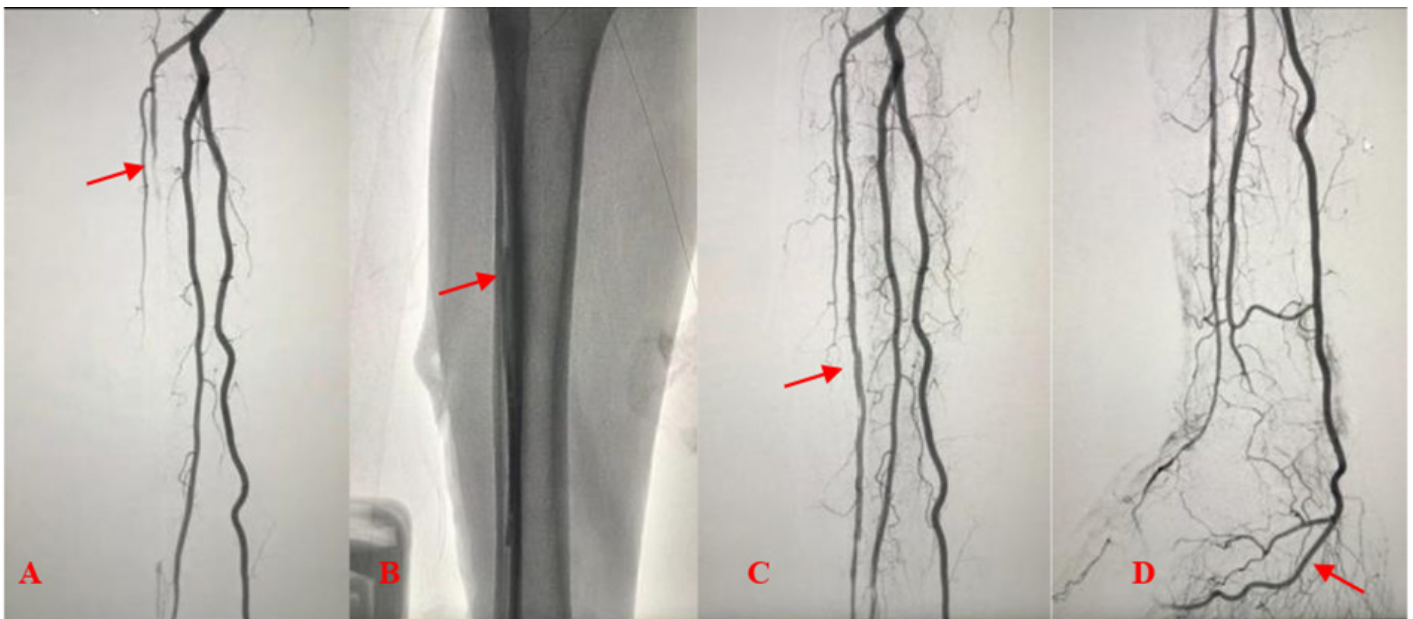


Figure 4. (A) Digital Subtraction Angiography (DSA) that showed total occlusion in the right ATA (red arrow) and there was no visualization of the pedic circulatory system on the right foot. (B) Hi tourque command wire 0.014” was inserted, and then sub intinally cannulated in the right ATA to the pedic circulation. (red arrow) Angioplasty was performed with using of ARMADA 14 balloon with size 2.5 x 200 x 150 along the right ATA lesion until the pedic circulation. (C & D) Evaluation results using DSA after angioplasty (red arrow) showed right ATA patency to the pedic circulation on the right foot was seen well visualized with TIMI flow 3. Perfusion to the right foot was achieved without significant occlusion.

in the lower extremities and represents the end stage of PAD.¹⁵

Surgical and endovascular revascularization is currently used to treat chronic limb-threatening ischemia. The goal of revascularization, whether open or endovascular, is to establish inline perfusion to the ischemic wound area.^{4,13}

The patient with CLTI is a candidate for revascularization, an angiogram continues to be the gold standard imaging technique for surgical intervention.⁷ CLTI is associated with amputation, increased mortality and impaired quality of life. Primary amputation is used to treat chronic limb-threatening ischemia in patients for whom revascularization is not possible, contraindicated, or futile.^{1,5,13,14}

It must be emphasized that the contemporary management of CLTI should include a combination of endovascular (or surgical) revascularization as the mainstay of therapy, complemented by a host of non-interventional therapies. This multidisciplinary approach should be delivered by a CLTI-team, as a continuum of care. The “Achilles heel” of the current approach to CLTI, is the reigning “disjointed” of the pieces that should conform the CLTI team. Multiple reasons are underlying this inefficient process, which vary geographically (albeit sharing some features among regions, including prevalent conflicts of interest among specialists, secondary to archaic payment models).^{6,13,16}

Reconstructing direct blood flow by angioplasty based on the angiosome concept in CLTI patients with isolated infrapopliteal lesions is clinically important for limb salvage. However, vascular reconstruction of a specific source artery for ischemic wounds is not always easy to perform due to technical obstacles and lesion severity.¹⁷

The evolution of endovascular therapy has not only affected the treatment paradigms of CLTI; the non-selective approach has also raised questions about the use of resources and the appropriateness of the intervention. Certainly, endovascular therapy may be an effective and more appropriate treatment in patients aged ≥ 75 years, who are poor candidates for open surgery. Questions over durability, the compromise of outflow arterial

vessels associated with periprocedural embolization, and the potential compromise of subsequent surgical revascularization following endovascular failure remain unanswered. In the current era of precision medicine and patient-specific treatment options, there remains a paucity of unbiased information guiding the treatment of CLTI in patients who qualify for both open and endovascular treatment.^{14,18} We performed endovascular revascularization for him because the patient is over 50 years of age, has a high comorbid form of DM and does not have a good native vessel for graft bypass.

CONCLUSION

Chronic limb-threatening ischemia typically manifests as ischemic pain in the distal leg or foot while the patient is at rest, as tissue loss, or as both. Chronic limb-threatening ischemia represents the end stage of PAD. Patients with chronic limb-threatening ischemia are at a high risk for leg amputation, cardiovascular complications, and death. Endovascular therapy is one of the best options for patients who are not suitable for open surgery. The goal of treatment is relieve pain, heal wounds, and preserve a functional limb. A cornerstone of treatment is timely arterial revascularization. Timely revascularization substantially improves rates of limb salvage.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the manuscript.

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AUTHOR CONTRIBUTION

All authors are contributed equally to the content of the study.

ETHICAL STATEMENT

The informed consent was declared from patient's regarding the publication in this journal.

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