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Early Results of Single Infragenicular Tibial Angioplasty In Critical Lower Limb Ischemia

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Abstract

Background: The most severe form of peripheral artery occlusive disease is critical limb ischemia. The diagnosis is poor, with death after one year reaching 25% and amputation rates reaching 30%.

Objective: To investigate the early results of single infragenicular tibial angioplasty in patients with critical limb ischemia (CLI).

Patients and methods: A prospective randomized clinical trial was performed in the Vascular Surgery Department of the Mostafa Kamel Military Hospital and the Al-Azhar University Hospitals. The study is conducted on 30 patients complaining of critical lower limb ischemia.

Results: Thirty patients with critical limb ischemia due to tibial disease were included. The patients' average length of stay in the hospital was 3 ± 1 day. In 4 cases (13%), there were no complications during the follow-up period. Restenosis was discovered in 3 individuals (10%), whereas thrombosis was found in 1 (3%). Follow-up revealed that 18 cases (60%) had fully healed their wounds, while 6 (20%) had incomplete healing.

Conclusion: One accepted endpoint of infrapopliteal PVI for patients with CLI was the achievement of the inflow of a single vessel into the wound.

Keywords: Angioplasty; Single tibial artery; Critical limb ischemia

1. Introduction

The most progressive stage of peripheral artery disease, critical limb ischemia (CLI), is marked by ischemic rest pain and loss of tissues and is associated with high mortality and morbidity. People with diabetes with severe below-the-knee (BTK) vascular atherosclerotic disease are more likely to experience CLI.¹

For those suffering from infra inguinal arterial occlusive disease, percutaneous transluminal angioplasty (PTA) is now regarded as an acceptable approach to therapy. When PTA and surgical bypass were compared, the results were broadly equal, even in the case of CLI. PTA allows for local anesthetics, reduces hospital stays, and may lower morbidity and death rates.²

Despite a patent bypass graft or an effective angioplasty, some patients suffering from

infected wounds or foot gangrene still need extensive amputations. These failures to salvage limbs are frequently brought on by severe gangrene or aggressive infection of the ischemic foot. Recent research, however, suggests that a successful clinical outcome of surgical bypass or angioplasty can depend on revascularization's aim.³

Vascular surgeons face challenges when treating patients with CLI with occluded tibial vessels. The gold standard for surgery still involves a great saphenous vein, which produces good outcomes concerning patency and limb salvage rates. However, CLI frequently impacts older patients, who are not good candidates for this type of surgery due to their severe comorbidities. A. Bolia described subintimal angioplasty in 1987, which depends on creating an arterial wall dissection using a hydrophilic wire to produce a "disease-free channel" to the distal patent artery.⁴

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The tibial occlusive disease requires special attention in CLI since it is well-known that sufficient revascularization for healing significant tissue loss in the foot necessitates the recanalization of at least one tibial artery reaching the ankle. If the occlusion involves the tibia's origin, recanalization could compromise the points of the branch. But without kissing balloons, repeated alternate angioplasty of the branch origins frequently yields good outcomes. Therapy of the branch origins with a cutting or scoring balloon may be beneficial. For individuals suffering from short-segment occlusions or diffuse focal stenosis, an endovascular approach to the tibial vessels is the best option. Multifocal high-grade tibial stenoses can occasionally look at angiography as a total blockage. However, this still makes angioplasty the best treatment option because it permits a wire to pass through easily. Endovascular recanalization of tibial occlusion results in low long-term patency but good limb salvage. Before considering amputation, tibial angioplasty is helpful for patients with high risks who are otherwise not candidates for bypass treatments. Treatment for ischemia ought to aim to restore the maximal flow of blood to the foot and palpable foot pulses. This pulsatile flow lessens future skin deterioration and ulcer formation while increasing the wound's chance of healing. It is crucial to get optimal blood flow in the tissue breakdown area when planning foot surgery or starting a wound care therapy course. Predicting the healing of wounds and foot salvage will be simpler if you are familiar with the autosomes principle and the foot's vascular anatomy.⁵

This study aims to investigate the early results of single infragenicular tibial angioplasty in patients with critical lower limb ischemia.

2. Patients and methods

Study design: This is a prospective randomized clinical trial that was conducted on 20 patients complaining of CLI and will be conducted at Al-Azhar University Hospitals and Mostafa Kamel Military Hospital.

Inclusion criteria: Patients with critical limb ischemia had limited gangrene in the lower extremities; only patients ≥ 45 years old had CLI owing to infrapopliteal arterial disease, and there was no significant stenosis in SFA or POP arteries. Only one run-off patent tibial vessel is distally post-angioplasty.

Exclusion criteria: In the presence of extensive gangrene in the lower extremities, uncontrollable risk factors, renal insufficiency. More than one run-off patent tibial vessel distally post angioplasty. Patients with CLI are scheduled for

an open surgical operation or have a history of previous vascular operations.

Patient evaluation: All patients were subjected to the following investigations before starting treatment: 1) Clinical evaluation according to medical or surgical history, including arterial examination and ankle brachial pressure index. 2) Laboratory (renal function, lipid profile, and CBC) 3) Radiology (arterial duplex of the affected lower limb, CTA if feasible).

Statistical Analysis: Statistical analysis was done by SPSS (Statistical Package for the Social Science).

3. Results

Thirty individuals were involved in this observational research on tibial disease-related critical limb ischemia.

Table 1. Demographic data of the studied cases (N=40).

DEMOGRAPHIC DATA	NUMBER OF PATIENTS (N=30)	PERCENTAGE
AGE (YEARS)		
MEAN \pm SD	60 \pm 4	
RANGE	45-78	
SEX		
MALE	20	66.5%
FEMALE	10	33.5%
BMI (KG/M ²)		
MEAN \pm SD	23 \pm 4	
RANGE	14-32	
PAST MEDICAL HISTORY		
HYPERTENSION	23	75%
DIABETES MELLITUS	24	80%
SMOKING	19	63.5%
CARDIAC DISEASE	20	67.5%
RENAL DISEASE	0	0%
COPD	6	20%

Data in N(%), mean \pm SD

In this study, the mean of age was 60 \pm 4 years. 20 patients (66.5%) were male while 10 patients (33.5%) were female (Figure 1). BMI was 23 \pm 4 kg/m².

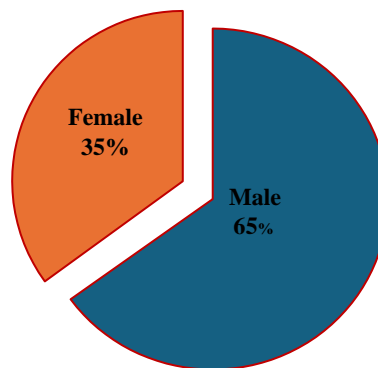


Figure 1. Sex distribution (N=30).

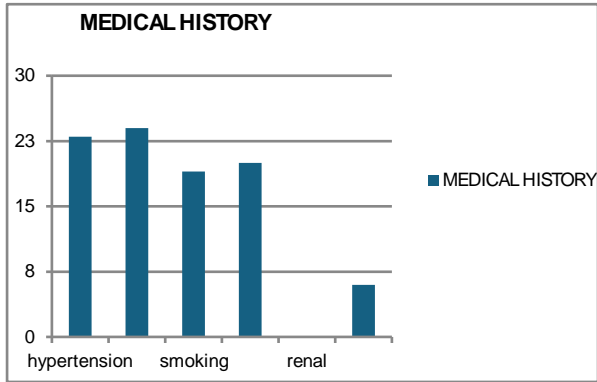


Figure 2. Shows the medical history of the studied patients.

Regarding the past medical history, hypertension was found in 23 patients (75%). Diabetes mellitus was found in 24 patients (80%). Smoking was found in 19 patients (63.5%). Cardiac diseases were found in 20 patients (67.5%). Renal diseases were found in 0 patients (0%). COPD was found in 6 patients (20%).

Table 3. Shows the operative data of the studied patients (N=30).

OPERATIVE DATA	NUMBER OF PATIENTS (N=30)	PERCENTAGE
INTERVENTION INDICATIONS		
REST PAIN	5	17%
ULCER	15	50%
GANGRENE	10	33%
REVASCULARIZED ARTERY		
ANTERIOR TIBIAL ARTERY	9	30%
POSTERIOR TIBIAL ARTERY	7	23.5%
PERONEAL ARTERY	14	26.5%
COMPLICATIONS DURING SURGERY		
NO	3	10%
PERFORATION	3	10%
HOSPITAL STAY DURATION (DAYS)		
MEAN±SD	3 ± 1	
RANGE	2-6	

Data in N (%), mean±S

The indications for intervention among the studied cases were rest pain in 5 patients (17%), ulcer in 15 patients (50%) and gangrene in 10 patients (33%).

Table 4. Details of the follow-up for the cases that were studied.

FOLLOW-UP DATA	NUMBER OF PATIENTS (N=30)	PERCENTAGE
COMPLICATIONS		
NO	4	13%
RESTENOSIS	3	10%
THROMBOSIS	1	3%
HEALING OF WOUNDS		
COMPLETE WOUND HEALING	18	60%
DELAYED WOUND HEALING	6	20%
MINOR AMPUTATION	3	10%
MAJOR AMPUTATIONS	3	10%

Follow-up Data (N=30) Data in N (%)

No complications were encountered during follow-up in 4 patients (13%). Restenosis was found in 3 patients (10%) while thrombosis was found 1 patient (3%).

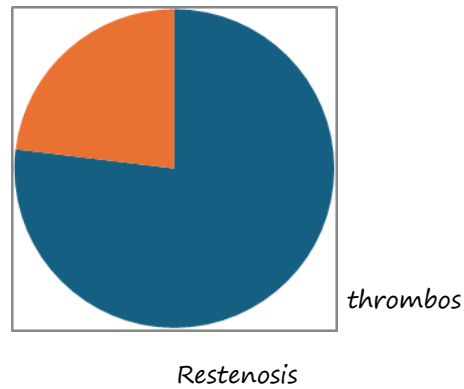


Figure 3. Complications (N=30).

4. Discussion

The average age was 60 ± 4 years. Ten cases (33.5%) were female, whereas 20 cases (66.5%) were male. The body mass index was 23 ± 4 kg/m². These findings were consistent with those reported by Ghoneim et al.⁶, who reported that the majority of patients in the study were diabetics and males.

According to our findings regarding the patient's past medical histories, 23 participants (75%) had hypertension, 24 (80%) had diabetes mellitus, and 19 (63.5%) smoked. In 20 cases (67.5%), cardiac diseases were discovered. In 0 cases (0%), kidney diseases were found. Six patients (20%) had chronic obstructive pulmonary disease (COPD).

According to our findings, gangrene in 10 participants (33%), ulcer in 15 participants (50%), and rest pain in 5 participants (17%) were the cases that required intervention among the cases we studied. In the present research, the posterior tibial artery was the target for revascularization in 7 participants (23.5%), compared to 9 participants (30%) with the anterior tibial artery revascularized. In 14 cases (46.5%), the peroneal artery was revascularized.

According to our findings, intraoperative complications in 3 cases (10%) and perforation in 3 cases (10%) resulted from calcified atherosclerotic vessels that were controlled with conservative therapy (manual compression to prevent extravasation). With chronic extravasation or the development of hemostasis, adjunctive endoscopic vascular surgery with balloon tamponade might be necessary. One of such cases had their patency preserved; the other two have been referred for intervention with surgery.

The patients' mean length of stay in the hospital

was 3 ± 1 day. In 4 cases (13%), there were no complications during the follow-up period. Thrombosis was discovered in 1 case (3%), mainly due to an occluded arch, whereas restenosis was found in 3 cases (10%), all scheduled for further endovascular balloon angioplasty.

For most patients who have had successful revascularization, salvage of the limb is decided. A hematoma, pseudoaneurysm, or groin infection was among the additional groin complications that were conservatively managed.

4. Conclusion

One accepted endpoint of infrapopliteal PVI for patients with CLI was achieving the inflow of a single vessel into the wound. In CLI patients who have a choice of target arteries for revascularization, the artery that feeds the wound's angioma ought to be preferred.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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