

The Efficacy of Percutaneous Revascularisation of Diseased Arteries in Symptomatic Patients with Buerger's Disease

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Abstract:

Background: Buerger's disease is associated with limb-threatening chronic arterial lesions.

Objective: This hospital-based retrospective study aimed to investigate the efficacy of percutaneous revascularization of diseased arteries in symptomatic patients with Buerger's disease.

Materials and Methods: 42 patients diagnosed with Buerger's disease between July 2022 to June 2023 were retrospectively investigated. Clinical data including biodata, complaints, clinical examination findings, investigation reports, operative records and post-operative follow up were taken up for analysis. The data was collected, coded and recorded on Microsoft Excel Spreadsheet program and descriptive statistical analysis was performed.

Result: All the study participants were male (100%) and all were smokers (100%) with all of them experiencing lower limb symptoms (100%). Maximum presenting symptoms comprised of 'ulcer' (80.95%, while remaining presenting symptoms involved 'wet gangrene of toes' (19.05%).

Conclusion: Percutaneous treatment of arterial occlusions in patients with Buerger's disease seems feasible in the current era of improving devices and angioplasty materials. Procedures may be safely performed with good technical and clinical success rates, and without mortality or complications as experience increases.

Keywords: Buerger's disease, Endovascular, Treatment.

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Introduction

Buerger's disease, or thromboangiitis obliterans, is a chronic inflammatory arteritis without prominent evidence of atherosclerosis.[1] Pathology was first described by Von Winiwarter in 1879 in a young, actively smoking male patient.[2] Leo Buerger described the histopathological findings of the disease in detail in 11 amputated limbs in 1908.[3] Buerger's disease is usually a non-atherosclerotic and inflammatory process affecting the small- and medium-sized arteries, veins, and nerves of the arms and legs. It leads to thrombotic occlusion in the distal vasculature of the extremities. The pathology most commonly affects male smokers at young ages. Buerger's disease may be seen worldwide; however, the prevalence is higher in the Middle East and Far East populations when compared with the West.[4]

Patients are usually asymptomatic until the advanced stages of the disease. The presentation is usually with ischemic symptoms in the extremities, including claudication, rest pain, or ulcer/gangrene secondary to the occlusion of the distal arteries and

veins. Symptoms are generally poorly controlled and claudication may rapidly progress to ischemic pain and distal gangrene leading to limb loss.[3] Rates of major amputation have been reported in increased percentages in actively smoking patients without treatment.[5]

The diagnosis of Buerger's disease is mainly based on clinical findings and association with cigarette smoking. Certain diagnostic criteria were established, and include history of tobacco exposure, initiation of the symptoms before the age of 50 years, the presence of distal-extremity ischemia without evidence of trauma, embolism, atherosclerosis, hypercoagulable state, or an autoimmune disorder.[4] As previously stated, tobacco exposure is the major factor in the pathogenesis of Buerger's disease and treatment of patients must start with cessation of smoking. On the other hand, in symptomatic patients and especially in patients with extremity-threatening arterial occlusions, additional invasive and medical measures are usually required; otherwise extremity

loss may occur. The aim should be prompt restoration of blood flow to the extremities with available medical and invasive tools.[5,6]

Together with medical and technological advances, endovascular therapeutic options for the treatment of vaso-occlusive disorders have evolved tremendously, with various procedural and long-term success rates in certain conditions. Historically, endovascular treatment strategies in the treatment of Buerger's disease have been disappointing, most likely due to the diffuse inflammatory process throughout the vessels. Moreover, endovascular revascularization in Buerger's disease has not been investigated in detail in the current era.[5] In view of the above, we sought to investigate the efficacy of percutaneous revascularization of diseased arteries in symptomatic patients with Buerger's disease.

Method

A total number of 42 patients, in whom the diagnosis of Buerger's disease established between July 2022 to June 2023 were included in this study. All the medical records of these 42 patients were retrieved from the Medical Records Department and taken up for further analysis. Clinical data including biodata, complaints, clinical examination findings, investigation reports, operative records and post-operative follow up were taken up for analysis. Amongst this 42 patients, 16 patients were undergone endovascular intervention along with medical therapy and remaining 26 patients treated with medical therapy alone. The medical therapy includes T. Cilastazol(100mg BD), T. Ecospirin(75mg)(1-0-0), T. Clopilet(75mg)(0-0-1), T. Atorvastatin (40mg)(0-0-1). The efficacy of percutaneous transluminal angioplasty was assessed by the rate of wound healing and while assessing the wound healing, patient entered into study period either with non-infected ischemic ulcer or the patient admitted with wet gangrene, initially amputation/wound debridement was done,

followed by a course of antibiotic, once infection settled which was proved by wound C&S, then they entered into the study. Those group of patients underwent angioplasty once infection settled down. The clinical study end point was wound should have healthy granulation tissue and fit for secondary healing, secondary suturing, grafting or flap. Then, the rate of wound healing was assessed by every weekend by shrinkage of wound, diameter & depth of the wound and appearance of healthy granulation tissue.

Inclusion Criteria

All symptomatic patients diagnosed as Buerger's disease with arterial doppler study admitted in the surgery ward during the study period were included in this study.

Exclusion Criteria

1. Age less than 25 years and more than 60 years
2. Known case of diabetes mellitus, hypertension, chronic renal failure, coronary artery disease, chronic lung disease, decompensated chronic liver disease.
3. Known case of associated lower limb venous disorder and lymphatic disorder
4. Known case of malignancies, on radiotherapy, on chemotherapy, on steroids
5. Known case of pre-existing osteomyelitis, and
6. Patients who were re-started smoking in this study period

Statistical Analysis

The data was collected, coded and recorded on Microsoft Excel Spreadsheet program and descriptive statistical analysis was performed. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) software (version 24). Statistical significance was kept at $p < 0.05$.

Results

Patient distribution

Table 1: Tabulation of patient distribution

| | |
|--------------------------|-------------------|
| Age(Years) (Mean) | 39.6 years |
| Gender | N (%) |
| Male | 42 (100%) |
| Female | 0 (0%) |
| Smoking status | N (%) |
| Yes | 42 (100%) |
| No | 0 (0%) |
| Presenting symptoms | N (%) |
| Ulcer | 34 (80.95%) |
| Wet gangrene of toes | 13 (19.05%) |
| Lower limb symptoms | N (%) |
| Yes | 42 (100%) |
| No | 0 (0%) |
| Limb involvement | N (%) |
| Unilateral | 37 (88.09%) |
| Bilateral | 5 (11.90%) |

Patient distribution with respect to gender, smoking status, presenting symptoms, lower limb symptoms and limb involvement were recorded in above Table 1. All the study participants were male (100%) and all were smokers (100%) with all of them experiencing lower limb symptoms (100%). Maximum presenting symptoms comprised of

‘ulcer’ (80.95%, while remaining presenting symptoms involved ‘wet gangrene of toes’ (19.05%). Maximum patient population had unilateral limb involvement (88.09%), whereas remaining had bilateral limb involvement (11.90%).

Table 2: Grading of Luminal Narrowing in CT-Angiogram

| Arteries involved | Number of limbs presented with symptoms | Grading of luminal narrowing in CT-angiogram |
|--|---|--|
| Posterior tibial alone | 3 | Mild-2 Moderate-1 Severe-0 |
| Posterior tibial + anterior tibial | 6 | Mild-4 Moderate-2 Severe-0 |
| Posterior tibial + anterior tibial + peroneal | 18 | Mild-0 Moderate-3 Severe-15 |
| Posterior tibial + anterior tibial + peroneal + dorsalis pedis | 20 | Mild-2 Moderate-12 Severe-4 |
| Total | 47 | |

CT – ANGIOGRAM FINDINGS

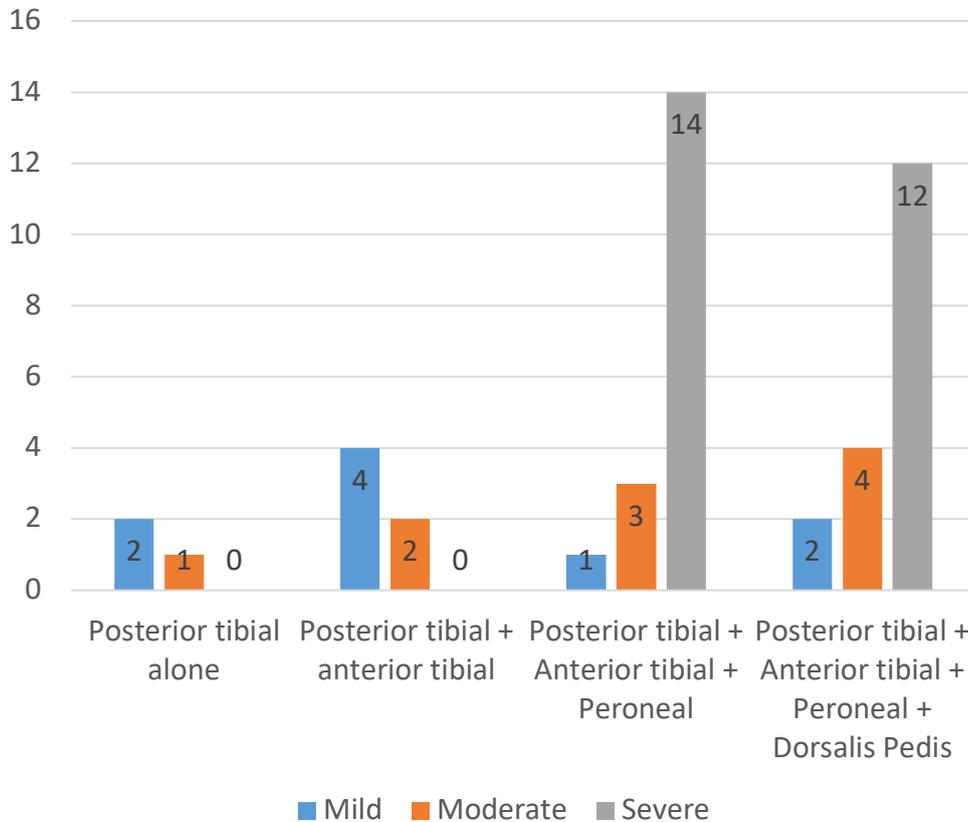


Figure 1: Grading of Luminal Narrowing in CT-Angiogram

Grading of Luminal Narrowing in CT-Angiogram is provided in above Table 2 and Figure 1. Four arteries (posterior tibial alone, posterior tibial with

anterior tibial, posterior tibial with anterior tibial and peroneal, and, posterior tibial with anterior tibial and peroneal and dorsalis pedis) were

involved in the current study. Maximum number of limbs (N=20/47) presented with symptoms were recorded in posterior tibial with anterior tibial and peroneal and dorsalis pedis artery. Grading of

luminal narrowing in CT-angiogram revealed that the 15 cases of posterior tibial with anterior tibial and peroneal artery were graded with severe score and 3 with moderate score.

Table 3: Line of management

| Line of management | N (%) |
|--|-------------|
| Medical therapy alone | 26 (61.90%) |
| Medical therapy with endovascular intervention | 16 (38.10%) |
| Wound healing days | |
| Wound healing days of 16 patients after endovascular intervention with medical therapy (average) | 41.37 |
| Wound healing days of 26 patients with medical therapy alone (average) | 65.84 |

Line of management and wound healing in the number of days were recorded in above Table 3. Line of management included two treatment areas viz., medical therapy alone and medical therapy with endovascular intervention. Maximum study population were treated with medical therapy alone (61.90%) whereas remaining were treated with medical therapy with endovascular intervention (38.10%). The average number of wound healing days of 26 patients with medical therapy alone was 65.84 days whereas the average number of wound healing days of 16 patients after endovascular intervention with medical therapy was 41.37 days.

Discussion

Buerger's disease is a challenging disease to treat and smoking cessation is the key therapeutic intervention.[7] The literature lacks a completely satisfactory medical or surgical management for Buerger's disease. The only common and definitive opinion about treatment is strict abstinence from tobacco.[8] Medical therapy includes antiplatelets, calcium-channel blockers, and analgesics. Also, antibiotics are used in the management of superposed infections. Calcium-channel blockers resolve vasospasm and may increase the efficiency of oxygen use in the extremities.[9]

In recent years, a limited number of studies reported experiences on endovascular therapy for patients with Buerger's disease.[10-15] Graziani et al [16] performed endovascular interventions on 20 limbs from 17 patients with technical success in 19 of 20 limbs (95%) and limb salvage at 100% over 23 months of follow-up. Clinical improvement was 84% and there was not a significant difference in limb salvage rates between smokers and non-smokers. A study by Kawarada et al [12] was the first to show intravascular ultrasonography findings in patients with Buerger's disease, with a mean follow-up of 26 months. Procedure success rate was 96% (complete and partial) and the patients had improvements of 1 or more Rutherford category grades. In another study, endovascular therapy was compared with autogenous venous bypass and was found to have comparable amputation-free survival, but lower primary and

secondary patency rates.[17] In addition, endovascular therapy has been associated with higher immediate failure and minor reintervention rates.[17]

Endovascular therapy for the treatment of Buerger's disease is controversial due to the diffuse, inflammatory, and thrombotic condition of the disease.[18] Technically, PTA in patients with Buerger's disease is challenging. While prolonged balloon inflation is recommended for these patients, stenting is not recommended because of inflammation and tendency to clot.[19] However, in cases of residual stenosis, dissection, or vascular recoil, stenting may need to be considered.[20] In addition, the unpredictable response of the inflamed arteries in patients with Buerger's disease has been one of the main reasons that many physicians refrained from percutaneous revascularization in this particular patient population.

The small number of patients and single-center nature of this study are the major limitations. In addition, this is a retrospective, non-comparative study, and does not include remote follow-up data.

Conclusion

Endovascular treatment of Buerger's disease is challenging because of the unpredictable nature of the disease. Our study propose that endovascular therapy may be considered as a first-line therapy, especially for limb salvage and wound healing in CLI patients as well as in patients with Buerger's disease. Promising studies of endovascular interventions that report lower amputation rates, ulcer healing, and effective therapy in patients presenting to the clinic with CLI are encouraging.

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