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## Study of clinical profile of peripheral vascular disease in department of surgery

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### Abstract

Peripheral vascular disease is circulation disorders that affect blood vessels outside of the heart and brain. Smoking tobacco is the main culprit for PVD. Management of atherosclerosis plays an important role in adult medical care. The objective of present study was to determine cardiovascular comorbidities associated with different stages of peripheral vascular disease and current use of pharmacological cardiovascular risk reducing therapy among men and women with the disease. This study was conducted by random selection of 60 cases with Peripheral Arterial disease of the lower extremities admitted to surgical wards of our tertiary care Centre done during the period from August 2020 to August 2022. The present study of chronic lower limb ischemia. TAO and Atherosclerosis are the etiologies for ischemia in these cases, with atherosclerosis being more common of the two. TAO presented at a younger age group whereas atherosclerosis presented in the older age group.

**Keywords:** Peripheral vascular disease, Peripheral arterial disease (PAD), Acute Limb Ischemia (ALI)

### Introduction

Peripheral vascular disease or commonly known as Peripheral arterial disease (PAD) comprises those entities which result in obstruction to blood flow in the arteries, exclusive of the coronary and intracranial vessels and the term is usually applied to disease involving the arteries of lower extremity [1].

The symptoms of lower extremity arterial occlusive disease are classified into two large categories: Acute Limb Ischemia (ALI) and chronic limb ischemia. 90% of acute ischemia's are either thrombotic or embolic. Chronic ischemia is largely due to atherosclerotic changes that manifest from asymptomatic to limb-threatening gangrene.

Peripheral arterial disease is an important manifestation of atherosclerosis involving the arteries of legs [2]. Vascular surgeons continue to encounter complications of atherosclerosis as their most common clinical challenge [3].

Management of atherosclerosis plays an important role in adult medical care. Although only 1-2% of people younger than 50 yrs. of age suffer from symptoms of intermittent claudication, this figure rises to 5% in those aged 50 to 70 yrs. and to 10% in those older than 70 yrs [4].

Vascular disease is a leading cause of morbidity and mortality in people with diabetes. Diabetic foot problems are due to combination of ischemia and neuropathy often complicated by infection [5].

Ischemia inhibits the ability of the wound to heal, further complicated by development of infection and gangrene. When associated with significant ischemia, diabetic foot ulcers require arterial revascularization to achieve wound healing [6].

Thrombo-angiitis obliterans (TAO) is an inflammatory occlusive disease primarily involving the medium sized muscular and smaller arteries in extremities, with smoking as the strong associated causative factor. In the lower limb, the disease commences in the digital arteries and small arteries of the foot and then proceeds to involve the crural arteries [7].

The clinical course of TAO is tremendously influenced by whether the patient stops smoking or not. If he continues to smoke there is progressive arterial insufficiency [8].

Currently the appropriate management of patients with chronic lower limb ischemia is a complex clinical issue.

Despite the advance in technical issues of revascularization, there remains much that can be done regarding education, risk factor modification and non-operative therapy for these patients [4].

Major amputation is eventually required in more than a third of patients once limb threatening symptoms and signs occur [9]. Popliteal artery entrapment syndrome and cystic adventitial disease of popliteal artery are rare causes of chronic arterial ischemia of generally young healthy individuals [10].

PAD is debilitating, persons with PAD have substantial functional impairment and increased rates of functional decline compared with their counterparts without PAD. Diagnosing PAD is important in order to implement appropriate therapies for preventing cardiovascular morbidity and mortality, improving functional impairment, and preventing further functional decline. The objective of present study was to determine cardiovascular comorbidities associated with different stages of peripheral vascular disease and current use of pharmacological cardiovascular risk reducing therapy among men and women with the disease.

**Materials and Methods**

This study was conducted by random selection of 60 cases with Peripheral Arterial disease of the lower extremities admitted to surgical wards of our tertiary care Centre done during the period from August 2020 to August 2022.

The method of the study consisted of taking a good clinical history in a chronological order as soon as the patient was admitted. A thorough clinical examination was carried out personally to find out and establish clinically first, the presence of vascular obstruction. Detailed vascular system examination was done as per the proforma provided.

The degree of vascular inadequacy and extent of the spread of the disease was assessed clinically by noting the colour change, extent and spread of gangrene and absence of peripheral pulses in the affected limbs. This together with history of the patient regarding the distribution and type of pain, gave in a fairly good number of cases studied, an idea of the state of patient’s vascular condition [11].

Later after clinical scrutiny, essential laboratory investigations were done as per the proforma provided to look for the presence of atherosclerotic risk factors. Patients were further evaluated objectively by Doppler scanning whenever feasible to assess the level and degree of obstruction objectively.

The treatment of each patient was individualized with the aim to achieve foot salvage wherever feasible. A record of patient’s progress and response to various modalities of treatment was made. Patients who returned for follow up were followed up for minimum of six months and during each follow up detailed history was taken and progress of the disease was assessed.

In all cases, a structural Proforma was used to collect the information of an individual patient. Cases were collected as and when they presented with the following inclusion and exclusion criteria.

**Inclusion criteria**

- Patients presenting with signs and symptoms of Peripheral Arterial disease of the lower extremities like intermittent claudication, rest pain, ulceration and gangrene.
- Patients with evidence of lower limb arterial occlusive disease on Doppler study.

**Exclusion criteria**

- Patients with Peripheral Arterial disease of regions other than the lower extremities.
- Patients with history of trauma to the lower extremities were

excluded.

- Patients presenting with pain of skeletal or neurologic origin of lower limbs with no evidence of vascular damage.
- Patients presenting with ulcers of traumatic or infective origin with no evidence of ischemia.
- Patient not willing to participate in the study.
- Patient with immunocompromised state.
- Patient with pregnancy.

These cases were analyzed in detail with reference to age, sex incidence, and duration of clinical presentation, clinical manifestations and various investigations they underwent during the period of hospital stay.

**Observation and Results**

Total number of patients in the present study were sixty (n=60). All the cases in the present study fall under the category of chronic lower limb ischemia and no cases of acute limb ischemia of non-traumatic origin were encountered during the study period. TAO and Atherosclerosis are the etiologies for PAD in these cases, with atherosclerosis being more common of the two. The diagnosis was done based on history, examination and relevant investigations. Out of these 60 patients 2 patients were referred to higher centre for bypass surgery.

Out of the total 60 cases, 44 (73.33%) cases were due to Atherosclerosis and 16 (26.67%) were due to Thrombo Angiitis Obliterans. Atherosclerosis was a more common presentation in this study. Among the 44 cases diagnosed with PAD due to Atherosclerosis in this study 40 (92%) were males and 4 (8%) patients were females. In this study all the 16(100%) patients diagnosed with TAO were males. Majority of the cases in atherosclerosis were above the age of 50 yrs., while in the TAO group majority belong to the age group between 31 to 50 yrs.

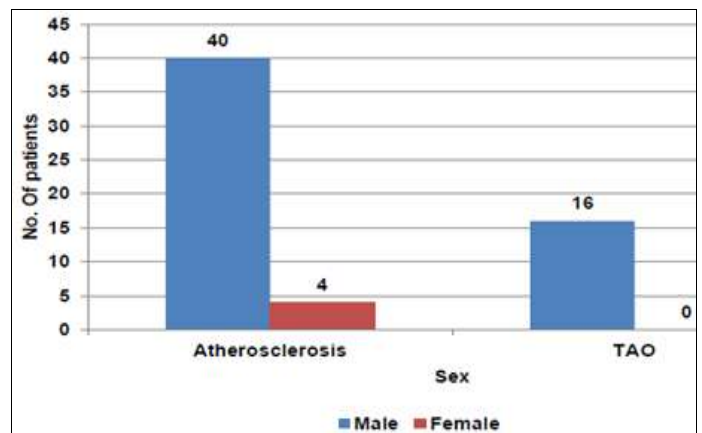


Chart 1: Gender distribution of patients with pad

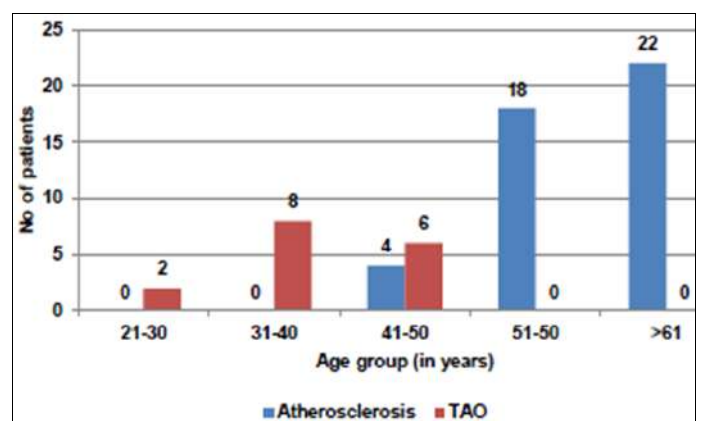


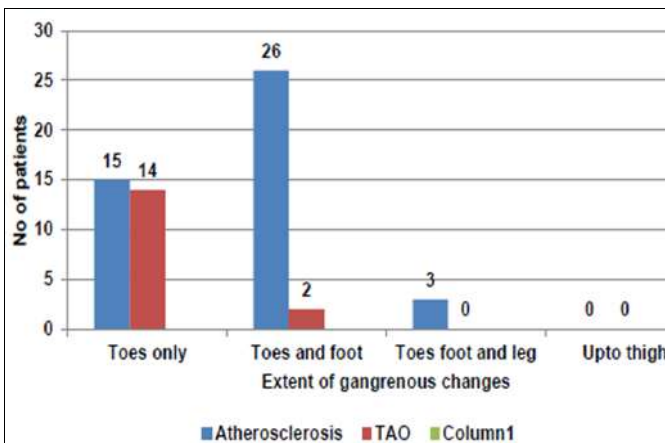
Chart 2: Age distribution of patients with pad

Majority of the patients presented with gangrenous changes. The incidence of gangrene is almost equal in both the groups. All patients had dry gangrene. Ischemic ulceration was present in ten patients. DM was the commonest associated disease among the atherosclerosis group, other conditions being hypertension and ischemic heart disease. In the atherosclerosis group, 6 cases had DM along with hypertension. In our study 2 patients had hypercholesterolemia and were also diabetic.

**Table 1:** Associated diseases in patients with PAD

Associated diseases	Atherosclerosis	TAO
Diabetes Mellitus (DM)	23 (53%)	0
Hypertension	11 (25%)	0
Ischemic Heart Disease	8 (17%)	0
Hypercholesterolemia	2 (5%)	0
Total	44 (73.33%)	

Doppler findings in the 60 patients that were subjected to Doppler study. Majority of the patients had popliteal disease in the atherosclerosis group, with TAO affecting more distal vessels and Atherosclerosis involving the more proximal arteries. Among patients with PAD the commonest site of narrowing was the femoro- popliteal segment (27.5%), followed by crural segment (22.5%) and aorto-iliac segment (15%). 15% had narrowing of both the femoro- popliteal segment and aorto-iliac and 5% had narrowing of both the crural and aorto-iliac segments. In 15% all three segments were involved. Hence, single segment involvement was seen in 65%, two segment involvement in 20% and three segment involvement in 15%.



**Chart 3:** Extent of gangrenous changes in lower limbs

**Table 2:** Doppler findings in the affected limbs

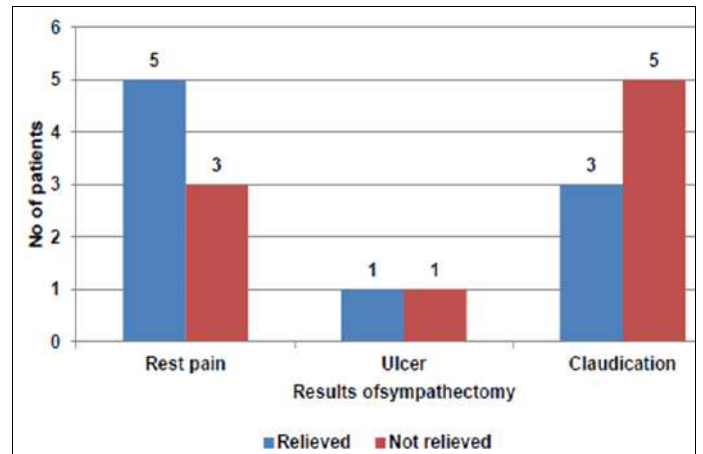
Site of obstruction	Atherosclerosis	TAO
Ankle	0	5 (29%)
Infra-popliteal	16 (36%)	11 (71%)
Popliteal	22 (50%)	0
Superficial femoral	6 (14%)	0
Total	44(73.33%)	16 (26.67%)

All the patients in this study were initially started on medical management, and eventually underwent different modalities of surgical management as shown in Table 3. Majority of the patients in my study underwent amputation of affected limb. The level of amputation was below knee in 42% and above knee in 58% cases. Lumbar sympathectomy was done in 8 cases, and among these cases toes disarticulation was done in 6 cases. 12% of the patients underwent disarticulation of the involved toes.

**Table 3:** CT Angiography findings in affected limbs

Segments	Frequency (N)	Percentage
Aorto-iliac	9	15%
Femoro-popliteal	16	27.5%
Crural	13	22.5%
Aorto-iliac and Femoro- popliteal	9	15%
Femoro-popliteal and crural	3	5%
Aorto-iliac and crural	0	0%
All 3 segments (aorto- iliac, femoro- popliteal and crural)	10	15%

The results of lumbar sympathectomy in terms of improvement in symptoms. Improvement of rest pain noted in 62.5% of cases, healing of ulcer in 50% of cases and improvement in claudication pain in 37.5% of patients who underwent lumbar sympathectomy.



**Chart 4:** Results of lumbar sympathectomy

The events in post-operative period during hospital stay. Majority of the patients had an uneventful recovery, with complication rates being higher among the atherosclerosis group. In atherosclerosis group, 50% required secondary suturing of the surgical wound and two cases underwent revision amputation.

**Table 4:** Postoperative recovery

Postoperative events	Atherosclerosis	TAO
Uneventful recovery	19 (44%)	9 (57%)
Revision amputation	3 (6%)	1 (7%)
Secondary suturing	22 (50%)	6 (36%)
Death	0	0
Total	44 (73.33%)	16 (26.67%)

**Discussion**

In the present series of 60 cases of Peripheral Arterial disease (PAD) of the lower extremities, all the cases in the present study fall under the category of chronic lower limb ischemia and no cases of acute limb ischemia of non-traumatic origin were encountered during the study period. The diagnosis was done based on detailed history, thorough physical examination and appropriate investigations.

Out of the total 60 cases, 44 (73.33%) cases were due to Atherosclerosis and 16 (26.67%) were due to Thrombo Angiitis Obliterans. Atherosclerosis was a more common presentation in this study. None of the cases in this study were due to any rare causes of lower limb ischemia like popliteal entrapment syndrome or cystic medial necrosis of the popliteal artery.

Selvin E and Erlinger TP reported from National Health and Nutrition Examination Survey (NHANES) conducted from 1999 to 2000 in the United States, that the overall prevalence of PAD (defined as an ABI < 0.90) was 4.3% (95% confidence interval [CI], 3.1% to 5.5%). The prevalence of Peripheral arterial disease in the general population is essentially unknown, primarily because of the lack of data on asymptomatic PAD.

Criqui MH *et al.* conducted a study and the prevalence of ischemic claudication in the population was found to be 2.2%, but on non-invasive testing, it was found that 11.7% of the population had large vessel PAD, 5.2% had both large and small disease. 12 Similar Prevalence was found in other studies [13-16].

There are widely varying prevalence rates of Buerger's disease in patients with peripheral arterial disease in Europe and Asia. The rates of TAO among all patients with peripheral arterial disease have been reported as 0.5% to 5.6% in Western European countries, 3% in Poland, 6.7% in East Germany, 11.5% in Czechoslovakia, 39% in Yugoslavia, 80% in Israel (Ashkenazim), 45% to 63% in India, and 16% to 66% in Korea and Japan [17, 18].

In a study done by Selvin E and Erlinger TP on the prevalence of and risk factors for peripheral arterial disease in the United States, it was found that although there was a slightly higher prevalence in men than in women, the prevalence dramatically increased with age, rising from 0.9% in those younger than 50 years to 14.5% in those 70 years or older [19]. Similar Results were observed in present study.

Atherosclerosis was commonly seen among the age group of above 60 years (50%) in my study and 91% cases were over the age of 50 yrs. 9% cases were seen in the age group of 41-50 yrs. Although atherosclerosis may be present in younger individuals, age has a dominant influence. All forms of cardiovascular disease become more prevalent in the elderly. In several studies the risk for PAD increased 1.5 to 2.0-fold for every 10-year rise in age [20-23].

In the present study, all the cases of PAD presented with intermittent claudication and rest pain as common symptoms, while gangrene and ischemic ulcer were the other predominant symptoms. 78% of the cases in the atherosclerosis group and 79% of the cases in the TAO group presented with gangrenous changes in the affected lower limb. Ischemic ulcer over the foot was present in 22% of the cases in the atherosclerosis group and 21% of the cases in the TAO group. Similar study by Nigam R reported that claudication was the commonest presentation in TAO and ulcer or gangrene with claudication was common mode of presentation in Atherosclerosis [24]. The commonest site of involvement in the form of critical limb ischemia was foot in both groups.

Cigarette smoking is an exceptionally powerful etiologic risk factor for lower extremity peripheral arterial disease. It is 2 to 3 times more likely to cause lower extremity peripheral arterial disease than coronary artery disease. Large epidemiological studies have found that smoking increases the risk of lower extremity peripheral arterial disease by 2- to 6-fold and the risk of intermittent claudication by 3- to 10-fold. 25 In present study, history of smoking was present in 61% patients in the atherosclerosis group and in 100% of the patients in the TAO group. The patients in the TAO group were chronic smokers

with history of smoking beedi or cigarette for 10 yrs. or more, with 86% of the cases smoking beedis.

In the present study Diabetes mellitus (DM) was present in 53% of the cases with atherosclerosis and none of the patients with TAO had DM. Hypertension was seen in 25% of the cases with atherosclerosis, whereas none of the TAO patients had associated hypertension. 8 (17%) patients with atherosclerotic PAD gave a history of ischemic heart disease or had ECG changes suggestive of myocardial ischemia. No patients with TAO had any form of myocardial episode. These findings correlate with another studies [24, 26-28].

In our study 2 patients had hypercholesterolemia and were also diabetic. In the Framingham Study, an elevated cholesterol level was associated with a 2-fold increased risk of claudication [29].

Doppler examination of the ischemic lower limb was undertaken for all the cases in this study. The commonest site of obstruction in atherosclerosis group was found to be popliteal and infra-popliteal vessels involvement. Femoral block was seen in 6 cases and all these patients had no distal collaterals. None of the atherosclerotic patients had disease limited to the ankle. In a study, ilio-femoral site of block was commonest in atherosclerosis and infra-popliteal was commonest in TAO [24].

In the TAO group, the commonest site of arterial block was infrapopliteal vessels, seen in 100% of the cases. None had popliteal vessel disease and none extended to the femoral artery. Disease limited to the ankle vessels was seen in 29% of the TAO cases. A study from Japan determined the distribution of arterial involvement in TAO on the basis of a nationwide survey carried out in 1993 [30]. The most frequently affected arteries in the lower extremities were the anterior (41.4%) or posterior (40.4%) tibial arteries.

All the cases were managed conservatively & medical management with but majority of the patients in this study presented at a late stage in the disease process, with gangrenous changes, thus leaving minimal options for salvaging the affected limb. Thus, we had to manage this patient by surgically. The level of amputation was below knee in 42% and above knee in 58% cases.

A recently published study states that the public is poorly informed about peripheral arterial disease, this leads to delay in presentation and diagnosis. Hence poor outcome of any intervention, the patient ultimately requiring amputation in some form [31]. Limb-loss is much more frequent once symptoms of rest pain or tissue loss become evident (critical limb ischaemia). In a prospective study from Italy, the risk of major amputation was 12.2% after only 3 months in patients with rest pain or ischaemic ulceration [32]. The risk of limb-loss is increased further when patients continue to smoke [33], and in patients with diabetes.

Most of the patients had uneventful recovery in the postoperative period. In the TAO group, 57% cases had an uneventful recovery and in the atherosclerosis group, 44% had uneventful recovery. Revision amputation at a proximal level was required in 3 cases in atherosclerosis group. Secondary suturing of the surgical site was required post operatively in 50% cases of atherosclerosis and in 6 cases of TAO. There were no deaths in the study.

## Conclusion

The present study of chronic lower limb ischemia. TAO and Atherosclerosis are the etiologies for ischemia in these cases, with atherosclerosis being more common of the two. TAO presented at a younger age group whereas atherosclerosis presented in the older age group.

The most common presentation in these patients is gangrene of some part of the lower limb. Gangrene was limited to the distal limb in the TAO cases and extended to the proximal limb in atherosclerosis. Atherosclerosis is more frequently associated with Diabetes mellitus. Doppler findings correlated with the disease presentation, TAO having a more infra-popliteal obstruction and atherosclerosis showing more proximal obstruction. Medical management consisted of analgesics, antibiotics, cessation of smoking, anti-diabetic and anti-hypertensive drugs. Majority of the cases are managed with some form of surgery and limb loss. This may be due to majority of the cases presenting in the terminal stages with gangrenous changes, thus leaving no scope for limb salvage & histopathology of most arterial biopsy showed atherosclerosis in terminal stages.

## Conflict of Interest

Not available

## Financial Support

Not available

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