

Clinical Study of Chronic Lower Limb Ischemia and its Management

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Abstract

Background: The aim of the study was to study the modes of presentation of chronic lower limb ischemia, to study the effect of comorbid conditions such as smoking, diabetes, and hypertension on the presentation, progression of lower limb ischemia, and to correlate the above study finding with management and outcome.

Materials and Methods: This is a study of 77 cases of chronic lower limb ischemia admitted in Mahatma Gandhi Memorial Hospital, attached to Kakatiya Medical College, Warangal, Telangana state, during the period of October 2011–October 2013. All the patients with a history of chronic lower limb ischemia requiring admission during the study period are included in this study. Results were analyzed.

Results: In our hospital, 125,263 patients were admitted between the study period, i.e., October 2011 and October 2013. Among them, the number of cases of chronic lower limb ischemia was 77. Thus, the incidence of chronic lower limb ischemia among the total number of hospital admissions was found to be 0.06%. The total number of surgical admissions in our institute during the period from October 2011 to October 2013 was 12,877, of which the number of cases of chronic lower limb ischemia was 77 (incidence – 0.597%). The highest incidence of chronic lower limb ischemia is seen to occur in the age group of 50 years and above. The main features at the time of presentation were with gangrenous changes in the lower limb, ischemic ulceration, claudication, and rest pain.

Conclusion: Atherosclerosis (77.92%) is the major etiological factor causing chronic lower limb ischemia. Thromboangiitis obliterans is the second cause and it exclusively affects males. Smoking plays a major role in the etiology of chronic lower limb ischemia and smokers get affected at a younger age, 12.1 years, than non-smokers. Diabetes has a major role in the etiology of chronic lower limb ischemia. It also has a crucial role in the outcome of the patients. Most of the cases in the present study with diabetes had surgical intervention (92.59%) with very few cases managed by conservative approach alone (7.41%).

Key words: Gangrene, Intermittent claudication, Limb ischemia, Rest pain

INTRODUCTION

Peripheral arterial disease results from any disease-causing stenosis or occlusion of the lower limb arteries.^[1] 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.

Vascular disease is a leading cause of morbidity and mortality in people with diabetes. Diabetic foot problems are due to the combination of ischemia and neuropathy often complicated by infection.^[4] Ischemia inhibits the ability of the wound to heal, further complicated by the development of infection and gangrene. When associated with significant ischemia, diabetic foot ulcers require arterial revascularization to achieve wound healing.^[5]

Thromboangiitis 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

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limb, the disease commences in the digital arteries and small arteries of the foot and then proceeds to involve the crural arteries.^[6] The risks to involve limbs are greater in TAO than in peripheral arteriosclerosis occlusive arterial disease. However, patients with TAO have a normal life span, whereas those with atherosclerosis have a greatly decreased survival compared with a normal population of the same age.^[7]

Intermittent claudication, heralded by pain in leg muscles during ambulation, is the earliest and the most classic symptom among patients with peripheral arterial^[2] disease. As the severity of arterial occlusion progresses, symptoms occur even at rest and may culminate in lower limb ulceration and gangrene.^[8]

At present, 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. Major amputation is eventually required in more than half of the patients once limb-threatening symptoms and signs occur.^[9] Nevertheless, the cause of death in patients with peripheral arterial disease is seldom direct result of lower limb ischemia, most patients die from complications of coronary artery or cerebrovascular disease.^[10]

Popliteal artery entrapment syndrome and cystic adventitial disease of popliteal artery are rare causes of chronic arterial ischemia of generally young healthy individuals. Although these diseases can produce severe disability if left untreated, normal circulation can be restored surgically.^[11]

MATERIALS AND METHODS

This is a study of 77 cases of chronic lower limb ischemia admitted in Mahatma Gandhi Memorial (MGM) Hospital, attached to Kakatiya Medical College, Warangal, Telangana state, during the period of October 2011–October 2013.

All the patients with a history of chronic lower limb ischemia requiring admission during the study period are included in this study. Documentation of patients, which included identification, thorough history and clinical examination, diagnostic tests, operative procedure, and complications during the stay in the hospital and during the subsequent follow-up period were all recorded on a pro forma specially prepared. The patients were followed up for a period up to the end of the study after discharge from the hospital.

Cases were collected as and when they presented with the following inclusion and exclusion criteria.

Inclusion Criteria

The following criteria were included in the study:

1. Patients presenting with signs and symptoms of chronic lower limb ischemia such as intermittent claudication, rest pain, ulceration and gangrene
2. Patients with evidence of lower limb arterial occlusive disease on Doppler study.

Exclusion Criteria

The following criteria were excluded from the study:

1. Patients presenting with pain of skeletal or neurologic origin with no evidence of vascular damage
2. Patients presenting with paralysis and paresthesia of neurologic origin
3. Patients presenting with ulcers of traumatic or infective origin with no evidence of ischemia.

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

RESULTS

In our hospital, 125,263 patients were admitted between the study period, i.e., October 2011 and October 2013. Among them, the number of cases of chronic lower limb ischemia was 77. Thus, the incidence of chronic lower limb ischemia among the total number of hospital admissions was found to be 0.06%.

The total number of surgical admissions during the same period was 12,877, and hence, the incidence of chronic lower limb ischemia among total admissions under the Department of General Surgery at MGM Hospital was found to be 0.597%.

Among the total number of (77) cases, 47 were male and 30 female. There is a higher involvement in males (61.04%) when compared to females (38.96%).

The previous studies by Criqui *et al.*, 1997, and Murabito *et al.*, 1997, show that the prevalence has been shown to be higher in men than in women.^[12,13]

Criqui *et al.*, 1998, showed that 4.7% of men (12/256) and 1.9% of women (6/309) had severe peripheral artery disease (PAD) (ankle–brachial index [ABI]: <0.6); the respective percentages for moderate PAD (ABI: 0.6–0.9) were 3.5% (9/256) and 2.9% (9/309) for men and women, respectively.^[14]

Table 1 shows the distribution of the incidence of chronic lower limb insufficiency in different age groups. It clearly suggests that the incidence is more in the age group of 50 years and above.

In several studies, the risk for PAD increased 1.5–2.0-fold for every 10-year rise in age.^[15,16]

The prevalence of PAD is highly age dependent. In a survey conducted in San Diego, in an older defined population, the prevalence was 2.5% in people aged <60 years old; this rose to 8.3% at 60–69 years and reached 18.8% in people >70 years of age.^[17]

PAD prevalence rates, Murabito *et al.*, 1997, by non-invasive testing are reported to be 2.5% at ages 40–59 years, 8.3% at ages 60–69 years, and 18.8% at ages 70–79 years.^[13]

In a study done by Selvin and Erlinger on the prevalence of and risk factors for PAD 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.^[18]

Life expectancy of the Indian population is less than the Western population. Hence, the number of cases above 70 years is less than the Western studies.

In the present study, out of 77 cases, most of the cases were caused by atherosclerosis (77.92%) and few cases were caused by TAO (22.08%). The diagnosis was based on Shionoya criteria and also on the biopsy reports of the vessels taken from the amputated specimens [Table 2].

Mills and Porter reported that TAO constitutes 1–3% of PAD in the Western population;^[19] Khanna reported that TAO is the most common type of PAD in India.^[20] There are widely varying prevalence rates of Buerger's disease in patients with PAD in Europe and Asia. The rates of TAO among all patients with PAD have been reported as 0.5–5.6% in Western European countries, 3% in Poland, 6.7% in East Germany, 11.5% in Czechoslovakia, 39% in Yugoslavia, 80% in Israel, 45–63% in India, and 16–66% in Korea and Japan.^[21]

Kelkar conducted an Indian study of 489 cases of chronic lower limb ischemia and found that 50% were due to TAO and 43% were due to atherosclerosis, the rest being due to miscellaneous causes.^[22]

A study done by Nigam had a higher incidence of TAO, accounting for 63% of the cases and atherosclerosis only 15%, the rest being miscellaneous causes.^[23]

In the present study, 82.35% of the patients with TAO (14 cases) were between 31 and 50 years of age. Nigam reported in his study that 88% of the TAO cases were aged between 31 and 50 years.^[23]

In the present study, most of the patients presented to the hospital with gangrenous changes in the lower limb, 57 out of 77 cases (74.02%), 11 out of 77 cases presented with ischemic ulceration, and 9 out of 77 cases presented with claudication and rest pain [Table 3].

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 or procedure, the patient ultimately requiring amputation in some form.^[24]

In the present study, Doppler study was undertaken for all the cases of chronic lower limb ischemia. The most common site of obstruction was found to be infrapopliteal vessels (37.67%) followed by ankle region vessels (31.17%) [Table 4].

Most patients in this study presented to the hospital in an advanced stage of limb ischemia where the ankle–brachial pressure index of most of the patients was below 0.5 [Table 5]. All the patients with ankle–brachial pressure

Table 1: Incidence of chronic lower limb insufficiency in different age groups

Age group	Number of patients (%)
20–30	2 (2.60)
30–40	7 (9.09)
40–50	12 (15.58)
50–60	18 (23.38)
60–70	21 (27.27)
70–80	15 (19.48)
80–90	2 (2.60)

Table 2: Cause of chronic lower limb insufficiency

Sex	Atherosclerosis	TAO
Male	30	17
Female	30	0
Total (%)	60 (77.92)	17 (22.08)

TAO: Thromboangiitis obliterans

Table 3: Modes of presentation in the present study

Intermittent claudication only	Nil
Intermittent claudication and rest pain	9 (11.69)
Intermittent claudication and rest pain and gangrene	57 (74.02)
Intermittent claudication and rest pain and ulceration	11 (14.29)

Table 4: Doppler findings in the affected limbs

Level of obstruction	Number of cases (%)
Supra-popliteal	12 (15.58)
Popliteal	12 (15.58)
Infrapopliteal	29 (37.67)
Ankle region	24 (31.17)

index above 0.5 could be managed either conservatively or by sympathectomy or by toe disarticulation. Most of the patients with ankle-brachial pressure index below 0.5 ended up with amputation.

This can be compared with the existing studies, Hirsch *et al.*,^[25] 2005, and Sacks *et al.*,^[26] 2002, which state that an ABI <0.4 increases the risk of limb loss, gangrene, ulceration, and delayed wound healing.

In the present study, more number of patients were managed surgically, either toe disarticulation or limb amputations, 10 cases were managed conservatively alone with cessation of smoking, limb exercises, low-dose aspirin, cilostazol, and pentoxifylline. Nine cases were managed by lumbar sympathectomy. Sixteen cases underwent disarticulation of one or more toes and 42 cases underwent limb amputations, both above-knee and below-knee amputations. All the cases which underwent some form of surgery also were supplemented with medical therapy [Table 6].

The present study shows that the average age of cases of lower limb ischemia with smoking history tends to present 12.1 years earlier than non-smokers. This is represented in Table 7. A study by transatlantic intersociety consensus working group states that, on average, the diagnosis

Table 5: Ankle-brachial pressure index in the patients of chronic lower limb ischemia in this study

Ankle-brachial pressure index	Number of patients (%)
0.2	18 (23.38)
0.3	21 (27.27)
0.4	13 (16.88)
0.5	18 (23.38)
0.6	6 (7.79)
0.7	1 (1.3)

Table 6: Treatment in patients of chronic lower limb ischemia in the present study

Treatment	Number (%)
Only conservatively managed	10 (12.99)
Toe/toes disarticulation	16 (20.78)
Lumbar sympathectomy	9 (11.69)
Limb amputations	42 (54.54)

Table 7: Comparison of the average age of presentation of smokers and non-smokers in the present study

Cases	Average age of presentation
Smokers	53.58
Non-smokers	65.68

of PAD is made 10 years earlier in smokers than non-smokers.^[27]

Outcome of Diabetic Patients with Chronic Lower Limb Ischemia in this Study [Table 8]

The present study shows the effect of diabetes on peripheral vascular disease. This clearly suggests that only 2 out of 27 diabetic cases could be managed conservatively with strict glycemic control and foot care education, whereas majority of them (92.59%) required surgical intervention either in the form of toe/toes disarticulation (29.63%) or limb amputations (62.96%). This result can be correlated with the existing data which clearly suggests that worse outcomes including limb loss are more in individuals with peripheral vascular disease and diabetes.^[28,29] The Centers for Disease Control and Prevention reported in 1997 that, in the United States, the LEA rate among those with diabetes was 28 times that of those without diabetes 73. In the present study, of the 42 amputations, 17 were of diabetic patients.

Normally in diabetic patients, digital amputations are done. However, if associated with peripheral vascular disease, rate of proximal limb amputations increases.

The present study shows the influence of diabetes and hypertension, in combination, on the outcome of lower limb ischemia. Table 9 clearly suggests that most of the cases, 12 out of 14, with both diabetes and hypertension, needed surgical intervention, either in the form of disarticulation or amputation. In that, majority of them, 9 out of 13, ended up having amputation. This suggests the effect of hypertension and diabetes on the outcome.

In the present study, 23 cases (29.88%) out of 77 were found to be hypertensive. Hypertension has been linked

Table 8: Treatment in chronic lower limb ischemia patients with diabetes in the present study

Treatment	Number (%)
Conservatively managed	2 (7.41)
Toe/toes disarticulation	8 (29.63)
Lower limb amputation	17 (62.96)
Total	27

Table 9: Effect of combination of diabetes and hypertension on outcome in the present study

Treatment	Number (%)
Conservatively managed	2 (14.29)
Lumbar sympathectomy	0 (0)
Toe/toes disarticulation	3 (21.43)
Lower limb amputation	9 (64.28)

with an increased risk of peripheral arterial occlusive disease in some studies. The Framingham data documented a 2.5-fold increase in the risk of PAD in men with hypertension and a 3.9-fold increase in women with hypertension.^[30] Almost every study has shown a strong association between hypertension and PAD, and as many as, 50–92% of patients with PAD have hypertension. In the systolic hypertension in the elderly program, 5.5% of the participants had an ABI under 0.90.^[31]

In the present study, 3 patients (3.9%) had a prior history of myocardial infarction (MI) and 1 patient (1.3%) had a history of cerebrovascular accident (CVA). Three patients with a history of MI were found to be diabetic. All the three patients underwent amputations. One patient with CVA was hypertensive and underwent amputation. In a study, among the subjects with ischemic claudication identified in the general population, the prevalence of ischemic heart disease varied between 30% and 40% and 6% of the patients gave a history of the previous stroke.^[32]

In the present study, 2 patients (2.6%) were found to have hypercholesterolemia and serum cholesterol >200 mg/dl and were managed with atorvastatin postoperatively. In epidemiological studies, total cholesterol levels are generally higher in patients with intermittent claudication than in those without lower extremity peripheral arterial disease.^[33]

Outcome of the Cases Treated

The outcome of treated cases, apart from amputations, was assessed by the following criteria:

1. Relief of rest pain, a subjective improvement from the patient point of view
2. Rise in cutaneous temperature as judged by palpation
3. Healing of trophic ulcers.

DISCUSSION

In this study of 77 cases, conservative treatment was adopted in all the cases. They were treated by cessation of smoking, limb exercise, cilostazol (100 mg BD), and pentoxifylline (400 mg BD). Medical treatment also included antibiotics, analgesics, antidiabetic, antihypertensive drugs, and low-dose aspirin (150 mg OD).

In this study, 10 cases out of 77 cases were exclusively managed conservatively. Out of 10 cases, 6 presented with claudication and rest pain. Four out of these six cases had symptomatic relief in rest pain. Remaining two cases had no improvement in the pain. Four cases with small ischemic ulcers were managed conservatively alone and all the four cases showed symptomatic relief from pain and three of them had healing of the ulcer. Remaining one case showed

no improvement in the ulcer but had symptomatic relief by the end of the study period.

In this study, 9 out of 77 cases underwent lumbar sympathectomy. Three cases had claudication with rest pain and all the three cases had symptomatic relief from pain. Clinical improvement was also noted with the raise of cutaneous temperature. Three cases had shallow small ulcers and two of them showed healthy granulation tissue at the base, one case the ulcer remained the same by the end of the study period. Three cases had gangrene of the digits, which had autoamputated with healthy granulation tissue at the base.

In this study, 16 cases out of 77 cases were treated by toe/toes disarticulation. They also received medical treatment simultaneously. Thirteen cases out of 16 had normal healing of the skin. Two cases developed superficial infection with wound gaping, for which secondary suturing was done. One case developed non-healing ulcer at the base of disarticulation by the end of the study period.

In this study, 42 cases out of 77 cases had underwent lower limb amputations. Seventeen out of 42 cases underwent below-knee amputation. The remaining 25 cases underwent above-knee amputation. One case of below-knee amputation underwent revision amputation due to compression of the stump of the tibia onto the skin causing skin necrosis. Five cases had wound gaping that was subsequently closed by secondary suturing. Remaining 36 cases had uneventful recovery. All the cases of amputations were treated medically postoperatively. All the cases had relief of pain on follow-up.

Post-operative period in amputations in the present study

Uneventful (%)	36 (85.71)
Secondary suturing (%)	5 (11.91)
Revision amputation (%)	1 (2.38)
Total	42

CONCLUSION

The present study, 77 cases of chronic lower limb ischemia, was studied during the period of October 2011–November 2013. A clinical study was done regarding the age and sex distribution, modes of clinical presentation, relevant investigations, and various modalities of treatment. The present study shows: Chronic lower limb ischemia cases constitute about 0.6% of total general surgical admissions.

Males (61.04%) are more commonly affected than females (38.96%), due to their habit of cigarette smoking.

The percentage of females affected increased with increasing age.

The age group of 60–70 years is the most common presenting age (27.27%) of chronic lower limb ischemia.

The youngest patient was 23 years of age and the oldest patient being 90 years of age.

Atherosclerosis (77.92%) is the major etiological factor causing chronic lower limb ischemia.

TAO is the second cause and it exclusively affects males. Female patients were not affected with TAO as they are non-smokers.

Most of the patients (74.02%) presented with gangrene of some part of the lower limb.

Smoking plays a major role in the etiology of chronic lower limb ischemia and smokers get affected at a younger age, 12.1 years, than non-smokers.

Diabetes has a major role in the etiology of chronic lower limb ischemia. It also has a crucial role in the outcome of the patients. Most of the cases in the present study with diabetes had surgical intervention (92.59%) with very few cases managed by conservative approach alone (7.41%).

Color Doppler was the main investigating modality used in the present study.

Majority of the cases had block in the infrapopliteal segment (37.67%) and in the ankle region (31.17%), with few cases having obstruction at popliteal (15.58%) and superficial femoral level (15.58%).

Most of the patients (54.54%) ended up having lower limb amputations. Remaining cases were treated either with lumbar sympathectomy (11.69%), disarticulation (20.78%), or conservative approach alone (12.99%).

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