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Original Article

Clinical Study of Chronic Lower Limb Ischemia and Correlation with Color Doppler Scan

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Abstract

Introduction: Chronic lower limb ischemia of the lower limb is a widely spread disease at the present time. It is a progressive disease and mainly comprises of atherosclerosis and Buerger's disease. Chronic critical limb ischemia is defined not only by the clinical presentation but also by an objective measurement of impaired blood flow using radiological investigations like color Doppler.

Aim: The aim of the study was to clinically evaluate patients of chronic lower limb ischemia and correlate the clinical findings with color Doppler study.

Materials and Methods: This study includes 50 patients admitted at Index Medical College, Indore with symptoms of chronic lower limb ischemia. Data were collected on basis of detailed history, clinical examination and color Doppler ultrasound findings.

Results: Out of the 50 patients observed the clinical diagnosis showed 24 patients as atherosclerosis and 26 patients as Buerger's disease. While color Doppler diagnosis revealed 26 patients as atherosclerosis and 24 patients to be Buerger's disease.

Conclusion: Current study establishes a strong correlation between diagnosis made on clinical basis and color Doppler findings.

Key words: Ischemia, Limb, Scan

INTRODUCTION

Chronic lower limb ischemia is a very common clinical occurrence in day to day out patients as well as admissions. This is a progressive disease broadly encompasses Atherosclerosis and Buerger's disease or Thromboangiitis Obliterans.[1-3]

Depending on its severity, lower extremity arterial disease can present in different ways, including (1) asymptomatic arterial insufficiency, (2) symptomatic disease presenting as intermittent claudication with positive noninvasive tests, and (3) critical leg ischemia, which defines the subgroup of patients with symptomatic lower extremity arterial disease in which the ischemic process endangers part or all of the lower extremity.

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Doppler US is a good method for screening and follow-up, as well as for the definitive diagnosis of peripheral arterial disease,[4-6] It does not require contrast enhancement, preparation of the patient before the study, or radiation exposure.[7,8]

Chronic lower limb ischemia limits the patients' lifestyle and causes significant morbidity in those suffering from it caused due to significant reduction in blood flow to the extremity manifesting in rest pain, intermittent claudication, rapidly progressing ulcers, gangrene, and even loss of limb.[9] Hence, early identification of symptoms and clinical features and their correlation of their severity with radiological studies like color Doppler ultrasound are of utmost important in their management.

MATERIALS AND METHODS

This study includes 50 patients admitted at Index Medical College, Indore with symptoms of chronic lower limb ischemia. Data were collected on basis of detailed history, clinical examination, and color Doppler ultrasound findings.

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Exclusion Criteria

Patients with acute lower limb ischemia, with traumatic, neurological, or infective etiology with no evidence of the lower limb vascular occlusion on Doppler were excluded from the study.

RESULTS

Out of the 50 patients observed the clinical diagnosis showed 24 patients as atherosclerosis and 26 patients as Buerger's disease. While color Doppler diagnosis revealed 26 patients as atherosclerosis and 24 patients to be Buergr's disease [Table 1].

The presence of intermittent claudication was found to be highly associated with the chronic lower limb ischemia. About 91.67% of atherosclerotics presented with claudication and 96.15% of Buerger's disease patients presented with claudication while on color Doppler 92.31% patients with atherosclerosis had intermittent claudication and 95.83% patients with Buerger's disease had intermittent claudication [Table 2].

Out of the total 24 patients with atherosclerosis diagnosed clinically 6 (25%) showed well palpable pulse (Grade 3), 16 (66.67%) showed diminished pulsations (Grade 2), and 2 (8.33%) showed absent femoral pulse. In 26 patients diagnosed clinically as Buerger's, 11 (42.31%) showed well palpable pulse (Grade 3) 15 (57.69%) showed diminished pulse (Grade 2) and none of the patients showed absent pulsation (Grade 1). Affection of femoral pulses was found to be greater in patients with atherosclerosis. Doppler findings were also consistent with clinical findings, that is, among the patients of atherosclerosis, 8 (30.77%) showed well palpable pulse, 16 (61.54%) showed diminished pulse, and 2 (7.69%) showed absent femoral pulse. In Buerger's disease patients, 9 (37.5%) showed well palpable pulse, 15 (62.5%) showed diminished pulse, and none showed absent pulsations. Similar higher affection of femoral pulse was found with atherosclerosis [Table 3].

Clinically diagnosed atherosclerosis patients showed 1 (4.17%) as well palpable, 17 (70.83%) as diminished and 6 (25%) as absent popliteal pulse while clinically diagnosed Buerger's patients showed 4 (15.38%) as well palpable, 12 (46.15%) as diminished, and 10 (38.46%) as absent popliteal pulse. Higher affection was found in popliteal pulse with Buerger's disease.

In color Doppler diagnosis of atherosclerosis, two patients (7.69%) showed well palpable pulse, 17 (65.38%) showed diminished pulse, and 7 (37.5%) showed absent pulsation. in Buerger's disease patients, three showed well palpable pulse (12.5%), 12 (50%) showed diminished pulse, and 9 (37.5%) showed absent popliteal pulse. Again a higher affliction was noted with Buerger's disease in popliteal pulse study [Table 4].

Anterior Tibial Pulse

Atherosclerosis patients diagnosed clinically showed 1 (4.17%) as well palpable, 12 (50%) as diminished pulse, and 11 (45.83%) as absent anterior tibial pulse. In clinically diagnosed Buerger's disease patients, none were well palpable for anterior tibial pulse, 6 (23.08%) showed diminished pulse, and 20 (76.92%) showed absent pulses. Higher affiliation was found in Buerger's disease with anterior tibial pulse.

Only 1 patient with atherosclerosis showed well papableata pulse with color Doppler diagnosis, 13 (50%) showed diminished and 12 (46.15%) showed absent pulse. On the other hand, none of the patients with Buerger's disease showed well palpable at a pulse, 5 (20.83%) showed

Table 1: diagnosed cases on the basis of color Doppler

Clinical	Color Doppler		Total
	Atherosclerosis	Buerger's Disease	
Atherosclerosis	21	3	24
	80.77	12.5	48
Buerger's Disease	5	21	26
	19.23	87.5	52
Total	26	24	50
	100	100	100

Table 2: Intermittent Claudication

	Clinical (%)		Color Doppler (%)	
	Present	Absent	Present	Absent
Atherosclerosis	22 (91.67)	2 (8.33)	24 (92.31)	2 (7.69)
Buergers' Disease	25 (96.15)	1 (3.85)	23 (95.83)	1 (4.17)

Table 3: Femoral Pulse

Femoral Pulse	Clinical Diagnosis (%)		Color Doppler (%)	
	Atherosclerosis	Buerger's	Atherosclerosis	Buerger's
1	2 (8.33)	0 (38.46)	2 (7.69)	0
2	16 (66.67)	15 (57.69)	16 (61.54)	15 (62.5)
3	6 (25)	11 (42.31)	8 (30.77)	9 (37.5)

Table 4: Popliteal Pulse

Popliteal Pulse	Clinical Diagnosis (%)		Color Doppler (%)	
	Atherosclerosis	Buerger's	Atherosclerosis	Buerger's
1	6 (25)	10 (38.46)	7 (26.92)	9 (37.5)
2	17 (70.83)	12 (46.15)	17 (65.38)	12 (50)
3	1 (4.17)	4 (15.38)	2 (7.69)	3 (12.5)

Table 5: Dorsalis Pedis Pulse

Dorsalis Pedis	Clinical Diagnosis (%)		Color Doppler (%)	
	Atherosclerosis	Buerger's	Atherosclerosis	Buerger's
1	12 (50)	20 (76.92)	13 (50)	21 (79.17)
2	12 (50)	6 (23.08)	13 (50)	5 (20.83)

Table 6: Ankle Brachial Index

Abi	Clinical Diagnosis (%)			Color Doppler (%)		
	Atherosclerosis	Buerger's	Total	Atherosclerosis	Buerger's	Total
a	1 (4.17)	0	1	1 (3.85)	0	1
b	9 (37.5)	4 (15.38)	13	10 (38.46)	3 (12.5)	13
c	3 (12.5)	2 (7.69)	5	3 (11.54)	2 (8.33)	5
d	11 (45.83)	20 (76.92)	31	12 (46.15)	19 (79.17)	31

diminished, and 19 (79.17%) showed absent pulsation. Higher involvement was seen in Buerger's disease in color Doppler study as well.

Posterior Tibial Pulse

None of the patients showed well palpable pta pulse overTotal in the study. in atherosclerosis 11 (45.83%) patients showed absent pulses while 13 (54.17%) patients showed diminished pulses while 20 (76.92%) patients showed absent pulsation and 6 (23.08%) showed diminished pta pulses in Buerger's disease patients. *P*-value of 0.0404367 showed the association to be significant. 12 (46.15%) patients with atherosclerosis showed absent pta pulses with color Doppler study as compared to 14 (53.85%) showing diminition of pulse. 19 (79.17%) patients with Buerger's disease showed absent pta pulse and only 5 (20.83%) showed diminition of the pta pulse. *P*-value of 0.015 showed the association to be significant.

12 (50%) patients with atherosclerosis showed absent and 12 (50%) showed diminished dorsalispedis pulse. While 20 (76.92%) showed absent dp pulse and 6 (23.08%) showed diminished dp in Buerger's disease patients clinically. *P*-value of 0.0765287 showed no significant association of impaired dp pulse among the two.

Again 50% patients showed absent and 50% patients showed diminished dp in patients with atherosclerosis, while 19 (79.17%) showed absent and only 5 (20.83%) showed diminished dp pulse in patients with Buerger's disease. *P*-value of 0.0420436 depicted this association between color Doppler diagnosis of Buerger's disease and affliction of dppulstion to be significant, that is, more commnltdp was involved in buergers disease. Gangrene was more extensively found in patients of Buerger's disease than atherosclerosis on clinical study.

Atherosclerosis patients diagnosed clinically showed 1 patient with abi >0.9 (4.17%) of the total atherosclerosis patients, 9 with Grade b (37.5%), 3 with Grade c (12.5%), and 11 with Grade d (45.83%). Buerger's disease patients showed none with abi as Grade a, 4 as Grade b (15.38%), 2 as Grade c (7.69%), and 20 as Grade d (76.92%).

Total 1 (2%) patient was found to have Grade a abi, 13 (26%) with Grade b abi, 5 (10%) patients with Grade c abi, and 31 (62%) patients with Grade dabi [Tables 5 and 6].

DISCUSSION

Strong correlation was found between the clinical diagnosis and color Doppler diagnosis among these patients presenting with features of chronic lower limb ischemia. Similar studies were conducted by Gray in 2011[10] and Hartimath and Sangma. in 2017[11] and strong correlation was found between clinical and color Doppler diagnosis in both the studies.

47 patients presented with intermittent claudication and only three patients did not have intermittent claudication as their presenting complaint. With both clinical and color Doppler study, intermittent claudication was found to be almost equally associated with both atherosclerosis and Buerger's disease. Suresh Clement *et al.* found a similar association of intermittent claudication as presenting complaint in their study in 2017.[12]

Reduced temperature in the affected limb was found in 39 patients with significantly higher number of such patients subsequently diagnosed as Buerger's disease both clinically as well as through color Doppler very similar to the study of Hartimath and Sangma.,[12]

33 patients presented with the complaint of rest pain with varying intensities. The association of rest pain was found to be similarly present in patients with both atherosclerosis and Buerger's disease in both clinical and color Doppler investigations contrary to the results comprehended in the study of Hartimath and Sangma. in 2017. While rest pain itself associated strongly with advanced lower limb ischemia as a whole. The same study also took into account the presence of swelling in the patients with PAD although only in a few cases with more commonly present in atherosclerosis patients as observed similarly in the current study.[12]

Palpation of lower limb arterial pulses was performed on femoral, popliteal, anterior tibial, posterior tibial and dorsalis pedis arterial pulses and grading was done as 3- palpable pulse, 2- diminished pulsation, 1- absent or

impalpable pulse. The involvement of femoral pulse was more commonly seen in patients with atherosclerosis than with Buerger's disease both clinically as well as with color Doppler with well palpable pulse more commonly encountered in Buerger's disease and diminished or absent pulsation more commonly encountered in atherosclerosis patients.

Palpation of popliteal pulses revealed absent or diminished pulsations more so in patients with Buerger's disease than atherosclerosis patients. Anterior tibial arterial pulsations were markedly affected in Buerger's disease patients than in atherosclerosis patients with more number of Buerger's disease patients showing absent pulsation. This observation was almost equally encountered with both clinical assessment and color Doppler scan.

Absent pulsation in posterior tibial arteries was much more frequently encountered in Buerger's disease with none of the patients having well palpable arteries. Diminished pulsation was seen more in atherosclerosis patients' limbs. Both the clinical study and color Doppler scan were concordant with the observation.

Similarly dorsalis pedis artery pulsation was absent more frequently in Burger's disease patients than atherosclerosis patients on clinical as well as color Doppler assessment.

This study on arterial pulsations was consistent with the study of Clement *et al*. in 2017, 39 Jandaghi *et al*. in 2013[13] and Larch *et al*. in 1997.[14]

Ankle brachial pressure index was also studied in all the patients and grading was done according to the severity of stenosis, that is, Grade a $\geq$ 0.9 (normal), Grade b = 0.8–0.89 (mild ischemia), Grade c = 0.5–0.79 (moderate ischemia), and Grade d $\leq$ 0.5 (severe ischemia). More predilection of the latter two was seen in advanced disease with Buerger's disease showing more inclination towards lower abpi. Similar results were observed in the study by Aboyans in December 2012.[15]

Therefore, chronic lower limb ischemia almost always presents with intermittent claudication which being present with about same frequency in both atherosclerosis as well as TAO.

CONCLUSION

The current study encompassed various clinical features commonly presented associated with chronic lower limb ischemia and compared them with the diagnoses obtained through both clinical as well as color Doppler diagnosis. The various aspects of the clinical study well conformed to the diagnosis made by color Doppler analysis and strong correlation was observed among the two.

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