



Evaluation of Peripheral Arterial Disease of Lower Limb by Duplex Color Doppler

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Abstract

Aims & Objectives: To evaluate clinically suspected cases of peripheral arterial diseases of lower limbs by Duplex Color Doppler.

Results: Color Duplex USG shows high sensitivity (92%) and specificity (96%) for diagnosis of peripheral arterial disease.

Conclusion: Duplex Color Doppler Sonography can be used for evaluation of elderly people with risk factors of peripheral artery disease such as diabetes, hyperlipidemia and hypertension.

Keywords: stenosis, peripheral vascular insufficiency, pulsatility index.

Introduction

Peripheral Arterial Disease (PAD) is an important cause of morbidity worldwide. Atherosclerosis is the leading cause of occlusive arterial disease of the extremities in patients over 40 years of age. It is more common in individuals with diabetes mellitus, hypertension, hyperlipidemia and in cigarette smokers. Thromboangitis obliterans is a condition which affects young males aged 20-40 years and who are chronic smokers. In the past, Contrast Angiography was done to aid diagnosis, which is invasive and has complications as well. Presently, Color Doppler sonography has emerged

which is most easily available, noninvasive, repeatable as well as cost effective. The following study was carried out with the objective to localise any obstruction to blood flow, determine type and length of stenosis in patients with PAD using Color Doppler Sonography and to find the cause of occlusion and grade it.

Materials and Methods

This was a cross sectional observational study.

Study Period: Two years from September 2012 to August 2014.

Study Population: A total of 50 patients with clinically suspected PVD were examined in the Department of Radiodiagnosis, VSS Institute of Medical Sciences and Research, Burla, Odisha.

Inclusion Criteria: Adult patients clinically suspected with Peripheral Arterial Disease.

Exclusion Criteria: Pregnant & Paediatric Patients.

Duplex Ultrasound Criteria for Arterial Evaluation

- i. B-Mode: Accessibility, Anatomy, Vessel Contour (Aneurysm, Stenosis), Wall thickness (Calcification, Plaques), Pulsation, Perivascular Structures (Haematoma, Abscess, Compressing Structures)
- ii. Doppler: Demonstration of flow, flow direction, flow pattern (Laminar, Turbulent), Flow Character (Monophasic, Biphasic, Triphasic), Flow Velocity.

Results

Table 1 Demographic Distribution of Cases

Age in Years	Male	Female	Total no. of Cases	Percentage
21-30	1	0	1	2
31-40	2	0	2	4
41-50	8	6	14	28
51-60	17	3	20	40
61-70	8	3	11	22
71-80	1	0	1	2
81-90	0	1	1	2
Total	37	13	50	100

Table 2 Documented Risk Factors

Risk Factor	No. of Patients	Percentage
Hypertension	25	50
Smoking	24	48
Alcohol	13	26
Diabetes Mellitus	23	46
IHD	5	10
Hyperlipidemia	25	50
Trauma	1	2

Table 3 Site of Lesions in Lower Limb

Level of Lesion	Right Limb	Left Limb
Common Iliac	2	1
External Iliac	1	1
Common Femoral	7	6
Superficial Femoral	16	10
Deep Femoral	6	2
Popliteal	10	8
Posterior Tibial	3	3
Anterior Tibial	5	3
Peroneal	2	1
Dorsalis Pedis	2	4

Table 4 Distribution based on Percentage of Stenosis

Percentage of Stenosis	No. of Patients	Percentage
1-19%	5	10
20-49%	10	20
50-99%	16	32
Total	19	38

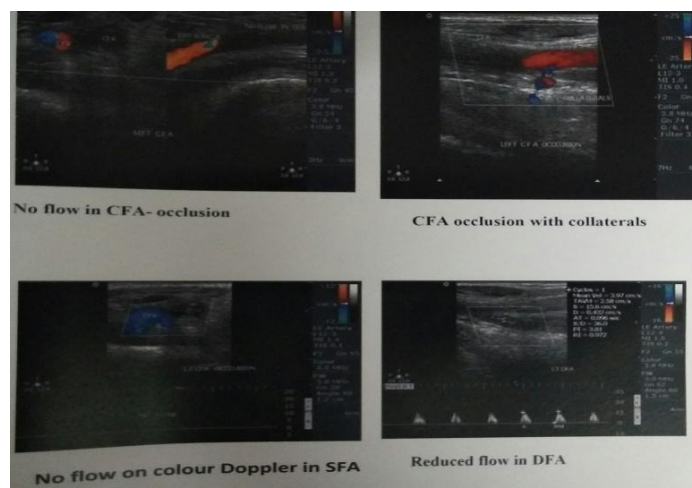


Fig 1 Doppler ultrasound images reveal varying degrees of stenosis in different patients.

Discussion

In our study, 50 clinically diagnosed cases of Peripheral Vascular Insufficiency (PVI) underwent duplex ultrasonography. Male predominance (94%) was found in the age group > 40 years which was consistent with Hughson et al (1978) where 2 % of males in general population (and 1 % of females) were affected ⁽¹⁾.

Highly prevalent risk factors: Alcohol (26 %), Hyperlipidemia (50%), Hypertension (50%), Diabetes (46%) were consonant with William F.Ganong (1986) ⁽²⁾.

Intermittent Claudication was the most common clinical symptom in 60% of patients in our study and was consistent with Tetsuo Ostida (1982) who found 69 out of 144 ischemic limbs having this symptom⁽³⁾. Incidence of claudication has been reported to be as high as 100 % in some studies⁽⁴⁾. Right limb involvement was reported in 48% of patients and among the patients, significant stenosis was seen in 75% of patients in femoropopliteal segment and 25% in iliac & infrapopliteal segments which was similar to findings of Ahchong K et al⁽⁵⁾.

Out of 50 patients studied, 19 (38%) (with PSV ratios of > 4) had complete occlusion whereas 15 (30%) had 49% occlusion. Monophasic waveforms were encountered distal to significant stenosis while increased Peak Systolic Velocities (PSV) were identified at the site of moderate stenosis. This was similar to the study by Cossman et al (1989)⁽⁶⁾.

PI (Pulsatility Index) ratio < 4 showed significant stenosis in 80 % of patients which corroborated with the study by Hatsukami (1992)⁽⁷⁾.

Color Duplex USG showed high sensitivity (92%) and specificity (96%) in the diagnosis of Peripheral Arterial Disease in our study. In a similar study, sensitivity was 92% and specificity 99%⁽⁸⁾.

Conclusion

Elderly males harbouring risk factors like smoking, diabetes, hypertension, hyperlipidemia are with increased risk of Peripheral Arterial Disease. The commonest site of pathology is Femoropopliteal segment which can be accurately located by Color Doppler Ultrasound with delineation of site and extent of stenosis. Assessment of waveforms and Peak Systolic Velocity help in management of hemodynamically nonsignificant and significant parts. Duplex Ultrasound is safe, cost effective, repeatable, noninvasive imaging modality and allows quantification of Peripheral Arterial Disease.

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