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Original Research Article

Comparison of Diagnostic Accuracies of Color Flow Doppler Ultrasonogrphy with Contrast Enhanced Magnetic Resonance Angiography in Patients with Obstructive Arterial Disease of Lower Limbs

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ABSTRACT

Introduction: Contrast enhanced Magnetic Resonance(MR) angiography has been considered the gold standard for the investigation of obstructive arterial disease of lower limbs. The development of color flow doppler (CFD) ultrasonography has extended the scope of non-invasive assessment of lower limb arterial disease. Comparative study is undertaken for the diagnostic accuracy of color flow doppler with magnetic resonance angiography in detecting hemodynamically significant lesions in obstructive arterial disease of lower limbs.

Materials and Methods: 30 clinically diagnosed patients of obstructive arterial disease of lower limbs evaluated with color flow doppler ultrasonography and contrast enhanced magnetic resonance angiography.

Results: Sensitivity and specificity of CFD ultrasonography were 70-90% and 100% in different arterial segments respectively. Sensitivity and specificity of contrast enhanced magnetic resonance angiography were 90-95% and 100% in different arterial segments respectively.

Conclusion: Obstructive arterial disease is more prevalent in males over 50 years. Color flow doppler ultrasonography has grown from an ancillary diagnostic aid to a critical component in non-invasive diagnostic work up for obstructive arterial disease of lower limbs, as initial investigation of choice compared to contrast enhanced MR angiography.

KEY WORDS: Peripheral arterial occlusive disease, Color flow doppler, Magnetic resonance angiography.

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INTRODUCTION

Obstructive arterial disease of lower limb is a common disorder with variable morbidity and mortality. Men and women over the age of 50 years are affected involving 10 million people per year [1]. Most of the obstructive lower limb arterial diseases are due to atherosclerosis which also puts the patient to high risk of cerebral strokes, renal vascular hypertension, myocardial infarction and cardiovascular death [2]. The risk factor includes smoking, hypertension, hyperlipidemia, diabetes, family history of vascular disease, obesity and sedentary life style.

Availability of modern surgical revascularization techniques as well as refined pharmacological interventions makes it mandatory for the accurate diagnosis. Although many imaging modalities like catheter based angiography, digital subtraction angiography, colour flow doppler and magnetic resonance angiography (MR angiography) have emerged , no single optimal technique provides information to its best [3]. The development of color flow doppler has extended the scope of non invasive assessment of obstructive arterial disease of lower limbs**.** Color flow doppler provides high resolution precise anatomical and physiological information of peripheral arteries including the blood flow [4]. Color flow doppler is a safe, fast, inexpensive, accurate and repeatable non invasive procedure and is being used more frequently as the first line investigation for patients with obstructive arterial disease of lower limbs. The aim of our study is to prospectively compare the diagnostic accuracy of color flow doppler with MR angiography in detecting hemodynamically significant lesions in patients with obstructive arterial disease of lower limbs.

MATERIALS AND METHODS

As a cross sectional study, 30 Patients diagnosed clinically as having obstructive arterial disease of lower limbs were submitted to both the modes of investigation.

Inclusion criteria: Patients of obstructive arterial disease of lower limbs evaluated with colorflow doppler and magnetic resonance angiography.

Exclusion criteria: 1. Pregnant patients, 2. Patients with history of allergy, 3. Patients with artificial cardiac implants (metallic implants).

The lesions were divided region wise into:

1. Aortoiliac and
2. Femoropopliteal segments.

Hemodynamically significant lesions recorded region wise by color flow doppler ultrasonography and contrast enhanced magnetic resonance angiography in the same subject and compared.

RESULTS

Present study has conducted with a total 30 cases (Table 1), out of that 28 (93.3%) male and 2 (6.7%) female were there. The male and female ratio was 14:1. Age wise distribution was <30 years were no cases, between 31-40 years were 4 cases (13.3%), between 41-50 years were 4 cases(13.3%), between 51-60 years were 11 cases (36.6%), >60 years were 11 cases (36.6%)(Table 2). Peak occurrence of lower limb arterial disease seen equally in the age group of 51-60 & > 60 years (36.6%). Color flow doppler findings in detecting arterial disease in aortoiliac segments in comparison with contrast enhanced MR angiography findings found that the Color flow doppler ultrasound analysis for aortoiliac segments revealed a sensitivity of 74% and specificity of 100% in comparison with MR angiography (Table 3), the p valve was <0.0001. For femoropopliteal segment the sensitivity was 77%, specificity was 100% in comparison with MR angiography (Table No 04), the p valve was <0.0001.

Table 1: Sex wise distribution of case.

Sex	No. of cases	Percentage
Male	28	93.30%
Female	2	6.70%
Total	30	100%

Table 2: Age wise distribution of cases.

Age	No. of cases	Percentage
<30 yrs	0	0
31-40 yrs	4	13.30%
41-50 yrs	4	13.30%
51-60 yrs	11	36.60%
>60 yrs	11	36.60%

Table 3: Color flow Doppler findings and MR angiography findings.

COLOR DOPLLER FINDINGS	MR ANGIOGRAPHIC FINDINGS			
	DISEASE	POSITIVE	NEGATIVE	TOTAL
	POSITIVE	26	0	26
	NEGATIVE	9	55	64
	TOTAL	35	55	90

Table 4: Color Flow Doppler Findings In Detecting Arterial Disease In Femoropopliteal_Segments In Comparison With MR Angiography.

COLOR DOPLLER FINDINGS	MR ANGIOGRAPHIC FINDINGS			
	DISEASE	POSITIVE	NEGATIVE	TOTAL
	POSITIVE	28	0	28
	NEGATIVE	8	84	92
	TOTAL	36	84	120

DISCUSSION

Obstructive arterial disease of lower limb is a prevalent disorder with substantial morbidity. The risk factors associated with obstructive arterial disease of lower limb have also increased the prevalence of mortality due to renal and cardiovascular involvement. A variety of invasive and noninvasive imaging techniques are available for evaluation of obstructive arterial disease of lower limb.

Obstructive arterial disease of lower limb is believed to be more common in males than females. In a series of 520 cases Juergens et al. found male to female ratio of 11:1 [5]. In epidemiological study by Jelnes et al. have consistently reported gender prevalence ratio of less than 2:1 [6]. while one explanation for the discrepancy in reported male to female ratio may be an increasing disease frequency among women, perhaps due to an increasing rates of smokers among women. Other possible explanation is a referral bias in the studies in which men with symptomatic arterial disease of lower limb are more likely to obtain medical attention than women with male to female ratio of 14:1 (Table 1).

The incidence of obstructive arterial disease of lower limb increases with age. No study clearly explains the true incidence of arterial disease of lower limb according to age distribution. 73% of pts were above the age of 50 years (Table 2). The study by Vogt et al. have shown five times increase in prevalence of arterial disease of lower limb in men over 50 years [7].

The CFD ultrasound analysis for aortoiliac segments revealed a sensitivity of 74% and specificity of 100% in comparison with MR angiography (Table 3). The CFD ultrasound observations of Leng revealed sensitivity of 70% and specificity of 96% in assessment of aortoiliac disease in comparison with MR angiography.[8] For femoropopliteal segment the sensitivity was 77%, specificity was 100% in comparison with MR angiography (Table 4).

CONCLUSION

Lower limb arterial disease more prevalent in male population and over the age of 50 years. The color flow Doppler ultrasonography less sensitive but a highly specific modality in assessment of both aortoiliac & femoropopliteal segments in comparison with contrast enhanced MR angiography (P value < 0.0001). Color flow doppler ultrasonography can thus be used as the initial investigation of choice for diagnosis of lower limb arterial disease.

The role of color flow doppler ultrasonography in preoperative evaluation of patients with lower limb arterial disease needs further evaluation when compared to contrast enhanced MR angiography which is considered as “gold standard” for this purpose.

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