Original Research

Efficiency of vascular color doppler ultrasound in renal artery stenoses

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ABSTRACT:
Background: Renal artery stenosis (RAS) is most commonly caused by either fibromuscular dysplasia or atherosclerosis. The present study was conducted to assess efficiency of vascular color doppler ultrasound for renal artery stenoses. **Material & Methods:** 60 suspected patients of renovascular arterial hypertension of both genders underwent vascular color doppler ultrasound with low-frequency curve transducers (2 to 3.5 MHz) to allow greater penetration (10-12 cm) of the ultrasound beam. **Results:** There were 32 males and 28 females. Color Doppler showed 24 cases were normal, 16 had moderate stenosis, 10 were obstructed, 4 were inconclusive and 8 had hemodynamically significant stenosis The difference was significant (P< 0.05). The sensitivity of color doppler was 95.2%, specificity 96.2%, positive predictive value 89.4% and negative predictive value 82.1%. **Conclusion:** Acolor doppler can provide important details about renal artery stenosis. Renal hypertension may be avoided with an early diagnosis of renal artery stenosis.
Key words: Color Doppler, renal artery stenosis, sensitivity

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INTRODUCTION

Renal artery stenosis (RAS) is most commonly caused by either fibromuscular dysplasia or atherosclerosis, and it may occur alone in the form of isolated anatomical RAS or associated with hypertension, renal insufficiency as ischemic nephropathy or both.[1] RAS due to atherosclerotic changes of the RAs has become a serious concern as a cause of hypertension and renal ischemia, resulting frequently in end-stage renal failure.[2]As much as 64% of patients with hypertension who are resistant to pharmacological treatment can have better blood pressure management when their RAS is corrected by angioplasty and stenting, so identifying patients with RAS-induced hypertension has significant clinical consequences.[3] Furthermore, 79% of patients in whom RAS is linked to declining renal function get either improvement in or stabilization of their renal function.[4,5]

Currently, intraarterial angiography is the gold standard for RAS diagnosis.[6]But this method's associated morbidity from bleeding, anaphylaxis, and contrast material-induced nephropathy has primarily limited its application to patients in whom RAS is strongly suspected due to clinical findings or a positive screening test result.[7] There are many benefits of duplex sonography, including its affordability, non-invasive nature, and widespread availability. On the other hand, duplex sonography is not an easy test. It is feasible to measure several renal blood flow indices more than once.[8,9] The present study was conducted to assess efficiency of vascular color doppler ultrasound for renal artery stenoses.

MATERIAL & METHODS

The present study consisted of60 suspected patients of renovascular arterial hypertension patients of both genders. All gave their written permission for the participation in the study.

Data pertaining of patients such as name, age, gender, etc. was entered in case file. After case history recording and careful examination of all patients, vascular color doppler ultrasound was planned according to the direct technique with the patients in the supine position with low-frequency curve transducers (2 to 3.5 MHz) to allow greater

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penetration (10-12 cm) of the ultrasound beam. The results were compiled and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 60		
Gender	**Males**	**Females**
Number	32	28

Table I shows that there were 32 males and 28 females.

Table II Diagnosis of cases

Diagnosis	Number	P value
Normal	22	0.05
Moderate stenoses	16	
Obstructed	10	
Inconclusive	4	
Hemodynamically significant stenoses	8	

Table II, graph I shows that color Doppler showed 24 cases were normal, 16had moderate stenosis, 10 were obstructed, 4 were inconclusive and 8 had hemodynamically significant stenosis The difference was significant (P< 0.05).
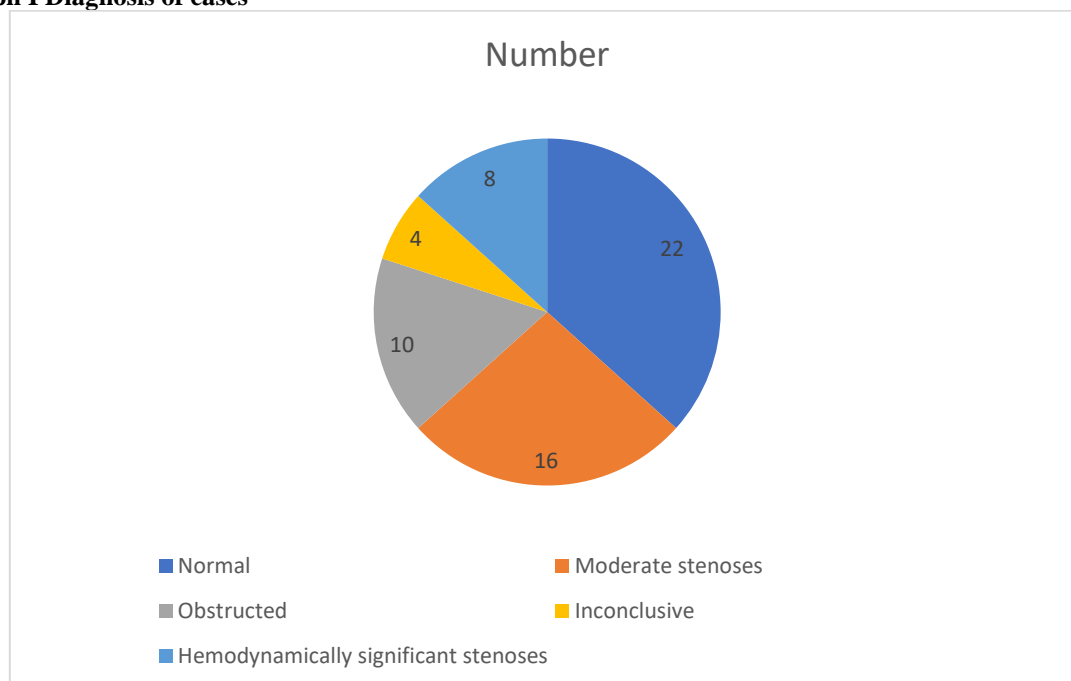
Graph I Diagnosis of cases

Table III Diagnostic accuracy of color Doppler

Parameters	Percentage
Sensitivity	95.2
Specificity	96.2
Positive predictive value	89.4
Negative predictive value	82.1

Table III show that the sensitivity of colordoppler was 95.2%, specificity 96.2%, positive predictive value89.4% and negative predictive value 82.1%.

DISCUSSION

Atherosclerotic RAS is a progressive condition that is more common in people who have diabetes or other atherosclerosis-related conditions.[10,11] In an ideal imaging procedure for RAS, the main RAs and accessory vessels would be identified, the site of stenosis or disease would be localized, the hemodynamic significance of the lesion would be demonstrated, and associated pathologies that might affect RAS treatment would be found.[12,13] Once

regarded as the "gold standard" for arterial imaging, angiography is costly, invasive, and has a slight but real chance of serious side effects like dissection of the arterial wall, cholesterol embolization, or negative reactions to contrast agents.[14,15]The present study assessedefficiency of vascular color doppler ultrasound for renal artery stenoses.

We found that there were 32 males and 28 females. Hansen et al[16]reported that renal-segmental ratio (RSR), i.e. a ratio of PSV measured in the renal artery to that obtained in the segmental artery, was the best parameter (sensitivity 93.33%; specificity 89.47%).Aytac et al showed that if the diameter of a RA measured by US is 4.65 mm or less, the presence of an accessory renal artery can be established with 80% sensitivity and 80.5% specificity. If the diameter of the renal artery is 4.15 mm or smaller, the presence of an accessory renal artery is extremely probable, with 98.8% specificity. It was also interesting that in kidneys with a main RA diameter of 5.5 mm, no accessory RAs were encountered.

We found that color Doppler showed 24 cases were normal, 16 had moderate stenosis, 10 were obstructed, 4 were inconclusive and 8 had hemodynamically significant stenosis. Using vascular color doppler ultrasound, Egglin et al[17] evaluated 137 renal arteries. Of these, 43 (31.3%) were found to be normal, 11 (8.1%) to have moderate stenoses, 70 (51.1%) to have hemodynamically significant stenoses, 7 (5.1%) to be obstructed, and 6 (4.4%) to have an inconclusive examination. The following were the arteriographic findings: There were 50 (36.5%) normal renal arteries, 10 (7.3%) moderate stenoses, 67 (48.9%) hemodynamically significant stenoses, 9 (6.6%) occluded renal arteries, and 1 (0.7%) had an inconclusive examination.

We found that the sensitivity of color doppler was 95.2%, specificity 96.2%, positive predictive value 89.4% and negative predictive value 82.1%.According to Missouris et al[18], renal duplex scanning with contrast enhancement results in more accurate and repeatable spectral waveforms as well as shorter exam times. In addition to a significant procedure time reduction, they showed a sensitivity of 85% and a specificity of 79% without contrast enhancement and a sensitivity of 94% and a specificity of 88% with contrast enhancement. Numerous epidemiological studies have demonstrated that atherosclerotic RAS is the primary cause of the increased prevalence of ischemic nephropathy in elderly patients. Atherosclerotic RAS has been linked, over the course of the last ten years, to an increasing number of end-stage renal diseases (ESRDs), accounting for between five and twenty-two percent of incident ESRD cases. The most frequent cause of secondary hypertension that may be treated and reversed is retinoic acid syndrome.

CONCLUSION
Authors suggested that acolor doppler can provide important details about renal artery stenosis. Renal hypertension may be avoided with an early diagnosis of renal artery stenosis.

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