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To determine diagnostic efficiency of vascular color Doppler ultrasound for renal artery stenosis

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Abstract

Background: Early diagnosis of RAS is an important clinical objective since interventional therapy may improve or cure hypertension and preserve renal function. The present study was conducted to determine diagnostic efficiency of vascular color Doppler ultrasound for renal artery stenoses.

Materials & Methods: The present study was conducted on 43 suspected of having renovascular arterial hypertension patients of both genders. All patients were subjected to vascular color doppler ultrasound 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 penetration (10-12 cm) of the ultrasound beam.

Results: Out of 43 patients, males were 22 and females were 21. Color Doppler of renal arteries, 14 were normal, 12 showed moderate stenosis, 8 had hemodynamically significant stenosis, 7 were obstructed and 2 were inconclusive. The difference was significant ($P < 0.05$). Sensitivity of color Doppler found to be 92.4%, specificity 91.5%, positive predictive value (PPD) 86.2% and negative predictive value (NPV) 88.1%.

Conclusion: Early diagnosis of renal artery stenosis may be helpful in preventing renal hypertension. Color Doppler provides useful information in renal artery stenosis.

Keywords: Color doppler, renal artery stenoses, renovascular arterial hypertension

Introduction

Renovascular disease is a complex disorder, most commonly caused by fibromuscular dysplasia and atherosclerotic diseases. It can be found in one of three forms: asymptomatic renal artery stenosis (RAS), renovascular hypertension, and ischemic nephropathy. Particularly, the atherosclerotic form is a progressive disease that may lead to gradual and silent loss of renal function^[1]. Thus, early diagnosis of RAS is an important clinical objective since interventional therapy may improve or cure hypertension and preserve renal function. Screening for RAS is indicated in suspected renovascular hypertension or ischemic nephropathy, in order to identify patients in whom an endoluminal or surgical revascularization is advisable. Screening tests for RAS have improved considerably over the last decade^[2].

The early diagnosis of patients suspected of having renovascular hypertension is important because of the risk of progression to renal insufficiency due to the nephropathic ischemia caused by lesions limiting the renal artery flow^[3]. The diagnosis of arterial hypertension resulting from renal artery stenosis may be established with the following different complementary examinations: determination of selective renin in the renal vein; functional study with radioisotopes; excretory urography; determination of the peripheral renin stimulated with captopril; magnetic angioresonance; angiography; and, more recently, vascular color doppler ultrasound^[4]. The present study was conducted to determine diagnostic efficiency of vascular color Doppler ultrasound for renal artery stenoses.

Materials and Methods

The present study was conducted in the department of Radiodiagnosis. It comprised of 43 suspected of having renovascular arterial hypertension patients of both genders. All were informed and written consent was obtained. Ethical clearance was obtained prior to the study.

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General data such as name, age, gender etc. was recorded. All patients were subjected to vascular color Doppler ultrasound 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 penetration (10-12 cm) of the ultrasound beam. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table 1: Distribution of patients

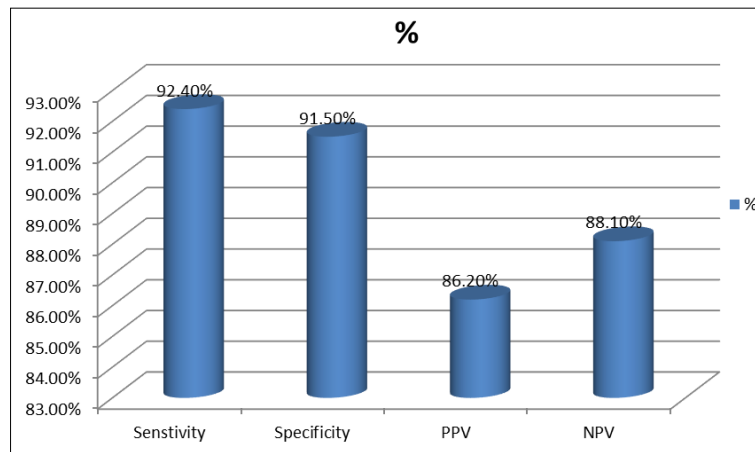
Total- 43		
Gender	Males	Females
Number	22	21

Table 1 shows that out of 43 patients, males were 22 and females were 21.

Table 2: Outcome of color Doppler

Diagnosis	Number	P value
Normal	14	0.021
Moderate stenoses	12	
Hemodynamically significant stenoses	8	
Obstructed	7	
Inconclusive	2	

Table 2 shows that in color Doppler of renal arteries, 14 were normal, 12 showed moderate stenosis, 8 had hemodynamically significant stenosis, 7 were obstructed and 2 were inconclusive. The difference was significant ($P < 0.05$).



Graph 1: Diagnostic ability of color Doppler

Graph I shows that sensitivity of color Doppler found to be 92.4%, specificity 91.5%, positive predictive value (PPD) 86.2% and negative predictive value (NPV) 88.1%.

Discussion

Screening tests for RAS have improved considerably over the last decade. Doppler ultrasound (US) of the renal arteries (RAs), angio-CT, or magnetic resonance angiography (MRA) has replaced other modalities and they are now considered the screening tests of choice [5]. An arteriogram is rarely needed for diagnostic purposes only. Color-Doppler US (CDUS) is a noninvasive, repeatable, relatively inexpensive diagnostic procedure which can accurately screen for renovascular diseases if performed by an expert. Moreover, the evaluation of the resistive index (RI) at Doppler US may be very useful in RAS affected patients for predicting the response to revascularization. However, when a discrepancy exists between clinical data and the results of Doppler US, additional tests are mandatory [6]. The present study was conducted to determine diagnostic efficiency of vascular color Doppler ultrasound for renal artery stenoses.

In this study, out of 43 patients, males were 22 and females were 21. We observed that in color Doppler of renal arteries, 14 were normal, 12 showed moderate stenosis, 8 had hemodynamically significant stenosis, 7 were obstructed and 2 were inconclusive. Egglin *et al.* [7] found that of the 137 renal arteries assessed on vascular color Doppler ultrasound, 43 (31.3%) were considered normal, 11 (8.1%) had moderate stenoses, 70 (51.1%) had

hemodynamically significant stenoses, 7 (5.1%) were obstructed, and in 6 (4.4%) arteries the examination was inconclusive. The arteriographic findings were as follows: 50 (36.5%) renal arteries were normal, 10 (7.3%) had moderate stenoses, 67 (48.9%) had hemodynamically significant stenoses, 9 (6.6%) were occluded, and in 1 (0.7%) the examination was inconclusive. After excluding the inconclusive examinations (7 arteries), the comparison of the methods in the remaining 130 arteries showed 116 (89.2%) concordant results and 14 (10.8%) discordant results.

It was found that sensitivity of color Doppler found to be 92.4%, specificity 91.5%, positive predictive value (PPD) 86.2% and negative predictive value (NPV) 88.1%. 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 [8]. Several epidemiologic studies have shown the elevated prevalence of ischemic nephropathy in elderly patients mainly due to atherosclerotic RAS. Over the past decade, data have accumulated implicating atherosclerotic RAS as an increasingly significant cause of end-stage renal disease (ESRD) ranging anywhere from 5% to 22% of incident ESRD patients. RAS is the most common potentially reversible and curable cause of secondary hypertension and renal failure [9].

The difficulties related to the direct evaluation of the stenosis (the mean examination time was 69 min for the complete examination and 14 min for the distal evaluation) have led several investigators to search for and to identify

waveform alterations, other than increased velocity, distal to the stenosis in arterial segments more accessible with Doppler US ^[10].

Conclusion

Early diagnosis of renal artery stenosis may be helpful in preventing renal hypertension. Color Doppler provides useful information in renal artery stenosis.

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