INTRODUCTION

Renal artery stenosis is the narrowing of one or both renal arteries or their branches that can cause hypertension by initiating the release of the enzyme renin from juxtaglomerular cells of the affected kidney. The cross section of the lumen must be decreased by at lest 60% before the occlusion becomes hemodynamically significant. It is the most frequent cause of curable hypertension but it accounts for less than 2% of all cases of hypertension. (***1)***

Renal artery stenosis most commonly caused by fibromuscular dysphasia. However among patients with a significant RAS, only two thirds show improvement of hypertension after revascularization and 27%-80% show improvement or stabilization of renal function. When left untreated, atheromatous RAS tends to worsen, leading to renal artery thrombosis. ***(2)***

Hypertension is a major cause of disability and death throughout the world. Renal artery stenosis is an etiological factor for a small but significant component of this disease with varying estimation of prevalence from l%-10% of patient with hypertension screened ***(3)***

Individuals who develop hypertension between the ages of 30 and 55 are most likely to have primary (essential) hypertension. If the initial diagnosis of hypertension in an adult is made before the age of 30, it is usually the result of fibromuscular dysplasia. Because atherosclerosis occurs in older individuals, it is usually the cause of RAS after the age of 55y. Accelerated or malignant hypertension has also been associated with a very high prevalence of RAS. Resistant hypertension is defined as failure to normalize blood pressure <140/90 mm Hg. ***(4)***

Atherosclerotic renal artery stenosis is the most common primary disease of renal arteries and it is associated with two major clinical syndromes, hypertension and ischemic renal disease. ***(5)***

Atherosclerosis and its related sequelae are leading causes for morbidity and mortality in the western world while hypertension is common in patients with diabetes with nephropathy, occurring in 75% to 85 % of cases. Renovascular hypertension has emerged as the most common reversible cause of secondary hypertension. (***5)***

In addition, medical treatment of renovascular hypertension caused by renal artery stenosis has been proved to be less effective than percutaneous or surgical revascularization Therefore, patients suspected of having RAS should undergo adequate screening. ***(4)***

With the increase in prevalence of renal artery stenosis and ischemic nephropathy clinicians dealing with renovascular disease need noninvasive diagnostic tools and effective therapeutic measures to resolve the problem successfully. ***(6)***

Ultrasonography, Color Doppler Ultrasound, and Magnetic Resonance Angiography (MRA), Spiral Computed Tomography Angiography (CTA), Digital subtraction Angiography (DSA) and Renal scintigraphy can be used in combination to achieve adequate screening of patients. This article describes the roles of these modalities in diagnosis of renal artery stenosis (RAS) and presents an algorithm for their use. ***(7)***

ULTRASONOGRAPHY is ideally suited for imaging kidneys. The renal cortex, medulla, and collecting system have different acoustic properties, and pathological changes are easily discernible and correlate well with histological findings. Furthermore, kidneys are easily visualized and show a limited spectrum of anatomic variation and pathological changes. The safety, simplicity and low cost has made sonography perfect tool in nephrology ***(7).***

Color Doppler ultrasound has emerges as a reliable method helping in the diagnostic work-up of patients with suspected renovascular disease as renal artery stenosis that causes renovascular hypertension ***(8).***

Color Doppler has the advantages of being noninvasive and inexpensive. However, regard to the role. Two approaches are used to detect RAS with Doppler US; direct visualization of the renal arteries and analysis of intrarenal Doppler waveforms ***(9).***

The first approach involves direct scanning of the main renal arteries with color or power Doppler US followed by analysis of renal artery velocity with spectral Doppler US **(10).**

Magnetic resonance angiography (MRA) has a major role in diagnosis of renal artery stenosis in addition, in recent study it has been used to measure the direct pressure in renal artery across the stenotic tract ***(11).***

Renal magnetic resonance (MR) angiography allows accurate evaluation of patients suspected to have renal artery stenosis without the risks associated with nephrotoxic contrast agent, ionizing radiation, or arterial catheterization. Other applications of renal MR angiography are mapping the vascular anatomy for planning renal revascularization planning repair of abdominal aortic aneurysm, assessing renal bypass grafts and

renal transplant anastomosis, and evaluating vascular involvement by renal tumors ***(12).***

Gadolinium-enhanced MRA is now available on high field strength imaging systems with high performance gradients, which are capable of performing breath, hold three-dimensional spoiled gradient echo imaging with short repetition times and echo times ***(13).***

Spiral CT angiography is able to image large columns of tissue very rapidly in a20-30s breath-hold have lead to the development of CT angiography. This produces higher quality axial images with better contrast enhancement than conventional CT and has the added advantages of being able to produce 2D coronal, sagittal, oblique and curved planar reconstructed images as well the 3D maximum intensity projection (MIP) and shaded Surface Display (SSD) reconstructed M images ***(14).***

Renal angiography is the undisputed golden standard in the diagnostic workup for evaluation of renovascular disease ***(15).***

Digital subtraction angiography (DSA) has become a well established modality for visualization of blood vessels in the human body. With this technique, sequence of 2D digital X-ray projection image is acquired to show the passage of a bolus of injected contrast material thought the vessel of interest.

Intra-arterial digital subtraction angiography (**DSA**) allows excellent visualization of all portions of the renal artery and can determine accurately whether the artery is normal, stenotic, or occluded Nevertheless angiography is invasive and costly when compared with other imaging modalities. Angiography is a poor screening test for renal artery stenosis ***(16).***

Renal scintigraphy has an important role in diagnosis of renal artery stenosis and kidney with renovascular hypertension may exhibit impaired function during (**ACEI**), this phenomenon is observed mainly in patients with bilateral RAS or with arterial stenosis in a solitary kidney; it is believed to be caused by disruption of the auto regulation system of the glomerular filtration rate (**GFR**). In patients with unilateral renal artery stenosis, a unilateral change in renal function induced by ACE inhibition can be revealed with scintigraphy. ***(17)***

Baseline and Captopril enhanced 99mTc-mercaptoacetyltriglycine (99mTc-MAG3) Scintigraphy using a 1- day 25-mg Captopril protocol, was recommended by the Working Party Group on Determining the Radionuclide of Choice ***(18).***