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Role of Renal Resistive Index as a Marker for Evaluation of Chronic Kidney Diseases in Screened 100 Patients.

KEYWORDS: RenalDoppler, chronic kidney disease, resistive index, renal pathology.

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ABSTRACT *Ultrasound Doppler examination is a non-invasive diagnostic technique that is used on patients with suspected or established renal disease. The purpose of this study was to determine the role of intrarenal Doppler ultrasonography in the assessment of the chronic kdney disease. This retrospective analysis of 100 patients who were referred for Renal Doppler ultrasonography was done. Resistive index (RI) of the interlobar arteries were documented.*

INTRODUCTION:

Chronic kidney disease (CKD) is a risk factor for end-stage renal disease (ESRD). Early detection and timely management are essential for the medical care of patients with CKD. In clinical practice, information derived from kidney biopsies is commonly considered a 'gold' standard that establishes the histopathological patterns concerning renal injury. However, biopsies are invasive and may result in various complications, including gross hematuria, and major complications that may eventually result in renal failure (1). Thus, certain disorders, including coagulopathy, are contraindicated for biopsy. Alternatively, Doppler sonography is a noninvasive method of examination that is widely used for the evaluation of patients with CKD.

Morphological changes associated with renal dysfunction, including the size, parenchymal echogenicity and corticomedullary differentiation of the injured kidneys, may be shown by sonography. However, these parameters lack specificity in the assessment of renal failure (2). Furthermore, it has been reported that the morphological changes detectable by sonography appear much later than the biochemical indicators, including increased serum creatinine levels (3).

An increased resistive index (RI) has been reported to correlate with glomerulosclerosis (GS), tubulointerstitial damage (TI) and vascular lesions (4). However, the results are not consistent (5). More notably, a previous study regarding renal histology has investigated small populations, and correlation analysis between reduced Doppler velocity in the interlobar arteries and histopathological changes in the impaired kidney is lacking (6).

The present study aimed to evaluate the correlations of a number of Doppler parameters, not only the RI but also the peak systolic velocity (PSV) and end-diastolic velocity (EDV).

EXAMINATION TECHNIQUE AND NORMAL ANATOMY:

Renal Doppler requires a great amount of skill due to the depth of the arteries, the motion imposed by respiration and intra-abdominal gas. The patients should therefore be examined early in the morning if at all possible after a 12 hrs overnight fast. This will diminish the amount of bowel gas and also ensure that the stomach is empty.

The procedure begins with the patient in the supine position. A low-frequency transducer (2.5-5.0 MHz) is used to depict the abdominal aorta and renal arteries. The main approaches for imaging the RAs are through the anterior abdominal wall, the oblique and fank (Figure1, 2, 3). In most cases the anterior approach is used to evaluate the main RAs. The flank approach may be used to image both the intrarenal vasculature and the main RAs.

The RAs originate from the lateral sides of the aorta typically at the level of the superior border of the second lumbar vertebra, directed slightly anteriorly, usually 1-2 cm below the superior mesenteric artery origin. The right RA originates from the anterolateral aspect of the aorta and immediately turns posteriorly to course beneath the inferior vena cava (IVC). The left RA tends to originate from the posterolateral surface of the aorta and courses posteriorly the surface of the aorta and over the psoas muscle. An aid to locating the left RA is to first identify the left renal vein, which is usually large and easy to find. Once the vein is identified, the artery will often be apparent as a smaller vessel directly behind it, coursing in the opposite direction.

The main RA divides at the hilum, either within or outside the kidney, into anterior and posterior branches that further divide into segmental and then interlobar arteries. The interlobar arteries further divide into a network of arcuate arteries that run at the corticomedullary junction and give off the cortical (interlobular) branches, which run radially towards the periphery, and the medullary branches, which supply the renal pyramids. The renal veins usually follow the course of the arteries running in a more ventral posi-

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tion. Approximately 20-30% of patients have one or more accessory renal arteries.

The right renal vein runs in a postero-anterior direction, with a short course to reach the IVC. The left vein is more horizontal and passes between the abdominal aorta and the superior mesenteric artery before entering the IVC.

Figure 1: Anterior approach: Renal arteries are clearly imaged in B Mode from an anterior, subcostal approach however as it is perpendicular to the ultrasound beam it is not suitable for Doppler assessment.

Figure 2: Oblique approach: By moving the probe to the left of midline and angling toward the patient's right, an acceptable Doppler angle of 60 degrees is achieved.

Figure 3: Flank approach: This view provide excellent angle for imaging the origin of both the right and left renal arteries using Color/ Power Doppler.

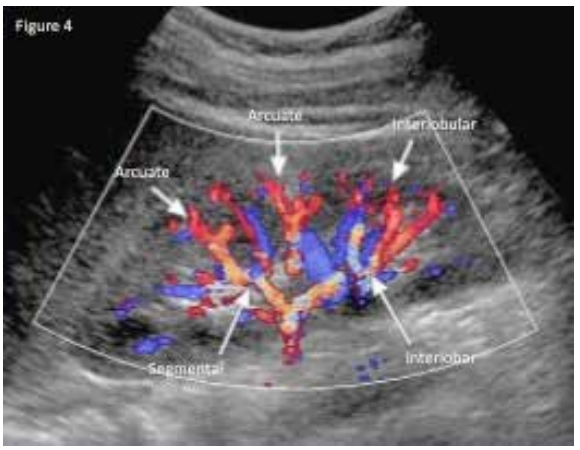

Figure 4: Renal arterial anatomy

RESULT:

Out of the 100 patients screened 43 patients had sonographic findings and renal functions suggestive of renal parenchymal disease, however only 29 of these patients had raised RI values. The average value came out to be more the .07 depending upon the severity of the disease in these patients.

Hence the increased RI value showed poor logarithmic correlation (r = 0.19) with the severity of vascular and interstitial damage, and therefore cannot be taken as a powerful predictor of disease progression.

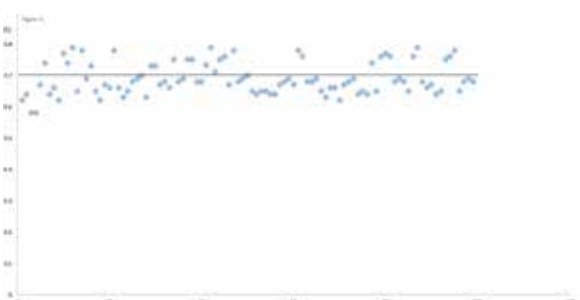

Figure 5: Out of the total sample of 100 patients, 32 patients showed raised RI value i.e. >0.7.

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