Original Research Paper

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Radiodiagnosis

ROLE OF USG IN DETECTING EARLY RENAL PARENCHYMAL DISEASE

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ABSTRACT

Background : Renal parenchymal disease is quite common in the elderly population, although young population are not immune. It causes significant morbidity and mortality cutting across races. Early diagnosis can reduce the suffering and prolong life in this subset of population. Ultrasonography is a reliable, non invasive modality for detection of renal parenchymal disease.

Aims : In this study, we evaluated the efficiency of ultrasonography in detecting early renal parenchymal disease with borderline elevation of serum creatinine level (<2) mg/dL.

Material &Methods : We selected 100 cases with marginally raised serum creatinine level. All of the selected cases has serum creatinine level less than 2 mg/dL. Five criteria were evaluated- renal size, cortical echogenicity, cortical thickness, renal parenchymal thickness, cortico-medullary differentiation and inference was drawn based on these criteria.

Results : All the 100 cases has normal kidney length ranging from 8.5 cm to 11.4 cm. Cortical thickness was normal in all cases ranging from 0.59 cm to 1.09 cm. Parenchymal thickness was normal in all cases ranging from 1.21 cm to 2.2 cm. Cortical echognicity was raised in 78 cases (equal to liver in 60 cases, more than liver in 18 cases). Cortico-medullary differentiation was maintained in 86 cases and ill distinct in 14 cases.

Conclusion : Ultrasonography is a reliable investigation in detecting renal parenchymal disease even in early stage and can help seek therapeutic attention to decelerate or halt the Progression of disease thereby reducing morbidity and prolonging productive life.

KEYWORDS : Renal parenchyma,Ultrasonography,renalsize,corticalechogenicity,corticalthickness,renal parenchymal thickness,cortico-medullary differentiation , serum creatinine .

Introduction :

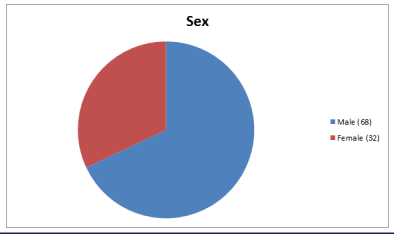
Renal parenchymal disease is a global health problem and the incidence is gradually on the rise. Although elderly people are the most common victims, young generation is by no means immune. Renal parenchymal disease is defined as decreased renal function passing over several stages (1 to 5) finally culminating into one necessitating dialysis. Multiple causes are responsible e.g. hypertension, diabetes mellitus, analgesic uptake, autoimmune diseases, gout etc. Of these, hypertension is both a cause and effect of renal parenchymal disease.[1,2] Most reliable criteria are reduced GFR, albuminuria >30 mg/24 hr or albumin creatinine ratio > 30 mg/g and increases serum creatinine level. Depending on the stages, the GFR progressively declines from > 90 ml / min / 1.73m^2 to < 15 ml / min / 1.73 m^2 (stage 5) and creatinine (stage I) level steadily rises from 1.5 mg/dL. But detection of stage I and 2 renal parenchymal disease is most challenging as the symptoms are trivial, biochemical parameters are high normal oronly borderline raised. Typical clinical manifestations like anaemia, oedema (peripheral and pulmonary), fatigue, cardiovascular symptoms, peripheral neuropathy, encephalopathy etc, take years to develop. USG is a widely available, non invasive modality which can detect renal parenchymal disease basedon increased cortical echogencity and reduced cortical parenchymal thickness as well as reduced renal size.[3]Although gray scale USG findings are nonspecific,it is of great help in evaluating renal parenchymal diseases.[4]

Material and methods :A total of 100 cases refereed from various departments – both out patient department (OPD) and in patient department (indoors) of Bankurasammilani Medical College, Bankura, West Bengal, India were selected based on , marginally raised serum creatinine levels (<2 mg/dL). Five criteria were selected for evaluation. These are renal size, cortical echogenicity, cortical thickness, renal parenchymal thickness and cortico medullary differentiation[5]. Patients were evaluatedindependently by two consultant radiologists and one was blinded to the findings of another radiologist and inference was based on consensus. Curvilinear probe of 2-5 MHz frequency of HD7 USG machine(Philips) was used for the purpose.During examination patients with fatty liver, non-renal causes of increased serum creatinine level like increased meat uptake, myopathies, dehydration etc.were excluded from our study. Likewise patients on dialysis, those with single kidney, transplant kidney were excluded from our study. Results were plotted in charts, the data were analysed using one way ANOVA method .

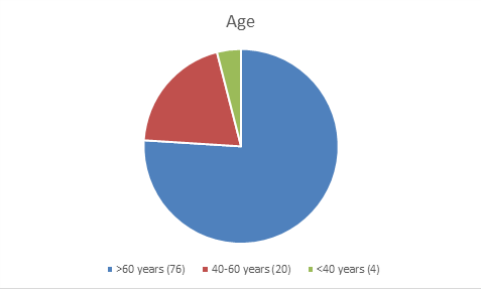
Results : Of the 100 cases, 68 were males and 32 were females. 76 were above 60 years of age, 20 were between 40 and 60 years and 4 patients were below 40 years of age. 1 patient belonged to paediatric age group (8 years). Except the paediatric patient all had a renal length between 8.5 cm and 11.5 cm. 70 patients had renal length between 9 and 11.2 cm, 18 patients had renal length 11.2 cm and 11.5 cm and 11 patients had renal length between 8.5 cm and 11.1 cm. The child participant had renal length of 8 cm. Cortical echogenicity was raised in 78 cases (equal to liver in 60 cases and more than liver in 18 cases) of these 78 cases of raised echogenicity 56 were males and 22 were females. Cortico-medullary differentiation was maintained in 86 cases and ill – distinct in 14 cases .Of these 14 cases with ill-distinct cortico-medullary differentiation, 10 were males and 4 were females. Parenchymal thickness was normal in all the adult cases ranging from 1.1 cm to 1.4 cm. Cortical thickness was also normal in all the adults cases ranging from 0.8 cm to 1.1 cm the child participant had a cortical length of 0.6 cm and parenchymal thickness of 1 cm.

Charts :-

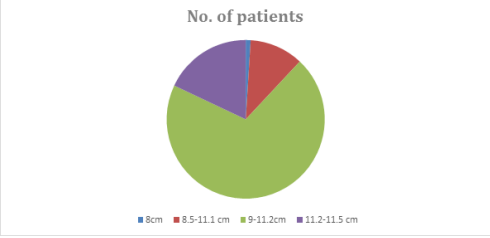
1) Sex distribution



2) Age distribution

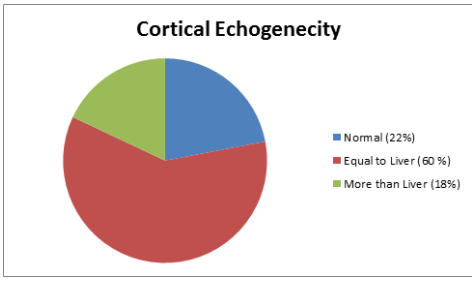


3) Renal length

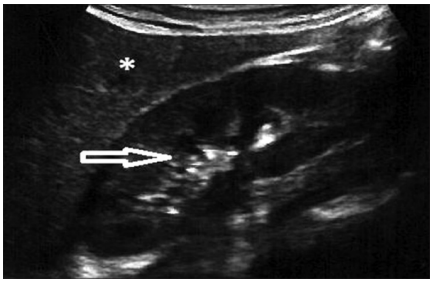


Renal length	No of patient
9- 11.2cm	70
11.2-11.5 cm	18
8.5-11.1 cm	11
8cm	1

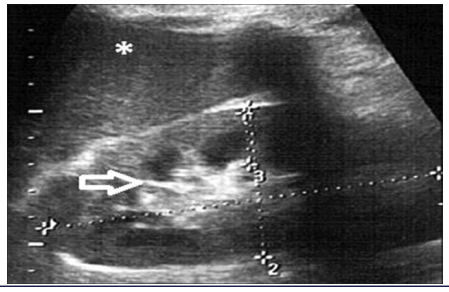
4) Renal cortical echogenicity



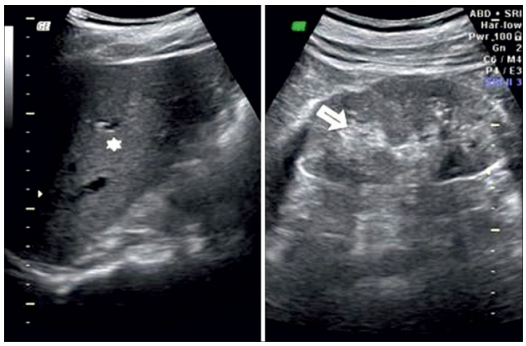
Cortical Echogenecity:	Patient No
Normal	22
Equal to Liver	60
More than Liver	18



Ultrasound of abdomen (longitudinal section) shows renal cortical echogenicity - Normal, echogenicity less than liver (star), with maintained cortico-medullary definition (arrow) of right kidney.

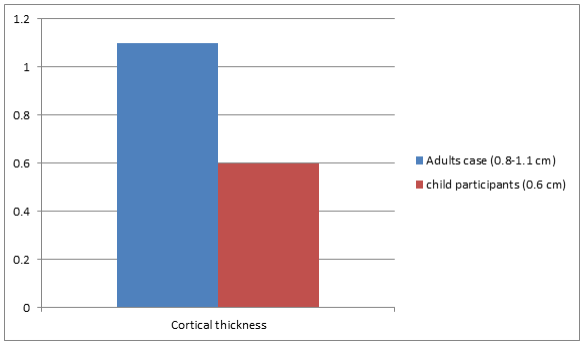


Ultrasound of abdomen (longitudinal section) shows renal cortical echogenicity - Echogenicity same as the liver (star), with maintained cortico-medullary definition (arrow) of right kidney.



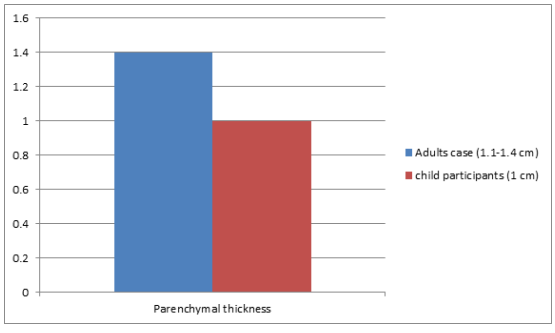
Ultrasound of abdomen (longitudinal section) shows renal cortical echogenicity - Echogenicity more than the liver (star), with maintained cortico-medullary definition (arrow) of left kidney.

5) Cortical thickness



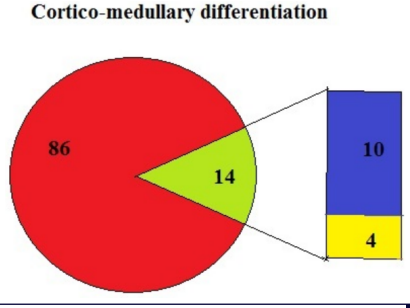
Cortical thickness	
Cases	Length
Adult case (99)	0.8 cm – 1.1 cm
Child case (1)	0.6 cm

6) Parenchymal thickness



Parenchymal thickness	
Cases	Length
Adult case (99)	1.1 cm – 1.4 cm
Child case (1)	1.0 cm

7) Cortico medullary differentiation



Cortico-medullary differentiation	Number
Cortico-medullary differentiation maintained	86
Cortico-medullary differentiation not maintained	14
Cortico-medullary differentiation not maintained (male)	10
Cortico-medullary differentiation not maintained (female)	4

Discussion :

Renal parenchymal disease is a worldwide health problem. It causes significant morbidity and mortality and poses enormous financial burden on the family in particular and the society in general. Elderly people are the common victims but it can affect any age group. Hypertension and diabetes are the most common causes cutting across race, religion and geographical boundaries. Early diagnosis can help institute early treatment thereby halting the progression of the disease. Serum creatinine level is an established marker of the severity of renal parenchymal disease. But the patients do not become symptomatic early in the course of the disease i.e. when serum creatinine level is low. Ultrasonography is a widely available non-invasive modality of investigation for a variety of abdominal pathologies encompassing all aspects – medical, surgical, gynaecological – obstetrical etc. The patients may come with an unrelated subset of symptoms which have no bearing on renal pathology. But during performing the procedure the radiologist can detect subtle changes in the renal parenchymal echogenicity which is an harbinger of renal parenchymal disease and suggest further biochemical investigations particularly serum creatinine to confirm or exclude the presence of renal parenchymal disease. In our study, 78 out of 100 cases (%) with borderline raised creatinine level (<2 mg/dL) showed increased renal cortical echogenicity. All these patients had creatinine level between 1.7 and 2 mg/dL. In 22 cases, no significant changes in renal parenchyma could be detected on ultrasonography. These subset of population had creatinine level between 1.3 and 1.6 mg / dL. Hence we reached a conclusion that ultrasonography is quite reliable in detecting early renal parenchymal disease in patients with creatinine level more than 1.7 mg/dL.

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