RENAL ULTRASOUND INDICES IN JOS.

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ABSTRACT

This work was aimed at establishing ultrasonographic renal parameters that could serve as ready references for the sonographer. It was a prospective study carried out at the Jos University Teaching Hospital from January 1st 2003 to December 31st 2003. One hundred randomly selected patients who met the inclusion criteria were scanned. There were 61 and 39 males and females respectively (male: Female ratio of 1.6:1), with an age range of 10 – 85yrs.

The kidneys had a mean bipolar length of 10.0+/- 1.0cm, width of 4.2 +/- 0.6, antero-posterior diameter of 2.8 +/- 0.8cm and mean cortical thickness of 1.4 +/- 0.4

No statistically significant difference in renal dimensions was found between the right and left kidneys ($p>0.2$), between the sexes ($p>0.8$) and no difference amongst the age-groups studied ($p>0.7$). Importantly too, the renal dimensions in Jos fall within quoted international reference values with declining renal dimensions from the age of 60years.

Key words: renal, ultrasound, size

INTRODUCTION:

The kidneys are paired retroperitoneal organs which lie obliquely along the lateral borders of the psoas muscles [1] with the right kidney at a slightly lower level than the left because of the compressive effect of the liver. The left kidney tends to be slightly longer than the right with both kidneys descending downwards by as much as 2.5cm during inspiration.[8] Despite these variations in anatomy, both kidneys generally attain the same dimension in adults of 9cm to 12cm length, 2.5cm to 3cm, antero – posterior diameter, 4cm to 5cm width and 1to2cm cortical thickness with no significant difference between the sexes[3]. Knowledge of these normal reference ranges will help sonographers as well as clinicians to quickly detect abnormal cases and investigate or refer appropriately. The reference ranges above are used internationally and paucity of data for our environment was what prompted this study.

METHODOLOGY:

This was a prospective study on randomly selected patients of all age groups and sexes, carried out at the Jos University Teaching

Hospital by the authors from 1st January 2003 - 31st December2003. This hospital is a tertiary health care centre located in the middle belt region of Nigeria. Excluded from the study were patients with clinical or biochemical evidence of renal impairment, pregnant women or patients found on sonography to have any renal abnormality e.g. hydronephrosis, cyst, etc. Patients with solitary kidneys from any cause were also excluded from the study.

The ultrasonography was carried out using Ultramark-9 HDI ultrasound machine, manufactured in 1993 by Advanced Technology laboratories; Bothell WA 98021 USA. The scan was done using 2-4 MHz probes. The liver and spleen were used as acoustic windows to visualize the right and left kidneys respectively. All measurements were taken with the patients in prone position.

All records were entered on epi-info version 3.2.2 with information on diagnosis, length, breadth, antero-posterior diameter, minimum and maximum cortical thicknesses for both kidneys. Analysis was for means, standard deviation and percentages. Students t-test was used to test for significance at a level of significance of $p < 0.05$.

RESULTS:

The mean age of the study population was 36.7 +/- 13.7yrs with an age range of 10 to 85years. There were 61 and 39 males and females respectively(male: female ratio of 1.6:1).The kidneys had a mean bipolar length of 10.0+/- 1.0cm, width of 4.2 +/- 0.6, anteroposterior diameter of 2.8+/- 0.8cm and mean cortical thickness of 1.4+/- 0.4cm.(Table 1)

Figure1 shows the mean length and trend with age in the various age groups.

Fig.1. Mean ultrasonographic renal lengths and trend in the different age groups

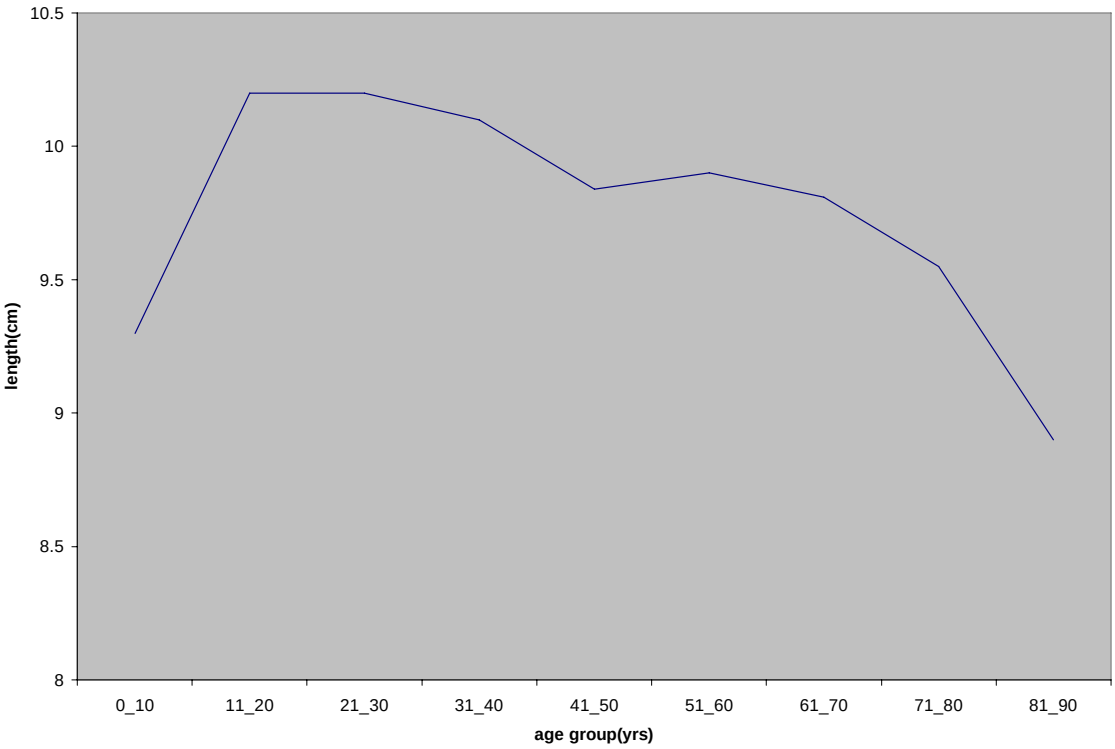

Table1. Mean renal dimensions of the right and left kidneys

Length	Width	A-P diameter	Cortical thickness
Right =9.95+/-0.86	4.32+/-0.64	2.87+/-0.86	1.36+/-0.49
Left = 10.07+/-1.10	4.15+/-0.60	2.85+/-0.68	1.38+/-0.31

DISCUSSION

The adult kidney develops from the metanephric duct system which arises from the twenty eighth somite; at the level of the fourth lumbar segment but later ascends to the level of the first lumbar segment and the glomeruli are fully functional at thirty sixth week of gestation. The kidneys progressively increase in size reaching adult size at about ten years of age, and the size of the kidney for any age group can be calculated by the following formulae; kidney size

=6.79 + 0.22 x age (yrs) [6] With this formula, a ten year old will have a renal length of 8.99 which agrees with that found in this study.

The kidneys measure 10.0cm in length, 4.2cm in width, 2.8cm in antero-posterior diameter and 1.4cm mean cortical thickness with no significant difference in renal dimensions between right and left kidneys($p>0.2$), between the sexes($p>0.8$) and between the age groups($p>0.7$). The compensatory renal hypertrophy that occurs with a solitary kidney, disease of a kidney, transplantation or removal of a kidney[6] and the physiologic hypertrophy of the kidneys in pregnancy is the rationale behind the exclusion of these categories of patients from the study. An important finding in this study is the steady rise in renal length from the age of ten years with maximum length noticed in the 20-30years age group and a steady decline from 60years up to the age of 85years. This is in agreement with the findings of Akpinar et al which showed declining renal size from the age of 60 years[9]. This decline in renal dimensions with age may have a correlation with the declining renal function noticed in the elderly.

Many factors affect sonographic renal measurements amongst which are intra and inter-observer errors and efforts were made in this study to reduce the latter by ensuring that the same sonographer did all the scans. Other factors affecting renal length are the age, height and build[7] of the patient with the best correlation to renal length being the height of the patient. From a physiologic standpoint, renal volume is more sensitive than any single linear measurement and is the most useful in detecting disease. The renal volume is calculated from the formula[8]; length x width x antero-posterior diameter x 0.5 and the measurements in this study allow the sonographer to calculate this renal volume. Ultrasonography provides a simple non invasive way of assessing the size of the kidney in health and disease, with acute diseases of the kidney affecting the renal parenchymal echo texture while the chronic diseases lead to reduction in renal dimensions.[2]

Our study documents that ultrasonographic renal dimensions in Nigerians correlates well with internationally documented values and this study provides easy reference valies for ultrasonographers.

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