Ultrasonographic Measurements of Kidney Dimensions of 109 Filipinos in South Luzon – A Descriptive Study

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ABSTRACT

Objective. The aim of this study is to measure the size of the kidney of Filipino patients, considered as having normal kidney size, in three dimensions, using ultrasound.

Methods. The ultrasound reports of 109 Filipino patients of a tertiary hospital south of Metro Manila were collected. LENGTH, WIDTH and HEIGHT of each kidney were tabulated and any associated condition seen during the procedure was noted. The ultrasonographic examination was done by only one board-certified radiologist.

Results. Based on ultrasonographic measurements, the average length, width and height of the right kidney are 10.38 cm, 5.30 cm and 3.82 cm, respectively. The left kidney has mean measurements of 10.32 cm, 5.15 cm and 4.10 cm for length, width and height, respectively. The presence of co-morbid conditions did not significantly alter the size of the kidneys.

Conclusion. These measurements conform to the standard measurements reported in earlier local researches and in standard textbooks with non-Filipino subjects. This study offers no new findings and just reaffirms what has already been reported. The data presented in this paper will hopefully emphasize the importance of looking at kidney size in the assessment of possible kidney pathology.

Key Words: descriptive study, ultrasonographic measurement, kidney dimensions

Introduction

There are so many Filipinos afflicted with renal disease. According to the Department of Health report of 2009, it ranks number 10 in the list of top causes of mortality among Filipinos. An ultrasound study of the kidneys has become a routine diagnostic examination in the evaluation and/or assessment of the status of the kidneys of patients with a possible renal problem. The sonographic measurements of both the right and left kidneys are always part of the final radiologic reports. Nephrologists and urologists use these reports in the evaluation of the renal status of their patients.

Renal ultrasonography helps establish the diagnosis and corresponding prognosis by documenting the size of the kidneys. Normal size indicates kidney disease that may be amenable to medical treatment. Small kidneys suggest irreversible disease. Asymmetry in kidney size suggests renovascular disease.[1]

The measurements of the kidney size in Filipino patients has undoubtedly been based mainly on ultrasonographic measurements and partly on radiographic and computed tomographic images. Ultrasonography offers a useful, non-invasive and relatively inexpensive method of measuring kidney size. In 1999, there was a published research study on the sonographic and radiologic renal dimensions among healthy Filipino adults by Villaroy and Morabe at the NKTI Proceedings. Another follow up paper on renal dimensions was published in the same journal. Unfortunately, access to the medical journal containing such studies was unavailable. Measurement of kidney size is therefore obviously very important in the assessment of patients suspected of having a renal pathology. Measurements that deviate from what is established as normal dimensions give us reason to suspect renal pathology in our patients.

Kidney size is likewise an important parameter in the assessment of a child with renal disease. Renal diseases may increase or decrease the size of the kidney, which may or may not be accompanied by changes in normal organ architecture.[2]

It is therefore important for us to know the normal limits of kidney size in our patients. Renal ultrasound is recommended not only because of its greater accuracy for measuring kidney size but also because of its harmlessness.[3]

Purpose of this study

This study will be a descriptive report on the size of the kidneys based on ultrasonographic measurements of these retroperitoneal organs of a number of Filipino patients assessed as having normal kidney sizes. It will also try to determine if these measurements conform to the standard dimensions of the kidneys as reported in the literature.

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Methods

This is a cross-sectional study of ultrasound reports of patients who underwent abdominal ultrasonography for a variety of indications in a tertiary medical center south of Metro Manila from the period September to December 2009. The ultrasound examination was done by a single board-certified radiologist with certified training in ultrasonography and who is also affiliated with a renowned tertiary hospital in Metro Manila. Those who had final reports of normal kidney sizes based on these ultrasonographic measurements were included in this study including those with associated findings like a small, non-obstructing nephrolithiasis that would not however, alter the size of these retroperitoneal organs. Those with reports of normal size of the kidneys but with changes in its echogenicity as well as its cortico-medullary thickness were excluded.

Each kidney was measured in three dimensions, LENGTH, WIDTH and HEIGHT. The LENGTH was measured as the distance from the superior pole to the inferior pole of the organ; the WIDTH diameter as the length from the dorsal border to the medial border in the hilum; and the HEIGHT as the measurement from the anterior to the posterior surface at its midpoint (Figure 1).

Data gathered were encoded using Microsoft excel and analyzed using Epi-info v 6. Descriptive statistics were utilized with mean and the standard deviation calculated for each of the three dimensions measured in each kidney. Cross-tabulation of the categorical data for presence and absence of co-morbidities was done and comparison of mean kidney sizes were presented.

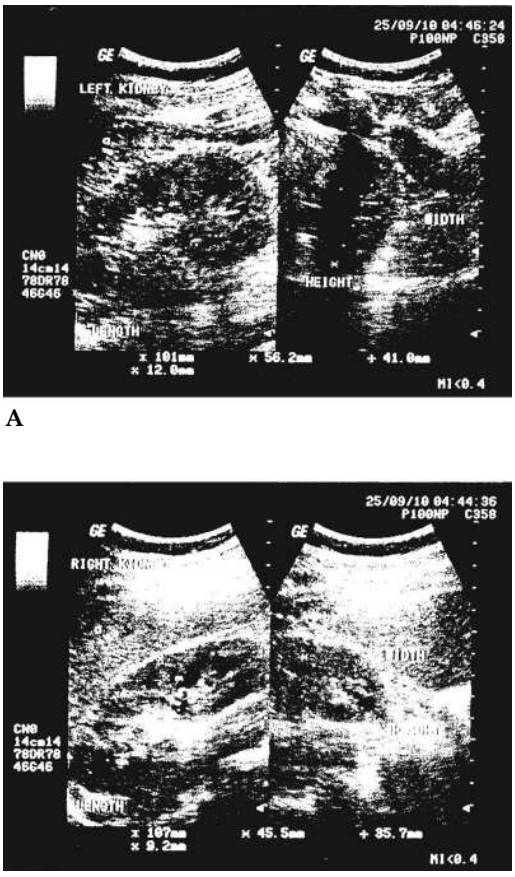

Figure 1. Sonographic measurements of the normal kidneys. A. Left Kidney (a) sagittal section showing the length; (b) cross section showing the width and height of the kidney. B. Right Kidney (a) sagittal section showing the length; (b) cross section showing the width and height of the kidney.

Results

A total of 109 cases with ultrasonographic measurements of kidney size interpreted as normal were available for inclusion in the study. The data gathered were submitted for descriptive analysis as to the mean and its standard deviation for length, width and height as well as the age and sex of the patients. Table 1 shows the ultrasonographic measurements of the kidney size. The mean age for this group is 44 years with more females than males.

Based on the available data on the ultrasonographic measurements of the kidneys, the average length, width and height of the right kidney are 10.38 cm (±0.75), 5.30 cm (±0.58) and 3.82 cm (±0.66), respectively. The dimensions of the left kidney showed a mean of 10.32 cm (±0.75), 5.15 cm (±0.53) and 4.19 cm (±0.51) for length, width and height, respectively. The mean of each renal dimension was almost the same for both the right and left kidneys.

As to the sex of the subjects, the mean dimensions of the right kidney as to length, width and height in males were 10.55 cm (±0.79), 5.48 (±0.62) cm and 4.01 (±0.65) cm, respectively. In females, they were 10.72 (±0.81) cm, 5.2 (±0.52) cm and 3.69 (±0.63) cm, respectively. With regard to the left kidney, the mean length, width and height in females were 10.32 (±0.64) cm, 5.06 (±0.47) cm and 4.13 (±0.48) cm, respectively. In males, they were 10.30 (±0.89) cm, 5.29 (±0.57) cm and 4.28 (±0.55) cm for length, width and height, respectively. There appears to be no marked difference in the dimensions of the kidneys between males and females.

When there are co-morbidities present as shown in Table 2, the mean length, width and height measurements of the right kidney were 10.39 (±0.82) cm, 5.30 (±0.59) cm and 3.79 (±0.64)cm, respectively. When no co-morbid conditions exist, their three dimensions were 10.36 (±0.80) cm, 5.31 (±0.57) cm and 3.87 (±0.69) cm for length, width and height, respectively. As for the left kidney, when co-morbid conditions exist, the mean for the three dimensions were 10.32 (±0.83) cm, 5.17 (±0.47) cm and 4.16 (±0.52) cm for length, width and height, respectively. The same dimensions for those with no co-morbidities were 10.36 (±0.56)cm, 5.12 (±0.62) cm and 4.24 (±0.51) cm for length, width and height,

respectively. The presence of co-morbid conditions does not affect the size of the kidneys.

It would seem that the mean measurements of the three dimensions of the kidneys are not much different from what is written in standard anatomy textbooks with western authors. There is also no difference in the measurements of the kidney with regard to sex, laterality and the presence of certain co-morbid conditions. It has to be pointed out however, that the co-morbid conditions that exist in these patients include conditions like a non-obstructing nephrolithiases, cholecystolithiases, fatty liver, ovarian mass, simple renal cyst and a few other conditions that will unlikely cause any obstruction to the urinary outflow and hence, affect the kidney size.

Table 1. Description of measurements of renal dimensions by ultrasonographic examination among 109 adult Filipinos

	Kidney Measurement Ultrasound (N=109)
Age, X(SD) years	43.98 (±12.03)
Sex, %	
Female	62% (67)
Male	38% (42)
Kidney Measurements, cms	
Right	
Length	10.38 (±0.75)
Width	5.30 (±0.58)
Height	3.82 (±0.66)
Left	
Length	10.32 (±0.75)
Width	5.15 (±0.53)
Height	4.19 (±0.51)

Table 2. Size of the right and left kidney in patients with and without co-morbid conditions

Measurements (cm)	Without Co-Morbidity (N=36)	With Co-Morbidity (N=73)
Left kidney		
Length	10.36 (± 0.56)	10.32 (±0.83)
Width	5.12 (± 0.62)	5.17 (±0.47)
Height	4.24 (± 0.51)	4.16 (±0.52)
Right Kidney		
Length	10.36 (±0.80)	10.39 (±0.82)
Width	5.31 (±0.57)	5.30 (±0.59)
Height	3.87 (±0.69)	3.79 (±0.64)

Other authors have found that the left kidney is bigger than the right one but only in studies in children. The population comprising this series is made up of adults whose right and left kidneys are basically similar in size.

Discussion

Ultrasound examination for the kidney dimensions has been used in the evaluation of the normal growth and development of these organs even in fetal life.[4] Clinicians rely significantly on the initial ultrasonographic findings of their patients when they evaluate those patients suspected of having renal pathology. It is thus imperative for clinicians to know the normal range of renal dimensions in ultrasonographic reports before they can label the kidneys as below or above normal in size and thus, plan the management accordingly. Although this paper is only a descriptive study, the data presented will still be helpful in the evaluation of our patients with suspected renal conditions.

During life, the kidneys measure approximately 10 cm in length, 5 cm in width, and 2.5 cm in thickness.[5] In the textbook Gray's Anatomy, the size of each kidney is about 11.25 cm in length, 5-7.5 cm in breadth and more than 2.5 cm in thickness.[6] These are measurements recorded in western countries. There have been a few studies on the renal dimensions in Filipinos and published in local journals. Unfortunately, an online access for these journals proved futile because the websites were unavailable.

I have been teaching renal anatomy to Learning Unit III medical students for several years now. When I describe the normal anatomy of the kidneys including its size, I always refer to the standard anatomy textbook written by western authors for references. Hence, I took interest in looking at the renal sizes among Filipinos. A review of the literature reveals that there was a paper on renal sizes among Filipinos done in the early 20's. This paper however, has become unavailable. I attempted to gather data on the actual size of the kidneys based on cadaveric measurements and those from autopsy reports. The sample size however, is insufficient to present it in this study at this point. Another descriptive study on the actual renal sizes gathered from these sources will hopefully be presented in another paper.

Conclusion

The normal sonographic measurements of the kidney dimensions among Filipinos in South Luzon conform to what is considered standard renal dimensions documented at least in standard anatomy textbooks. No general statement with statistical significance can be forwarded at this time regarding normal renal measurements among Filipinos. This study offers but a descriptive presentation of the ultrasonographic measurements of the kidneys in Filipinos. Additional data has to be gathered in a prospective study to be able to come up with significant statements about the renal dimensions in Filipinos. It is also recommended that normal values for kidney size be further established in relation to age and other variables like height, weight and that they be tabulated to serve as a guide to

accurately monitor those patients who may likely develop renal pathology.

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