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STRUCTURAL RENAL CHANGES IN HEALTHY ELDERLY

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ABSTRACT Aging is an inevitable process. It is commonly measured by chronological age. There is no universally accepted standard regarding the age at which people become elderly. However, in most countries, the onset of old age is considered to be around 60 years. A better and more acceptable term for elderly is senior citizen. Sixty years and above are considered elderly or senior citizens (SC's) for purpose of this study. One hundred healthy SC's were screened among those who attended the free medical camps. Renal morphological parameters were assessed on ultrasonography and correlated with age and weight of SC's. The result showed significant changes after the age of 70 years.

KEYWORDS : Renal Morphology, Senior Citizens Ultrasound, GFR

AIM

A retrospective study to evaluate the sonographic values of renal length, parenchymal and cortical thickness in SC's and to assess if renal size significantly decreases with age in SC's free from life style diseases and those affecting the kidneys.

INTRODUCTION

The renals undergo involution with age. There is a gradual decline in the renal volume, weight and function after the age of 60 years. The most marked decrease occurring between the 7th and 8th decade.

The fundamental alterations of renal morphology in SC's include size reduction, parenchymal thickness reduction and margin irregularities. In particular, the most important morphologic alteration of the aged renal is the volume reduction, approximately 20-30% in above 80 years and a loss of weight that decreases from 250-270 gm to 180-200 gm after age of 65 years[1].

The progressive loss of renal mass appears to affect the renal cortex more than the renal medulla. Due to the progressive increase in the mean age of global population it is very important to know the renal morphologic changes according to the age. The functional alterations of the aged renals are characterized principally by a progressive reduction of renal blood flow from about 600 to 300 ml/min/1.73 m^2, and of glomerular filtration rate (GFR) from 130 mL/min^2 to 60-80 mL/min^2.

MATERIALS AND METHODS

Regular free medical camps for SC's were conducted and data of last 4 years has been evaluated, during this period health check services were provided to 10,000 SC's including treatment for various chronic ailments like asthma, arthritis, diabetes, hypertension, cardiac and Kidney.

For this study screening data of 100 SC's who were free from all diseases including the above mentioned entities with normal creatinine levels were analyzed. They were divided in 3 groups.

1) Group 1 - 60-69 years (Young SC's)
2) Group 2 - 70-79 years (Middle SC's)
3) Group 3 - 80 years and above (Grand SC's)

The sonographic renal parameters in different age groups of SC's are shown in Table 1. The mean and standard deviations of renal parameters are shown in Table 2. Renal morphological changes in SC's were most marked after the age of 80 years.[1,2] For proper understanding and interpretation of results the sonographic and pathological changes are shown in Table 3.

RESULTS

The total number of SC's studied was 100, amongst which 60 were males and 40 were females. The numbers of SC's in Group 1 were 48, in Group 2 were 38 and in Group 3 were 22. The mean renal length on right was 95.05 mm and on left was 97.38 mm. There was progressive reduction in renal length with increase in age with mean value of 3.9 mm in group 3. The mean parenchymal thickness was 15.2 mm with reduction of 2.6 mm in group 3 and the mean cortical thickness was 9.02 mm with reduction of 1.8 mm in group 3.

Table 1: Renal Parameters in mm in different age groups

	60-69 (n =48)	70-79 (n = 38)	80 and above (n = 22)
Right renal length	96.3	94.4	93
Left renal length	99.1	96.5	94.6
Parenchymal Thickness	15.8	15.6	13.2
Cortical Thickness	9.6	8.9	7.8
SC's Body Weight in Kg	58.7	57.4	55.9

Table 2: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
AGE	100	24	60	84	70.56	.716	7.161
Weight	100	25	45	70	57.76	.582	5.822
Right	100	30	80	110	95.05	.636	6.359
Left	100	30	85	115	97.38	.733	7.329
Cortical Thickness	100	8	5	13	9.02	.160	1.595
Parenchymal Thickness	100	10	9	19	15.21	.225	2.249

Table 3: Renal morphological changes in SC's after 80 years of age [1,2]

a. Measurements	* Gradual decline in volume of 20-30% *Weight is reduced by 50-150 gm (Normal weight 250-270 gm).
b. Sonographic	*Length reduction is variable *Parenchymal and cortical thickness is significantly reduced, cortical echoes variable. *Renal capsule may be thickened, renal sins fatty echo is increased.

	* Retention cysts and renal sinus cysts are seen frequently *Renal margin can have irregularity with pseudo lobular appearance due to cortical scars of infarcts and infections. *Doppler shows reduced sub capsular and cortical perfusion.
c. Microscopic	*Glomeruli become shrunken due to progressive sclerosis, hyalinization, hyper filtration and hyper perfusion. *Reduction in number of glomeruli is not consistent.
d. Electron microscopic	*The loss of glomeruli mass is proportional to the loss of tubular mass to preserve the balance. *Outer cortical glomeruli are more extensively involved than the deeper. *Thickening of basement membrane of glomeruli and distal tubule due to type-4 collagen deposition Glomerular sclerosis, interstitial fibrosis and tubular atrophy
e. Renal vascular	* Renal arteries show increased tortuosity, tapering and obliteration of interlobular arteries, intimal thickening, shunts between afferent and efferent arterioles * Vascular changes due to aging are difficult to differentiate from changes due to hypertension
f. Functional; GFR and renal blood flow	* Progressive reduction of renal blood flow from about 600 to 300 mL/min/1.73 m2, * Glomerular filtration rate (GFR) from 130 mL/min to 60-80 mL/min.

DISCUSSION

Measure what is measurable, and make measurable what is not so (Galileo 1564-1642). Renal size was conventionally determined on X-ray KUB or on urography with various drawbacks in measuring the renal length relative to the distance of lumbar vertebrae from L1 to L3/4 as renal hilum usually corresponds to L2. With the advent of newer modalities in radiology renal morphology is effectively illustrated by ultrasonography, computed tomography and MRI. Renal volume is the most precise indicator of renal size.

However volume assessment is not used clinically because its measurement is difficult due to the complex renal shape. Many factors like body mass index, height, gender, age, position of renal and renal vasculature influence the measurements.[3]

Renal Length:

Renal length decreases with age especially after 70 years because of parenchymal reduction due to reduced perfusion related to nephroangiosclerosis.[4]. There is progressive reduction in renal length with mean value of 3.9 mm in different groups of SC's in this study (Table 1).

Renal Parenchymal And Cortical Thickness:

The mean parenchymal thickness is 15.2 mm and cortical thickness is 9.02 mm. There is significant change in parenchymal and cortical thickness with age and weight of SC's (Table 2). Renal cortical echogenicity is variable from hypo-echoic, iso-echoic and even slightly hyper-echoic normally. Renal echogenicity is assessed qualitatively by operator and is unreliable. Quantitative assessment of renal cortical echo with that of liver with advanced software by calculating the pixel densities will avoid the subjective variability.[5]

CONCLUSION

The most marked involution changes due to ageing are seen after the age of 80 years, which may not have any particular clinical impact. The data available on the relationship between renal morphology and function in SC's is inadequate. Quantitative assessment of renal cortical echogenicity and renal perfusion studies by ultrasound may improve the ability of prediction to discriminate renal changes in healthy SC in future[5].

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