

CORRELATION OF LENGTH OF KIDNEYS WITH ULTRASONOGRAPHY IN VARIOUS CLINICAL STAGES OF CHRONIC TYPE II DIABETES

Abstract :

An essential study with ultrasound imaging technique to differentiate between acute and chronic kidney diseases in type 2 diabetes . The renal length of left and right kidneys were compared and a detailed documentation was made.

Keywords: Kidney, ultrasonography, clinical stages, diabetes

INTRODUCTION :

In the longitudinal scan plane, the kidney has the characteristic oval bean-shape. The right kidney is often found more caudally and is slimmer than the left kidney, which may have a so-called dromedary hump due to its proximity to the spleen. The kidney is surrounded by a capsule separating the kidney from the echogenic perirenal fat, which is seen as a thin linear structure. The length of the adult kidney is normally 10–12 cm, and the right kidney is often slightly longer than the left kidney.^(1,5,6) The adult kidney size is variable due to the correlation with body height and age.^(1,5)

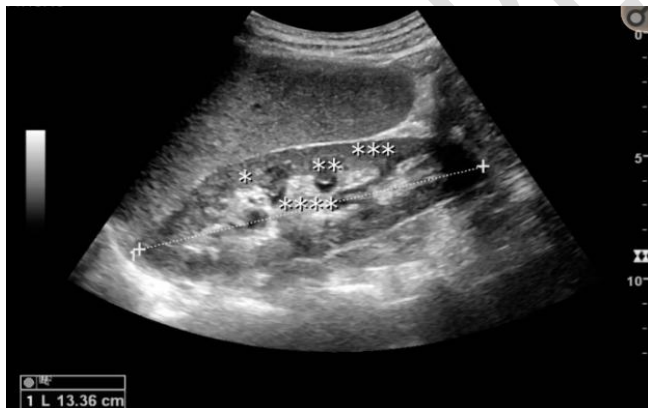


Figure 1: Normal adult kidney. Measurement of kidney length on the US image is illustrated by '+' and a dashed line. * Column of Bertin; ** pyramid; * cortex; **** sinus.^[6]**

Subject and methods:The study included both adult male and female population with type 2 Diabetes Mellitus , above 18 years of age and biochemically diagnosed for nephropathy . All of them were subjected to ultrasonographic evaluation of the length of kidneys and the findings were documented.

RESULTS AND ANALYSIS :

Table 1: Distribution of Renal Length between the groups of Right Kidney (in cm)

Groups	Min	Max	Mean	SD	Median	IQ Range
Control	10.7	11.1	10.8	.11	10.9	10.8, 11.0
Diabetic nephropathy Group I	11.6	12.1	11.8	.14	11.9	11.7, 12.0
Diabetic nephropathy Group II	10.9	11.5	11.2	.15	11.3	11.1, 11.4
Diabetic nephropathy Group III A	10.7	11.2	10.9	.15	11.0	10.9, 11.1
Diabetic nephropathy Group III B	9.8	10.1	9.9	.18	10.0	9.9, 10.02
Diabetic nephropathy Group III C	9.1	9.3	9.2	.08	9.2	9.12, 9.27
One-way ANOVA with LSD post-hoc test used; F-value= 543.7, p<.001						

Figure 2: Comparison of mean length of right kidney

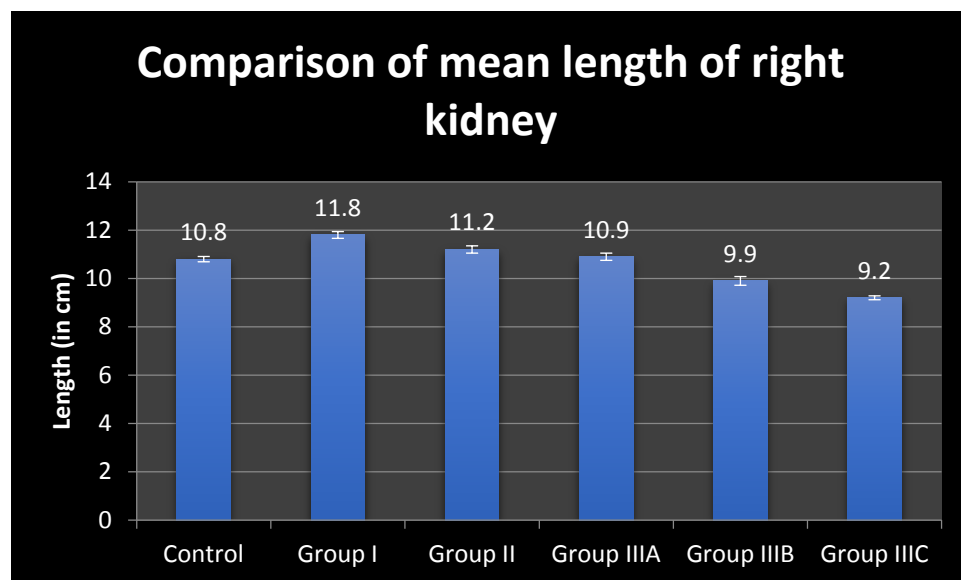


Table 2: Distribution of Renal Length between the groups for Left Kidney (in cm)

Groups	Min	Max	Mean	SD	Median	IQ Range
Control	10.9	11.5	11.15	.18	11.15	11.0, 11.3
Diabetic nephropathy Group I	11.7	12.4	12.01	.15	12.0	11.9, 12.1
Diabetic nephropathy Group II	11.1	11.9	11.53	.17	11.55	11.4, 11.62
Diabetic nephropathy Group III A	10.9	11.4	11.14	.16	11.15	11.0, 11.3
Diabetic nephropathy Group III B	10.1	10.7	10.42	.13	10.45	10.3, 10.52
Diabetic nephropathy Group III C	9.4	9.6	9.5	.09	9.5	9.42, 9.57
One-way ANOVA with LSD post-hoc test used; F-value= 293.2, p<.001						

Figure 3: Comparison of mean length of left kidney :

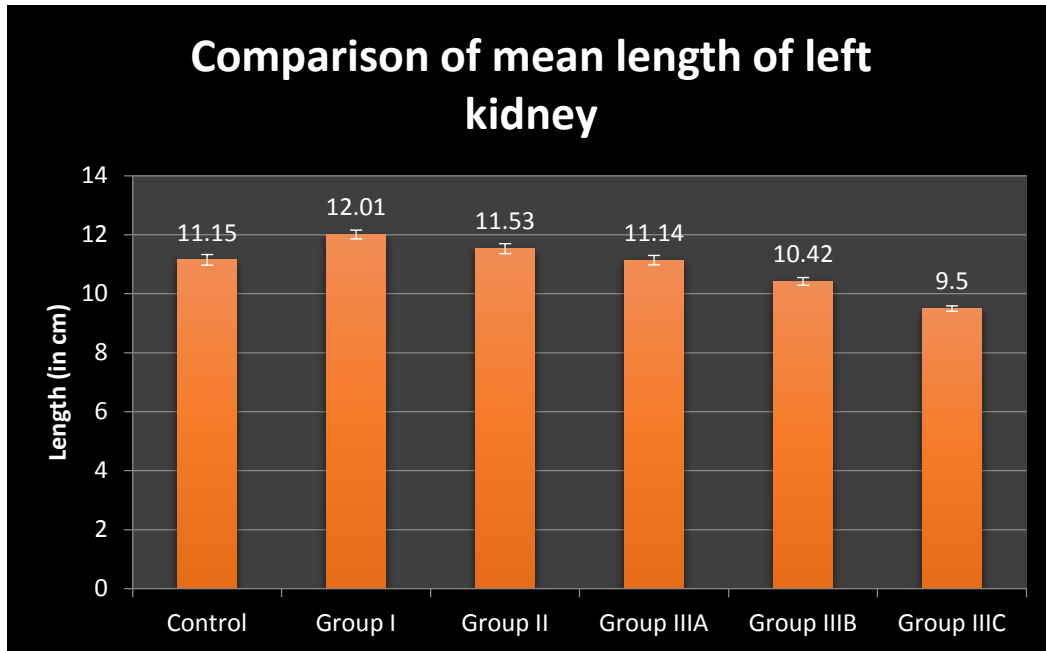
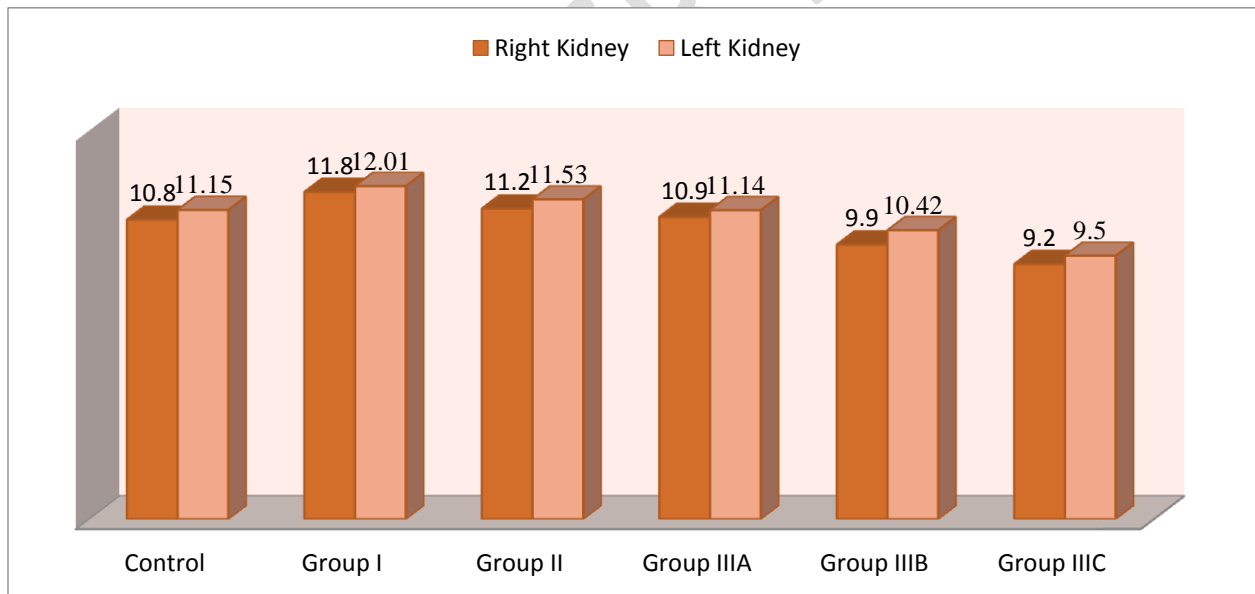


Figure 4: Comparison of Renal Length in both kidneys (in cm)



DISCUSSION :

The study subjects were equally dispersed between all the groups with 30 in each of those. In diabetic nephropathy group III, the sub-classifications included group IIIA, group IIIB, group IIIC and maximum representation were from group III B (46.6%) and it was minimum by group IIIC (13.3%).

For the right kidney, the mean length (centimeters) and SD of controls, group I, group II, group IIIA, group IIIB, group IIIC were $10.8 \pm .11$, $11.8 \pm .14$, $11.2 \pm .15$, $10.9 \pm .15$, $9.9 \pm .18$, $9.2 \pm .08$ respectively. Their lengths ranged from 10.7 to 11.1, 11.6 to 12.1, 10.9 to 11.5, 10.7 to 11.2, 9.8 to 10.1 and 9.1 to 9.3 among the controls, group I, group II, group IIIA, group IIIB, group IIIC respectively. The median (50th percentile) renal length (inter-quartile range, i.e between 25th percentile and 75th percentile) fluctuated with values of 10.9 (10.8, 11.0), 11.9 (11.7, 12.0), 11.3 (11.1, 11.4), 11.0 (10.9, 11.1), 10.0 (9.9, 10.02) and 9.2 (9.12, 9.27) respectively among controls, group I, group II, group IIIA, group IIIB, group IIIC that have been included in this study. The mean kidney length was (14.5 cm) was higher in diabetic patients of one study,⁽²⁾ which is contrary to that of our study subjects. This might be explained due to that there are differences in ethnicity between the groups as well as the duration of diabetes that will be differing in both the groups. Having most of the studies, dealing the renal length with progression of the disease, there was an interesting study which correlated the length with the type of diabetes which found was a significantly higher proportion of larger kidneys (11 cm or more) in the IDDM group than in the NIDDM group⁽³⁾ Even they postulated that the mean length of kidneys were inversely related to the serum creatinine levels as was the correlation observed in our study.

For the left kidney, the mean length (centimeters) and SD of controls, group I, group II, group IIIA, group IIIB, group IIIC were $11.15 \pm .18$, $12.01 \pm .15$, $11.53 \pm .17$, $11.14 \pm .16$, $10.42 \pm .13$,

9.5 ± .09 centimeters respectively. Their lengths ranged from 10.9 to 11.5, 11.7 to 12.4, 11.1 to 11.9, 10.9 to 11.4, 10.1 to 10.7 and 9.4 to 9.6 among the controls, group I, group II, group IIIA, group IIIB, group IIIC respectively. The median (50th percentile) renal length (inter-quartile range, i.e between 25th percentile and 75th percentile) fluctuated with values of 11.15 (11.0, 11.3), 12.0 (11.9, 12.1), 11.55 (11.4, 11.62), 11.15 (11.0, 11.3), 10.45 (10.3, 10.52) and 9.5 (9.42, 9.57) respectively among controls, group I, group II, group IIIA, group IIIB, group IIIC that have been included in this study. The results in our study were comparable to one study where the proportion of small kidneys were significantly higher in the cases group than controls. In that study,⁽⁴⁾ the control group had 33 patients (75%) with normal size kidneys and 11 patients (25%) had small kidneys (Length <9cm) with post-inflammatory changes. In cases group 9 patients (18.8%) had normal size kidneys and small kidneys were found in 39 patients (81.2%)

Figure 5: Ultrasound image of the measurement of right kidney

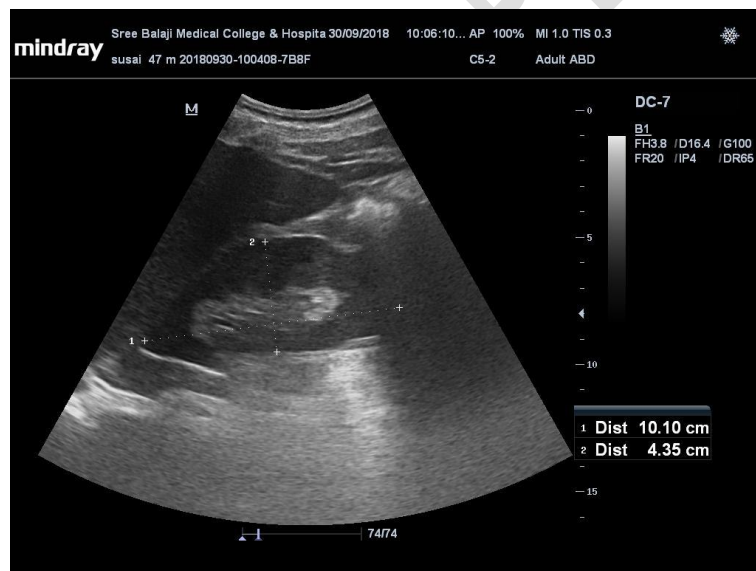


Figure 6: Ultrasound image of the measurement of left kidney



CONCLUSION :

Based on the measurement of right and left renal length sonologically in diabetic nephropathy subjects, it was interpreted that the length diminished while the disease was getting progressed.

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