

Sonographical study of human neonatal kidney

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Abstract

This study provides an estimates of the sonographical measurments of normal neonatal kidney.

In this population-based cross-sectional study, the study consisted of a representative sample of (9) males and (11) females aged (0-28) days have been investigated using a sonographical machine to measure the length , width, cortical thickness and medullary thickness of the kidney.

The mean length , width, cortical thickness and medullary thickness of the right kidney in males were (41.60±1.47)mm ,(19.40±0.42)mm ,(3.10±0.28)mm and (4.47±0.26) respectively.

The mean length , width, cortical thickness and medullary thickness of the left kidney in males were (43.10±1.45)mm ,(18.98±0.55)mm ,(3.47±0.26)mm and (4.67±0.28) respectively.

The mean length , width, cortical thickness and medullary thickness of the right kidney in females were (41.72±1.18)mm ,(19.45±0.43)mm ,(3.12±0.27)mm and (4.57±0.27) respectively.

The mean length , width, cortical thickness and medullary thickness of the left kidney in females were (43.17±1.45)mm ,(19.07±0.55)mm ,(3.45±0.28)mm and (4.78±0.29) respectively.

Also the study revealed that the cortex was hyperechogenic and the mdullary pyramids were hypoechogenic.

The left kidney in neonates is longer than the right one.

The right kidney in neonates is wider than the left one.

Introduction

During the last few years, ultrasound has been increasingly used for evaluating kidney anatomy in the neonatal period which is routinely used in longitudinal and transverse planes (1). Advancement in ultrasound technology and because of its lack of ionizing radiation , non-invasive nature, cheap and available so the renal ultrasound study has an important rule in the work-up of suspected renal diseases in the neonates(2,3).Normal kidneys in newborn and young infants have several distinct sonographical features in comparison to the adult by; the renal cortex is more echogenic, the medullary pyramids are prominent and the central sinus echo is reduced(4).

Subjects and Methods

Investigations of twenty male and female neonates aging (0-28) days were performed between December 2007 and October 2008 using (Versa plus, seimens 1997) ultrasonic machine, excluding cystic diseases, hydronephrosis or any congenital diseases of the kidney. By using the cross-sectional study, the length , width, cortical thickness and medullary thickness of each kidney were measured using the probe (7.5)MHz. The ultrasonographs of the twenty neonate kidneys were divided into four groups:

Group A: 0-7 days, Group B: 8-14 days, Group C: 15-21 days and Group D: 22-28 days.

Results

1: Length of the Kidney

Table (1) Ultrasonographic investigation of male kidney length correlated to age .

Group	Mean \pm SD of right kidney length (mm)	Mean \pm SD of left kidney length (mm)
A	34.50 \pm 2.11	36.10 \pm 2.60
B	39.20 \pm 1.64	40.30 \pm 1.08
C	45.80 \pm 1.06	47.50 \pm 1.09
D	46.90 \pm 1.09	48.50 \pm 1.05

The mean length of the neonate kidney in male was (41.60 \pm 1.47)mm in right kidney& (43.10 \pm 1.45)mm in left kidney.

Table (2) Ultrasonographic investigation of female kidney length correlated to age .

Group	Mean \pm SD of right kidney length (mm)	Mean \pm SD of left kidney length (mm)
A	34.60 \pm 2.12	36.10 \pm 2.60
B	40.00 \pm 1.08	41.20 \pm 1.07
C	44.90 \pm 0.69	46.00 \pm 1.12
D	47.40 \pm 0.83	49.50 \pm 1.04

The mean length of the neonate kidney in female was (41.72 \pm 1.18)mm in right kidney&(43.17 \pm 1.45)mm in left kidney.

2 : Width of the Kidney :

Table (3) Ultrasonographic investigation of male kidney width correlated to age .

Group	Mean \pm SD of right kidney Width (mm)	Mean \pm SD of left kidney Width (mm)
A	16.30 \pm 0.37	16.25 \pm 0.36
B	17.50 \pm 0.35	17.27 \pm 0.31
C	21.50 \pm 0.61	20.80 \pm 0.81
D	22.30 \pm 0.35	21.60 \pm 0.72

The mean width of the neonate kidney in male was (19.40 \pm 0.42)mm in right kidney& (18.98 \pm 0.55)mm in left kidney.

Table (4) Ultrasonographic investigation of female kidney width correlated to age .

Group	Mean \pm SD of right kidney Width (mm)	Mean \pm SD of left kidney Width (mm)
A	16.50 \pm 0.33	16.30 \pm 0.34
B	17.80 \pm 0.36	17.60 \pm 0.33
C	20.80 \pm 0.72	19.80 \pm 0.91
D	22.70 \pm 0.32	22.60 \pm 0.62

The mean width of the neonate kidney in female was (19.45 \pm 0.43)mm in right kidney& (19.07 \pm 0.55)mm in left kidney.

3: Cortical Thickness of the Kidney:

Table (5) Ultrasonographic investigation of male kidney cortical thickness correlated to age .

Group	Mean \pm SD of right kidney cortical thickness (mm)	Mean \pm SD of left kidney cortical thickness (mm)
A	1.70 \pm 0.29	1.95 \pm 0.28
B	2.60 \pm 0.31	2.95 \pm 0.29
C	3.90 \pm 0.27	4.35 \pm 0.27
D	4.20 \pm 0.26	4.65 \pm 0.21

The mean cortical thickness of the neonate kidney in male was (3.10 \pm 0.28) mm in right kidney & (3.47 \pm 0.26)mm in left kidney.

Table(6) Ultrasonographic investigation of female kidney cortical thickness correlated to age .

Group	Mean \pm SD of right kidney cortical thickness (mm)	Mean \pm SD of left kidney cortical thickness (mm)
A	1.80 \pm 0.30	2.10 \pm 0.30
B	2.90 \pm 0.29	3.00 \pm 0.35
C	3.40 \pm 0.25	3.90 \pm 0.26
D	4.40 \pm 0.27	4.80 \pm 0.22

The mean cortical thickness of the neonate kidney in female was (3.12 \pm 0.27)mm in right kidney & (3.45 \pm 0.28)mm in left kidney.

4: Medullary Thickness of the Kidney

Table (7) Ultrasonographic investigation of male kidney medullary thickness correlated to age

Group	Mean \pm SD of right kidney medullary thickness (mm)	Mean \pm SD of left kidney medullary thickness (mm)
A	2.90 \pm 0.40	3.10 \pm 0.47
B	4.10 \pm 0.28	4.30 \pm 0.29
C	5.30 \pm 0.20	5.50 \pm 0.22
D	5.60 \pm 0.19	5.80 \pm 0.17

The mean medullary thickness of the neonate kidney in male was (4.47 \pm 0.26)mm in right kidney & (4.67 \pm 0.28)mm in left kidney.

Table (8) Ultrasonographic investigation of female kidney medullary thickness correlated to age

Group	Mean \pm SD of right kidney medullary thickness (mm)	Mean \pm SD of left kidney medullary thickness (mm)
A	3.20 \pm 0.42	3.25 \pm 0.38
B	4.40 \pm 0.29	4.60 \pm 0.27
C	4.90 \pm 0.21	5.20 \pm 0.24
D	5.80 \pm 0.18	6.10 \pm 0.28

Discussion

In the four groups (A,B,C & D) there was increment in length , width , cortical thickness and medullary thickness of the kidney with progressing of age of neonate , that is because of the growth of the neonate .

In the present study the length of the left kidney was more than of the right . These results are corresponding with the results mentioned by other investigators (3,5) also the study revealed that the width of right kidney was more than of the left , which is in agreement with those mentioned by (5,6).

There was a hyperechocenesity of the renal cortex and hypoechogenisity of the medullary pyramids .in the ault there is a central dense echoes that is because of the presence of the fatty renal sinus , this finding was not present in this study that is because a little fat in the renal sinus of the neonate kidney These results are corresponding with that mentioned by Hricak et al (1) and Ferrer et al (6) .

References

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