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Morphological Measurements of the Left Kidney In Foetal Cadavers Of Different Gestational Ages

Dr. N. Kishore kumar raju[1], Dr. S. Ravindra Kishore[2], Dr. G. Sailaja[2], Mr. C. Rajeev Kumar

[1,3] *Assistant Professor, Rajiv Gandhi institute of medical sciences, Srikakulam, Andhra Pradesh, India.*
[2] *Associate Professor (I/c HOD), Rajiv Gandhi institute of medical sciences, Srikakulam, Andhra Pradesh, India.*
[4] *Tutor, Department of anatomy, Rajiv Gandhi institute of medical sciences, Srikakulam, Andhra Pradesh, India.*

Abstract: *The aim of present study is to get comprehensive anatomical knowledge of the left foetal kidney in terms of length, breadth, thickness, hilum length, lobulations. Initially the study is planned in adults, but latter it is changed into fetuses. The left kidney is chosen as it is usually preferred for the renal transplantation and it is a little longer, narrower, heavier than right and lies nearer to median plane. The present study is carried out during the period of April2009 to November2009 in the Department of Anatomy, Guntur Medical College Guntur, Andhra Pradesh, India. Further the work is done at RIMS, Srikakulam.The Material examined consists of 50 foetal cadavers of the different gestational ages. It is observed that mean values of the length, breadth are approximately ¼ th and thickness is about ½ of adult values. This data about the morphological measurements of left kidney will instill a light on the future research work in the nephrology with particular reference to prenatal period.*

Key words: *Left foetal kidney, length, breadth, thickness, lobulations, & Hilum length,*

I. Introduction

The metanephric kidney consists of collecting part which develops from the ureteric bud. And excretory from the metanephric blastema , the former develops earlier .It is probable that the tubular function commences at about the 9th week In the reabsorption of the filtrate by the loop of Henle takes place at about in the13th week. The foetal kidney ascends from the pelvis to the adult position in the lumbar region. Incomplete fusion of the foetal lobules can persist post natally and may be observed in 7% adults. Pattern of lobulation is very variable such as larger triangular, rectangular or polygonal lobule. Small and numerous irregular lobules also exist looking a mulberry. Around term the lobules number about 13 or 14.

The kidneys excrete the end products of metabolism and excess water. Both of these actions are essential to the control of concentrations of various substances in body fluids e.g., maintaining electrolyte and water balance approximately constant in the tissue fluids. The kidneys also have endocrine function, Producing and releasing erythropoietin which affects the red blood cell formation, Renin which influences blood pressure, 1, 25 dihydroxy chole calciferol, which is involved in the control of calcium metabolism and is a derivative of vitamin D, and perhaps modifies the action of the parathyroid hormone and various other soluble factors with metabolic actions.

II. Material & Methods

The material examined consists of 50 foetal cadavers of the different gestational ages collected from the department of Obstretics and Gynaecology, Government general hospital, Guntur. They are dissected and studied. Out the 50 foetuses, 30 are male and 20 are of female. Crown rump lengths are range from 180mm to 385mm.The fetuses are embalmed with 10% formalin solution in few crystals of copper sulphate. Materials used are blunt scalpel, blade scalpel, toothed forceps, untoothed forceps, measuring scale, measuring tape, geometric instrument (divider).

The abdominal cavity is opened by giving the muscle depth incision including the peritoneum passing from the xiphistenum to the upper border of the pubic symphysis and extended parallel to the xiphisternum up to mid axillary line on both sides superiorly and inferiorly along the groin crease and a point just behind the highest point of iliac crest. Visceral relations of left kidney are observed and it is removed from the abdominal cavity cleared of its coverings and collected in plastic bottles with lids. External measurements and lobulations of left kidney are observed. Following abbreviations are used

1) Nl : Number of foetal lobulations of left kidney, done after removing the renal capsule in the both anterior and posterior surfaces
2) L: Length of the left kidney. Vertical distance between the highest and lowest points on the superior and inferior poles of the left kidney.
3) B: Breadth of the left kidney. Maximum horizontal distance between the medial and lateral borders of left kidney
4) T: Thickness of the left kidney: Maximum anteroposterior distance of the left kidney between the anterior and posterior surfaces
5) Lh: Length of the hilum of the left kidney.

III. Observations

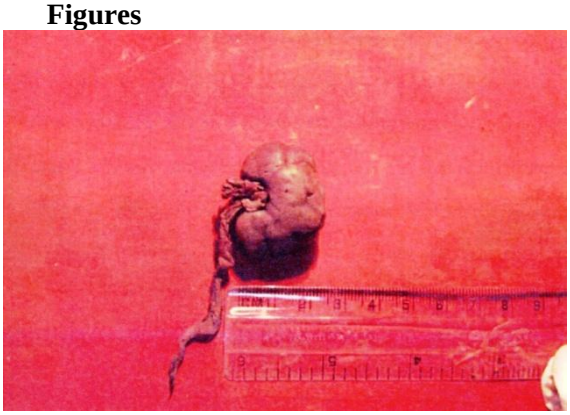
The following table showing the measured and noted values in all (50) the fetuses (cases) .Values in cms

Sl. no	Case no.	Sex	CRL (mm)	Nl	L	B	T	Lh	Sl. no	Case no	Sex	CRL (mm)	Nl	L	B	T	Lh
1	1	M	280	7	3.5	2	1	0.8	**26**	28	F	315	ND	3.6	2.4	1.9	0.7
2	2	F	300	16	3.2	1.6	1.5	1.2	**27**	29	F	270	11	1.7	1	0.8	0.5
3	3	M	280	12	3	1.4	1.4	0.9	**28**	30	F	305	5	3	1.8	1.5	0.6
4	4	F	280	14	3.6	1.7	2	1	**29**	31	F	350	5	2.9	1.9	1.3	0.6
5	5	M	280	7	2.2	1.6	1.3	0.6	**30**	32	M	305	ND	2.5	1.3	1.4	0.6
6	6	M	190	9	2.6	1.5	1	0.9	**31**	33	M	180	12	1.8	0.9	0.8	0.6
7	7	M	230	12	2.2	1.1	0.9	0.6	**32**	34	F	290	7	2.5	1.4	1.3	0.9
8	9	F	350	12	3	2	1.1	0.9	**33**	35	M	235	14	2.4	1.3	1.3	0.6
9	10	M	310	ND	3	1.8	1.5	1	**34**	36	M	350	ND	3	1.6	1.8	1
10	11	M	275	5	2.5	1.3	1.5	1	**35**	37	M	350	10	4	2	2	0.9
11	12	M	180	13	2	0.9	1	0.5	**36**	38	F	315	7	3.5	1.9	2	1
12	13	F	230	13	2.1	1	0.7	0.8	**37**	39	M	360	8	4	2.2	1.5	1
13	15	M	340	15	3	1.8	1.4	0.8	**38**	41	F	300	6	3	1.2	2.1	0.8
14	16	M	385	12	3.6	2.8	1.5	0.9	**39**	42	M	310	11	3.2	1.8	2	1.1
15	17	F	270	7	2.5	1.3	1	0.8	**40**	43	M	355	6	3.5	2	1.5	1.8
16	18	M	300	7	2.5	1.5	1.5	0.7	**41**	44	M	340	IC6	2.5	1.5	1.2	1
17	19	M	340	IC,6	3	1.7	1.6	1.1	**42**	45	F	310	10	2.5	1.3	1.2	0.9
18	20	M	385	11	3.9	2.4	2	1.6	**43**	46	M	310	7	3.3	1.5	1.5	0.9
19	21	F	375	16	3.3	2	2.1	0.9	**44**	47	M	300	ND	3.2	1	1.4	0.8
20	22	M	370	ND	3	1.5	1.2	1	**45**	48	F	350	10	3.5	2	1.8	1.2
21	23	F	280	12	2.5	1.6	1.5	0.7	**46**	49	F	300	IC4	3.1	2	1.4	0.6
22	24	M	260	7	2.7	1.2	0.9	1	**47**	50	M	295	9	2.6	1.2	1.5	0.9
23	25	F	270	9	2.6	1.5	1	0.7	**48**	51	F	265	6	3	1.4	0.9	0.6
24	26	F	280	10	2.5	1.5	1.2	0.8	**49**	52	M	280	13	3	1.5	1.4	0.8
25	27	M	180	12	1.6	1	0.7	0.7	**50**	53	M	235	9	2.7	1.1	0.9	0.7

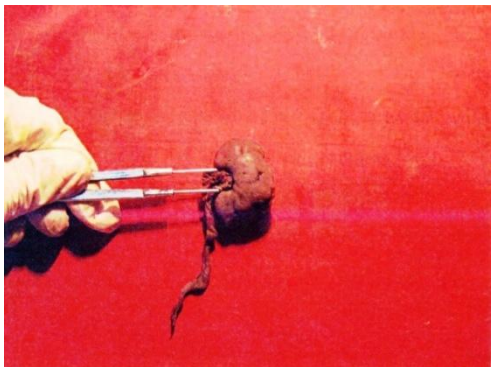
CRL: crown rump length, **ND:** Not distinguishable, **IC:** Incomplete.

IV. Figures

i



ii



iii

Fig.1 showing way of taking the measurements of the left kidney. i) length, ii) breadth iii)Hilum length

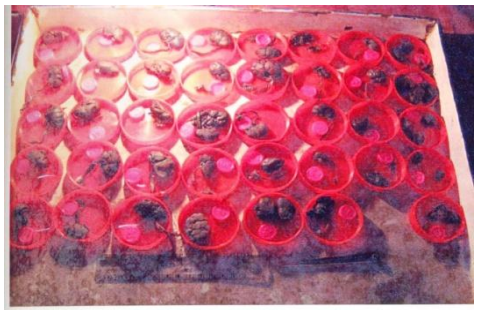


Fig.2 showing the cases

V. Discussion

a.) The Length of left foetal kidney (L) ranged from 4cm to 1.6cm in males and 3.9 to 1.7 cm in females. Mean length is 2.852cm.
b.) The breadth of left foetal kidney (B) ranged from 2.8 to 0.9 cm in males and 2.4cm to 1cm in females. Mean value is 1.558cm.
c.) The Thickness of left foetal kidney (T) ranged from 2cm to 0.7cm in males and 2.1cm to 0.8cm in females. Mean value is 1.378cm.
d.) The Length of hilum (Lh) of left foetal kidney ranged from 1.8cm to 0.5cm in males and 1.6 to 0.5 cm in females. Mean value is 0.86cm.
e.) Number of Foetal lobulations (Nl) 15 to 5 in males and 18 to 4 in females. Mean value is 8.44.

The lobulations are well marked and delineated as described by the Sykes (1963) ; All the cases are examined maximum number of lobulations is 18 observed in females. These are gradually increasing around the period of gestation. But in later stages interlobular grooves are fading away. The regular polygonal pattern along with the triangular and rectangular shapes observed. All the lobules are not equal in size.

The mean values of the length, breadth are approximately ¼. & thickness is about ½ of the adult values, coherent with that of some authors (Woodjones of 1949) but slightly inconsistent with that of Ningthoujam eta al 2005.

Sl. No	Parameter	Woodjones F.(1949)	Gray's Anatomy(39th edition)	Present study	Arey LB (1965)
1	Foetal lobules	Anterior surface 4 to 5. Posterior surface 4 to 5.	12	Mean value 8.44. Maximum value 18	Maximum value 20

VI. Conclusion

The knowledge of morphological measurements of foetal kidney along with the pattern of pelvicaliceal system would help the surgeons and interventioin radioligsts in planning their procedures more accurately. Foetal kidney morphology is important, as it is affected in the foetal kidney diseases like renal failure, renal stones and other diseases. The data obtained in this study will constitute as reference for future work. Further, the statistical work on this data may provide more information on the foetal kidney, like foetal kidney length which will be used as nontraditional parameter for estimating gestational age, under study.

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