

## Renal Anomalies with Accessory Renal Vessels

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### Abstract

The Subject of Kidney anomalies including their incidents has created much interest to the scientists in late 1950 and 1960 with the aim of preventing and curing them as much as possible. Knowledge about their incidents Particularly helps us to know how frequently they are seen in the population and makes us to search the possible etiological factors for such high occurrence. An attempt has been made to know the various anomalies, detailed dimensions of specimens available from the cadavers. To apply this knowledge to the incoming post graduates in their research works. Renal vascular segmentation was originally recognized by John Hunter in 1794. The term accessory vessels denote two or more arterial branches supplying the same renal segment. As each segment is supplied by a single end artery. Evans et al in 1951 and Tuli in 1968 noted multiple congenital anomalies affecting nervous system, urogenital system and cardiovascular system resulting from acute folic acid deficiency during gestation in pregnant rates. Gleen in 1959 described in 30% of cases the blood supply from one renal artery to each kidney. Boatman et al. 1971, Colin et al 1972 the blood supply may be internal iliac artery or external iliac artery or sacral arteries. Malfunction of renal and testicular veins – a case report from the journal of the anatomical society of India volume 54, No.2 (2005, 2206) authors Varma R., Kalaras and Rana K.

**Keywords:** Aberrant Vessel; Birth Defects Aorto Graphy Renal Parenchyma; Fornix.

### Introduction

- The subject of kidney anomalies including their incidence has created much interest to the scientists in late 1950 and 1960 with the aim of preventing and curing them as much as possible.
- Knowledge about their incidence particularly helps us to know how frequently they are seen in the population and makes us to search the possible etiology factors for such high occurrence.
- Human kidney serve to filter more than 170 liter of blood per day into about 1 liter of highly specialized concentrated fluid called urine. In doing so the kidney excrete the waste products of metabolism, precisely regulates the body's concentration of water and salts, maintains the appropriate acid base balance, and serves as endocrine organ, secreting such hormones as erythropoietin, renin, and prostaglandins. The physiologic mechanism that the kidney has evolved to carrying out these functions requires a high degree of structural complexity.
- Embryology explains the etiological factors of many birth defects including the anomalies of the kidneys and among the explained many are due to various genetic and environmental factors teratogens such as Physical, Chemical, Nutritional and Biological causing mutations in the genes and affecting the development at various stages of growth it is the intricate action between the differentiation and maturation of the organ systems of the body.
- Kidney is one of the vital organs of the human body, which is effected by many known and unknown teratogens and thus a frequent site of anomalies.
- Now, the modern studies include in addition to the above mentioned, various imaging (Radio-diagnosis) procedures such as plain and contract X-rays, Ultrasound scanning and MRI etc. It is

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important to note that the incidence of congenital anomalies vary greatly depending upon the methodology adopted for the study.

- Anomalies of Renal Vasculature.
  - a. Aberrant, accessory or multiple vessels.
  - b. Renal artery aneurysm.
  - c. Renal Arterio Venous fistula.
- Aberrant, accessory, or multiple vessels are important to every urologic surgeon, and fortunately this subject lends itself to easy investigation. Anatomists were keenly interested in renal vascular patterns before the turn of the century, but the advent of Aortography in the 1940s and 1950s sphere headed a systematic clinical approach to this topic. Most of the classic work was performed by investigators in the middle to late 1950s and early 1960s (Graves, 1954, 1956; Anson and Kurth, 1955; Merklin and Michele, 1958; Anson and Dascler, 1961; Coyer and pouasse.1962).
- The kidney is divided into various segments, each supplied by a single "end" arterial branch that generally courses from one main renal artery. Multiple renal arteries is the correct term to describe any kidney supplied by more than one vessel. The term anomalous vessels or aberrant vessels should be reserved for arteries that originate from vessels other than the aorta or main renal artery. The term accessory vessel denotes two or more arterial branches supplying the same renal segment.
- Between 71% Merklin and Michele, (1958) and 85% Geyer and poutasse,(1962) of kidneys have one artery that supplies the entire renal parenchyma. A slightly higher percentage of right - sided kidneys (87%) have a single renal artery compared with left sided organs Geyer and Poutesse, (1962). This figure does not seem to be influenced significantly by either sex or race. True aberrant vessels are rare expect in patients with renal ectopia with or without fusion and in individual with a horseshoe kidney. Venous drainage of the kidney has been carefully restudied by Sampaio and Aragao (1990a), who noted a close association between the inferior branch to the main renal vein and anterior inferior aspect of the renal pelvis in 40% of Kidneys. They cautioned that an endourologic incision of an obstructed ureteropelvic junction should be done laterally and posteriorly instead of anteriorly to avoid injury to this vessel.

## Materials & Methods

- The present study has been under taken on 76 kidneys from cadavers and 60 from sonograms and 40 from fetal kidneys. The study was started and finished an a period of 2 years. The specimens from cadavers were obtained from Siddhartha medical college, Vijayawada and kakatiya medical college, Warangal. The sonograms are obtained from GGH, Vijayawada fromm the in and out patients attending to the radiology department.
- The parameters like weight, length of the kidney, breadth of kidney and breadth at the superior pole, inferior pole and at the hilum are taken with the help of electronic weighing machine, vernier calipers, the scale and thread are used. During the routine dissections the kidneys identified and the photographs are taken in situ wherever necessary. The parameters are taken, anomalies are noted and detailed diagrams are drawn.
- Screening of general population by non-invasive imaging procedures like plain X-ray of kidney ,ureter and bladder (KUB), ultra sound of the abdomen etc.
- Screening of patients attending to various out patient (op) departments of the hospitals.
- Looking for any renal anomalies during various genitourinary abdominal operative procedures and nothing down the incidence
- Cadaveric studies including fetal dissections, fetuses are obtained from G.G.H Vijayawada .
- It should be emphasized once again that the incidence of congenital anomalies varies greatly depending upon the methodology adopted for the study. For example Holinshed (1956) and K.Mortn (1958) observed renal anomalies in 2-3% of all operations and 0.5 to 1% in all autopsies.
- The present study was conduct on:
  - a. 76 adult cadavers.
  - b. 20 still born fetuses of kidney specimens of 40.
  - c. 60 kidneys from patients attending general out patient department of radiology GGH, and Vijayawada

Screening of patients for any renal anomalies, who-where attending to the urological outpatients departments:

1. Anomalies

- *Cadavers of anatomy dissection hall and autopsy:* 76 specimens were studied and the study of upper urinary tract [11] was undertaken in detail, after noting the Sl.No, Sex, Parameters. Anomalies were studied and photographs were taken:
- *Unclaimed still born fetus:* 40 specimens were studied after noting the following particulars.
  - Sl.No
  - Approx age of fetus.
  - Sex of fetus
  - Parameters
  - Anomalies

*Procedure:* The abdomen was opened by right para median incision and two parallel transverse incisions, which were taken at the end of the right para median incision. The superficial viscera were studied in detail and noted the anomalies if any present. Next the coils of small intestines were removed from abdominal cavity to get a clear view of the posterior abdominal organs.

The size, shape and position of the kidney were recorded. The hilum of the kidneys and the structures in relation to it were noted down. Next the pelvic viscera, diaphragm, great vessels were examined for any anomalies.

Results

In the present study 176 specimens of kidneys were studied out of which 40 were fetal specimens and the rest were adult specimens consisting of both cadaveric and sonograms. The adult specimens from cadavers were 76 and 60 from sonograms .

The following observations were made:

Out of 40 fetal specimens 2 anomalies were observed.

1. Aberrant renal artery.
2. Aberrant renal vein.
3. Agenesis of left Kidney.

Out of 76 cadaveric specimens the following anomalies were observed

1. Aberrant renal arteries - 10
2. Double ureter - 1
3. Lobulated adults Kidneys - 5
4. Hypoplastic kidneys - 10
5. Testicular veins - testicular vein draining into renal vein.

Out of 60 sonograms of kidney,

1. Polycystic kidneys - 2
2. Hydro nephrosis - 10
3. Renal Calculi - 4

Table 1: Anomalies of the Kidney 9,10,11,15

Sl. No	Length In Cm	Breadth In Cm	Sup. Pole Length In Cm.	Inferior Pole Legth In Cm	Weight in Grams	Right or Left	Variations
1	5.60	5.60	4.04	4.74	126	Right - F	Inferior Pole, Aberrant artery. Length is short
2	8.63	5.73	5.41	5.18	115	Left - F	Left Superior pole, aberrant artery
3	9.53	5.82	4.51	4.15	145	Left - M	Left Superior pole, aberrant artery
4	8.48	4.88	4.11	4.15	145	Left - M	Left Superior pole, aberrant artery
5	10.0	4.56	5.29	4.52	157	Left - F	Aberrant artery, Superior pole.
6	10.6	3.23	5.64	3.77	126	Right - F	Inferior Pole, Aberrant artery. Length is short
7	9.19	4.36	5.64	4.09	106	Left - M	Aberrant artery, Superior pole.
8	9.80	5.40	4.50	3.60	145	Left - M	Aberrant artery, Superior pole.
9	10.6	4.5	3.3	3.40	110		Aberrant renal artery
10	11	4.00	2.50	3.25	105		Aberrant renal vein
11	13	8.2	4.50	5.50	208	Right	Aberrant renal vein from Superior pole.
12	3.07	1.75	1.10	4.42	9.2	Left - F	Lobulated with aberrant vein at right superior pole. Weight 1.6 k.g
13	4.22	2.32	2.32	2.18	10.58	Left - F	CRL: 35cm,Weight: 2.78 aberrant arteries to left. Superior pole

WET SPECIMENS (ADULT CADAVERS)

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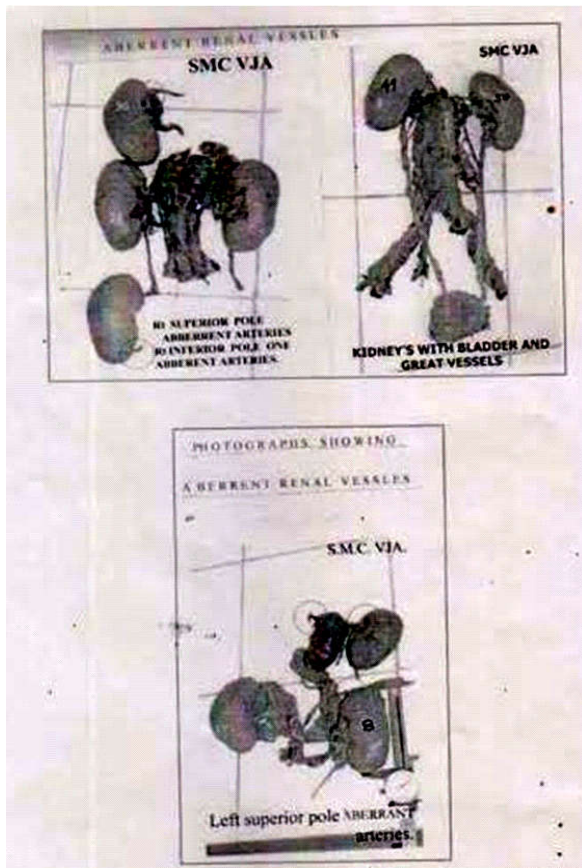


Diagram 1: Showing Accessory Renal Vessels Supplying the Poles of the kidney (Ref:-10,14,15)

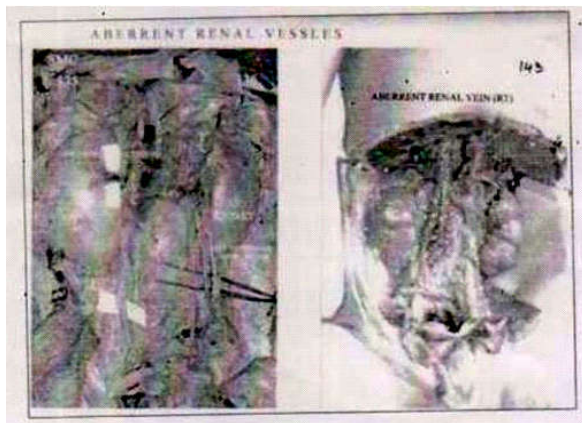


Diagram 2: Aberrant Renal Vessels Diagram 3: Aberrant Renal Vein Vessels

### Discussion

The medial testicular vein [3] on right side was bifurcating into two divisions, the lateral one was connected with the lower renal vein where - as medial one was draining directly into the inferior vena cava.

- In normal case, there is one renal vein and one testicular vein on each side. On right side both renal and testicular veins [5] open directly into the IVC. The right renal vein is a mesonephric vein that originally drains into that portion of right sub cardinal veins which from part of IVC. The testicular veins are remnant of that part of sub cardinal vein [6] which lie below inter sub-cardinal anastomosis
- The reason for this observation could be attributed to early stages of development.
- Regarding anomalies of renal [12] vasculature the observations in the study were 14 aberrant vessels (10 in 76 cadaveric specimens and in 40 fetal specimens). According to Merklin and Michele, [13] (1958) 71% and according to Geyer and Poutasse, (1962) 85% of Kidneys have one artery that supplies the entire renal parenchyma.
- A slightly higher percentage i.e. 87% of right sided kidneys have single renal vessel was observed by Geyer and Poutasse (1962). In this present study it was observed that 12:168 (i.e. 7.14%) of which right - sided are 7 and left are 5. So as per the study single artery kidneys are 93%.

### Conclusion

- It is of interest to note that congenital anomalies [13] were noted from as early as 460-377B.C. It is started that anomalies of the urinary tract rank third or fourth in position and they constitute 3 - 4% of total congenital anomalies and seen in 2-3% of population.
- The present study is confined mainly to study have been discussed in detail and comparative study has been made with the available data.
- In the present study, a rare anomaly, of right testicular vein joining the right renal vein is observed.
- In the present study, two adult polycystic kidney anomalies [14], are observed.
  - In the present study, 14 aberrant vessels are observed [15].
  - In the present study, 10 hypoplastic kidneys are observed.
  - In the present study, 10 specimens of hydronephrosis are 14 observed.
  - In the present study, 5 specimens of fetal specimens lobulations are observed.

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