



Study of morphology of Renal Artery in 50 Human cadavers by dissection method in Ahmedabad district

KEYWORDS

Renal Artery, origin, length and diameter of Renal Artery

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ABSTRACT

Study of morphology of Renal Artery in terms of origin, length and diameter supplying kidney is very significant. This study helps in avoiding the surgical accidental injuries of blood vessels during renovascular surgery, kidney transplant and radiological procedures. Present study was conducted on 50 formalin fixed cadaver by dissection method. A comparative analysis was done with previous studies. In this study origin of Right Renal artery is little higher than Left Renal artery in most cases. In evaluation of distance between origin of Renal Artery and origin of Superior Mesenteric Artery from abdominal aorta on Right side mean distance 12.72 ± 3.04 mm and on Left side mean distance 11.16 ± 2.42 mm. In evaluation of length of Renal Artery mean length on Right side 38.04 ± 4.29 mm and on left side 27.04 ± 5.27 mm. In evaluation of diameter of Renal Artery near origin from Abdominal Aorta mean diameter of right side 4.76 ± 0.32 mm and on left side 5.22 ± 0.34 mm. Knowledge of this variation is important for surgeon and radiologists.

INTRODUCTION:

Among many systems in our body the Urinary System is one of most important excretory system. Most common variations in case of circulatory system usually occur in form of origin, number, length, diameter etc. The urinary and reproductive systems develop from intermediate mesenchyme and are intimately associated with one another especially in the earlier stages of their development.¹ Permanent renal artery develops from lateral splanchnic branches of dorsal aorta. These consist of numerous branches which supply the pronephric, mesonephric and metanephric kidneys and the gonads. Most of the vessels undergo regression. In the later part of development, gonadal artery and the three suprarenal arteries persists on each side. 2,3 They supply the kidneys through a number of subdivisions described sequentially as segmental, lobar, interlobar, and arcuate arteries. These are end arteries with no anastomoses. The arcuate arteries further divide into interlobular arteries which give rise to the afferent arteries to the glomeruli. The renal arteries branch laterally from the aorta just below the origin of the superior mesenteric artery. Both cross the corresponding crus of the diaphragm at right angles to the aorta. The right renal artery is longer and often higher, passing posterior to the inferior vena cava, right renal vein, head of the pancreas and descending part of the duodenum. The left renal artery is a little lower and passes behind the left renal vein, the body of the pancreas and splenic vein. It may be crossed anteriorly by the inferior mesenteric vein. A single renal artery to each kidney is present in 70% of individuals. The arteries vary in their level of origin and in their caliber, obliquity and precise relations. Near the renal hilum, each artery divides into an anterior and a posterior division, and these divide into segmental arteries supplying the renal vascular segments.^{2,4,5}

REVIEW OF LITERATURE:

Knowledge of variations in anatomy is important to anatomists, radiologists, anesthesiologists and surgeons, and has gained more importance due to the wide use and reliance on computer imaging in diagnostic medicine.

Norman D. Levine (1970)⁶ reported an unusual renal arterial anomaly. Not uncommonly, multiple renal arteries are seen to supply kidneys which have ascended normally. Their anomalous arteries may arise anywhere along the aorta from T11 down to the hypogastric arteries.

Ryosuke Miyauchi (1988)⁷ : Renal arteries were reported to be located between the lower third of the first lumbar vertebra

and the cranial third of the second lumbar vertebra. The right and left renal arteries were reported to be at the same level in about 30% of cases, while the right was higher in 47% and the left was higher in about 23% of cases. A single renal artery on one side and multiple (two, three, or four) renal arteries on the other is not unusual.

Saldarriaga B. (2008)⁸ : The sample included 195 renal blocks corresponding to 57 (14.6%) kidneys the average right and left renal artery length was 34.6 mm and 28.6 respectively ($p < 0.001$). Renal artery diameter was 4.87 mm. Main renal artery diameter in kidneys presenting additional renal arteries was less than that of those having a single renal artery, this being a significant difference ($p = 0.0000$). The renal arteries more frequently (85%) originated from the anterolateral part of the aorta. The right renal artery emerged rostrally in 49.2%, whilst both arteries were located at the same level in 34.4%.

MATERIALS AND METHOD:

This study was conducted on 50 embalmed Human cadaver for Renal artery variation by dissection method according to Cunningham's Manual of Practical Anatomy, 15th edition.⁹

OBSERVATION:

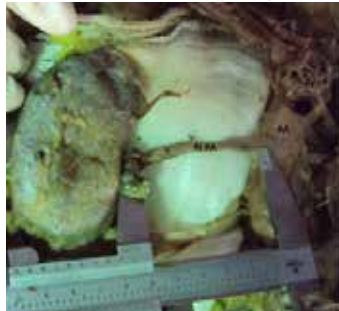
The location of the renal artery according to origin from abdominal aorta was evaluated as origin of right renal artery above the origin of left renal artery 30 cases (60%), at the same level 14 cases (28%) and right renal artery lower to left renal artery 6 cases (12%). So origin of Right Renal Artery is little higher than Left Renal Artery in most cases.

Regarding the evaluation of the origin of Renal Artery in relation to the distance between origin of Renal Artery and origin of Superior Mesenteric Artery from Abdominal Aorta. (Figure.2)



Distance from Superior Mesenteric Artery (in mm)	Min	Max	Mean \pm SD
Right	7	16	12.72 \pm 3.04
Left	5	16	11.16 \pm 2.42

The measurement of length of Renal Artery from the Abdominal Aorta to division of Renal Artery. (Figure. 1)



Length of Renal Artery (in mm)	Min	Max	Mean \pm SD
Right	28	53	38.04 \pm 4.29
Left	20	52	27.04 \pm 5.27

In evaluation of diameter of Renal Artery near origin from Abdominal Aorta.

Diameter of RA (in mm)	Min	Max	Mean \pm SD
Right	4.1	5.3	4.76 \pm 0.32
Left	4.3	5.7	5.22 \pm 0.34

DISCUSSION:

Ronald A. Bergman (1988)¹⁰ reported the right and left renal arteries were reported to be at the same level in about 30% of cases, while the right was higher in 47% and the left was higher in about 23% of cases.

In previous study done by Aynur Emine Çiçekciba i (2011)¹¹ reported origin site of the right RA from the abdominal aorta was superior to, at the same level with, and inferior to that of the left RA in 53.8%, 34.6% and 11.5% of the cases, respectively.

In present study origin of right renal artery above the origin of left renal artery 30 case (60%), at the same level 14 case (28%) and right renal artery lower to left renal artery 6 case (12%). So origin of RRA is little higher than LRA in most cases.

Taner Ziyilan (2005)¹² in his study reported that the right RA originated from the lateral part and anterolateral wall of the abdominal aorta in 73.0% and 26.9% of cases while the lateral and anterolateral wall origin percentages of left RA were 90.3% and 9.6%, respectively.

In previous study done by Bladimir Saldarriaga (2008)⁸ the renal arteries more frequently (85%) originated from the anterolateral part of the aorta. In present study site of origin of RA from AA in 69% cases RA arise lateral side and in 31% case arise from anterolateral side.

In previous study done by Thompson SA et al.(1988)⁷ reported that the distance between origin of RA and SMA from AA was on right side 10.2 \pm 6 mm & on left side 11.2 \pm 5.7mm.

In present study regarding the evaluation of the origin of RA in relation to the distance between origin of RA and origin of SMA from AA, on right side min and max distance 7mm & 16mm respectively with the mean 12.72 \pm 3.04 mm, and on left side min and max distance 5mm & 16mm respectively with the mean of 11.16 \pm 2.42 mm.

Affi AK et al. (1988)⁷ evaluates the right renal artery, from aortic origin to its division point, can measure 0.5 - 8 cm long; the length of the left can vary from 0.5 - 6 cm. The mean length of the main renal artery was 31.05 \pm 12 and 25.0 \pm 9.5 mm on the right and the left side respectively & the mean length of the accessory renal artery was 36.4 \pm 10 and 36.6 \pm 11 mm on the right and the left side respectively reported by P. Dhar and K. Lal (2005) during dissection in 5 years of duration over 40 cadavers.

Saldarriaga B et al. (2008)⁸ studied morphological expression of the renal artery by a direct anatomical study in a Colombian half-caste population reported average right and left renal artery length was 34.6 mm and 28.6 mm respectively (p<0.001).

In present study regarding the evaluation of length of RA from the AA to the division of RA on right side min and max length 30mm & 53mm respectively with the mean of 38.04 \pm 4.29 mm and on left side min and max length 20mm & 52mm respectively with the mean of 27.04 \pm 5.27

mm. The measurement of ARA from AA to its termination into hilum or pole of kidney, on right side min length 32mm & max length 47mm with mean of 40.6 \pm 4.7 mm, on left side min length 25mm & max length 52mm with mean of 33.33 \pm 4.5 mm.

M.K. Tarzanni (2007)¹³ done study on 117 patients underwent contrastenhanced 64-slice multi-detector computed tomography renal angiography and evaluate that the mean diameters of the aorta and renal artery were 2.62 \pm 1.55 mm and 0.62 \pm 0.11 mm respectively and the distance to branching was 3.39 \pm 1.59 mm. There was no significant difference in diameter between the left and right renal arteries or in the distance to branching (0.62 \pm 0.11 vs. 0.61 \pm 0.12 mm; p = 0.35; 3.24 \pm 1.2 vs. 3.56 \pm 1.77 mm; p = 0.11).

Saldarriaga B. (2008)⁸ reported the average diameter on RRA 4.8 mm and on LRA 4.93 mm.

Pinto S.A. (2008)⁸ evaluate that the Renal artery diameter was 4.87 mm. Main renal artery diameter in kidneys presenting additional renal arteries was less than that of those having a single renal artery, this being a significant difference (p=0.0000).

In present study the measurement of in diameter of RA near origin from AA, on right side min and max diameter of RRA 4.1mm & 5.3mm respectively with the mean of 4.76 \pm 0.32 mm, on left side min and max diameter of LRA 4.3mm & 5.7 mm respectively with the mean of 5.22 \pm 0.34 mm. The measurement of diameter of ARA near its origin, on right side min diameter 2.7mm & max diameter 3.2mm with mean of 2.9 \pm 0.18 mm, on left side min diameter 2.5 & max diameter 4mm with mean of 2.9 \pm 0.23 mm.

CONCLUSION:

A profound knowledge of the anatomic characteristics and variation of the renal vessels such as its origin, length, diameter, number, course and branching patterns is an important value for a safe attempt in suitable position for surgeons in planning and performing procedure. Knowledge of the variations of the renal vessels has grown in importance with increasing numbers of renal transplants, vascular reconstructions and various surgical and radiological techniques being performed in recent years. It also facilitates a safe approach to the kidneys in trauma management.

REFERENCE

1. HENRY GRAY. *Gary's Anatomy: Susan Standring, 40th edition, Anatomical basis of clinical practice.* | 2. A.K. DATTA. *Essentials of Human Embryology, The Urogenital System, 5th ed. 2007; 213-222.* | 3. WILLIAMS P.L., BANNISTER L.H., BERRY M.M., COLLINS P., DUSSEK J. E., FERGUSON M. W.J. *Gray's Anatomy, in: Embryology & development, Urinary system, 38th edn. 1995; 199-204.* | 4. B. D. CHAURASIA. *Text book of Human Anatomy (Lower limb & Abdoman) Volume II, 5th ed 2010; 319-324.* | 5. KEITH MOORE AND T.V.N. PERSAUD. *Before we are born. Essentials of Embryology and Birth Defects. The Urogenital system. 6th ed 2003; 230-244.* | 6. NORMAN D. LEVINE. *An unusual renal artery anomaly- Common origin of arteries to the lower poles. Merklin: 45:505.* | 7. R MIYAUCHI, AFIFI AK, BREGMAN RA, THOMPSON SA. *Compendium of Human Anatomic Variations. Munich: Urban and Schwarzenberg, 1988; 81.* | 8. SALDARRIAGA B.; PINTO, S. A. & BALLESTEROS, L. E. *Morphological expression of the renal artery. A direct anatomical study in a Colombian half-caste population, Int. J. Morphol., 2008; 26(1): 31-38.* | 9. G.J. ROMANES. *Cunningham's Manual of Practical Anatomy (Thorax & Abdomen) Volume II, 15th edition.* | 10. RONALD A. BERGMAN, ADEL K. AFIFI, RYOSUKE MIYAUCHI. *Illustrated Encyclopedia of Human Anatomic Variation: Opus II: Cardiovascular System: Arteries: Thorax & Abdomen.* | 11. AYNUR EMINE CICEKCIBASI. *A Complex Variation of the Parietal and Visceral Branches of the Abdominal Aorta, int. J. Morphol., 2011; 29(1): 90-93.* | 12. TANER ZIYLAN. *An investigation of the origin, location and variations of the renal arteries in human fetuses and their clinical relevance, September 2005; 187 (4) 421-427.* | 13. M.K. TARZAMNI. *Anatomical differences in the right and left renal arterial patterns, Folia Morphol. 67(2), 104-110.* |