

## Morphometric Analysis of Distance of Origin of Renal Artery from Bifurcation of Abdominal Aorta for Interventional Procedures

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### Abstract

**Background:** Renal artery arises from abdominal aorta supply the kidney, sometimes assisted by accessory renal arteries which also can arise from abdominal aorta. So various orifices present within the abdominal aorta may create problem to identify the renal artery for the surgeons and radiologist during interventional procedures. Considering this clinical problem the present study has been undertaken to measure the distance of origin of renal artery from aortic bifurcation.

**Materials and methods:** 16 embalmed formalin fixed cadavers (12 males, 4 females) were dissected in the abdomen to expose the renal artery, kidney and abdominal aorta by using routine dissection methods. Then the distance between the origin of renal artery and the aortic bifurcation were measured.

**Results:** In males the renal artery arises from the aortic bifurcation at an average distance of 9.98 cm and 9.91 cm on the right and left sides respectively. In females the average distance is 8.35 cm and 8.43 cm respectively on right and left sides.

**Conclusion:** The knowledge of average distance of origin of renal artery from aortic bifurcation will help the surgeons and radiologist during the interventional procedures in renal artery through abdominal aorta.

**Keywords:** Renal artery, abdominal aorta, aortic bifurcation, kidney

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Date of Submission: 02-04-2019

Date of acceptance: 17-04-2019

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### I. Introduction

Kidney is one of the major paired excretory organ located in the corresponding lumbar region. It receives its blood supply through renal artery which arises as a lateral branch from abdominal aorta usually at the level of L1 vertebra<sup>1,2</sup>. But the level of origin of renal artery may vary due to embryological and racial reasons. Considering this clinical problem the present study has been undertaken to measure the distance between the origin of renal artery and the bifurcation of abdominal aorta. The knowledge of the distance between the origin of renal artery and aortic bifurcation helps the surgeons, radiologist to identify the exact position of orifice of renal artery during interventional procedures.

### II. Materials And Methods

The present study has been undertaken in the Department of Anatomy, Coimbatore Medical College, Coimbatore during the academic year 2017 – 18 and 2018 – 19. In the present study 16 embalmed formalin fixed adult cadavers (12 males and 4 females) has been used. These cadavers have been dissected to expose the kidney, renal artery and the abdominal aorta by using routine dissection methods<sup>3</sup>. Then the distance between the level of origin of renal artery and the bifurcation of abdominal aorta were measured (Fig-1) and the results were compared between right and left sides and also with the previous studies.

### III. Results

The mean distance of origin of renal arteries differs on right and left side. The right renal artery arises from the bifurcation of abdominal aorta with the mean distance of 9.57 cm with the standard deviation of 1.169 cm, whereas on the left side the renal artery arises from aortic bifurcation with mean value 9.54 cm and standard deviation of 1.102 cm. In male cadavers the mean distance of origin of renal artery from aortic bifurcation is  $9.98 \pm SD 0.748$  cm and  $9.91 \pm SD 0.71$  cm respectively on right and left side. In female cadavers the mean distance is  $8.35 \pm 1.462$  cm on the right side and  $8.43 \pm 1.422$  on the left side.

#### IV. Discussion

Kidney is a retroperitoneal structure which receives about 20% of cardiac output through renal arteries. These renal arteries may vary in length, branching pattern and its level of origin. These variations in the renal artery may create problems for the surgeons during surgical procedures in the renal artery or for the radiologist during interventional procedures.

So in the present study the distance of origin of renal artery from the bifurcation of abdominal aorta were measured and the results were compared and statistically analyzed. Out of 16 cadavers dissected, the level of origin of renal artery from aortic bifurcation do not differ significantly between right and left side with p value 0.938 using student t test with 95% confidence interval - 0.78 to + 0.85.

Likewise in 12 male cadavers and 4 female cadavers the results do not differ significantly between right and left side with p value 0.825 with 95% confidence interval - 0.55 to + 0.68 in males and in females the p value is 0.94 with 95% confidence interval - 2.57 to + 2.4 using student t test.

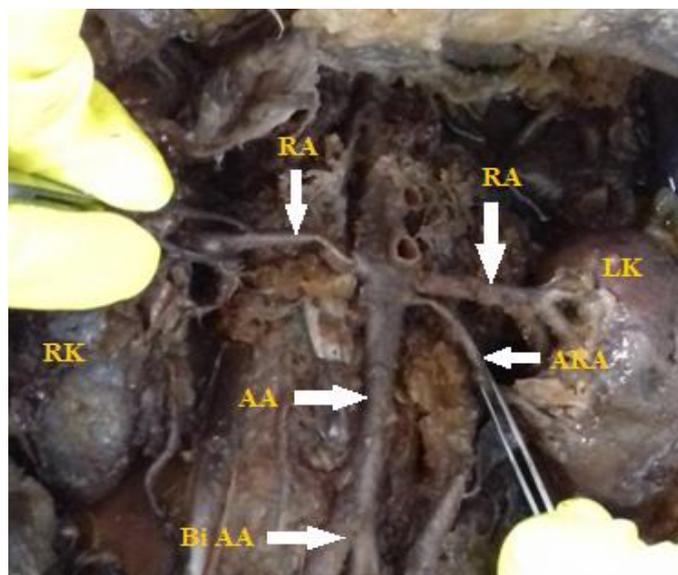
In a study done by Wamanrao M U et al the average distance of origin of renal artery from aortic bifurcation is 9.3 cm<sup>4</sup>. In the present study the average distance of origin of renal artery from aortic bifurcation is 9.57 cm and 9.54 cm respectively on the right and left side. In males the average distance is 9.98 and 9.91 cm on the right and left sides respectively. In females the average distance between origin of renal artery and aortic bifurcation is 8.35 cm and 8.43 cm on the right and left sides respectively (Fig-2).

#### V. Conclusion

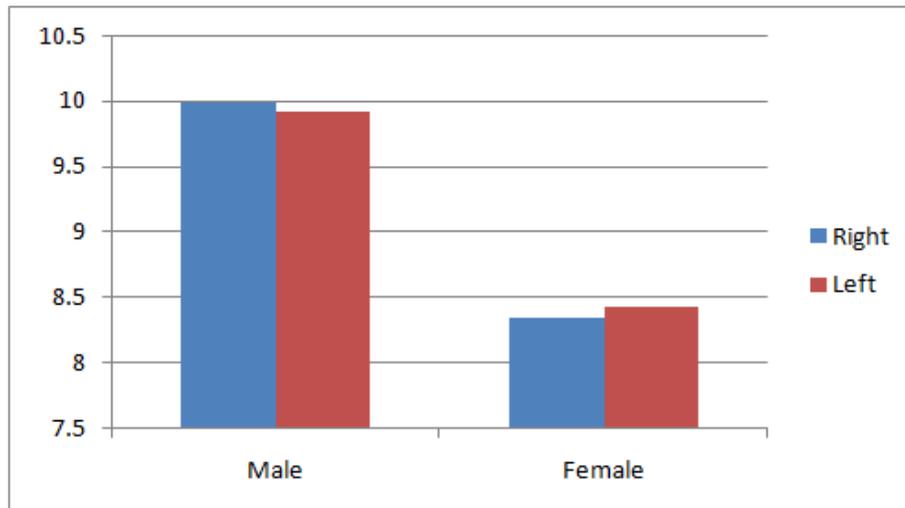
To conclude, the surgeons and the radiologist during the interventional procedures in the renal artery through abdominal aorta has to look for the origin of renal artery from aortic bifurcation at about 9.5 - 10 cm in males and about 8 - 8.5 cm in females in order to avoid confusion between the orifice of main trunk of renal artery and the orifices of other branches of abdominal aorta including accessory renal arteries.

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**Fig- 1.** Image showing the distance between renal artery and aortic bifurcation. RA –Renal Artery; AA – Abdominal Aorta; ARA – Accessory Renal Artery; BiAA – Bifurcation of Abdominal Aorta; RK – Right Kidney; LK – Left Kidney.



**Fig- 2.** Bar chart showing the comparison of distance between origin of renal artery and aortic bifurcation between right and left sides of male and female.

Dr.V.Vimala. "Morphometric Analysis of Distance of Origin of Renal Artery from Bifurcation of Abdominal Aorta for Interventional Procedures." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 4, 2019, pp 66-68.