

## Study of variation in renal artery of cadaver by dissection

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### Abstract

**Objective:** The main purpose of the study was to observe the variation of renal artery in cadaveric study brought to the Department of Forensic Medicine, Maharajgunj Medical Campus, Nepal.**Methods and Methodology:** This was cross-sectional study done on the 97 cases (194 kidneys) brought to the Department of Forensic Medicine. Cases were dissected and variations of renal arteries were noted by photography.**Results:** There were 97 cases out of which 21.64 % (21 cases) showed variation of renal artery. Right sided variation was observed in three cases (3.09%), Left sided variation was observed in eight cases (8.24%) and bilateral variation was observed in ten cases (10.30%)**Conclusion:** There was variation of renal artery in terms of duplication and multiple prehilum branching. Therefore this information may be useful for clinical as well as research purpose.**Keywords:** Renal artery, Polar artery, Prehilum multiple branching artery.

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### 1. Introduction

Traditionally each kidney is supplied by single renal artery. [1] However, there are many variations in renal blood supply that may influence different clinical procedures. Normally single renal artery irrigates each kidney. The renal arteries are paired arteries that arise from the lateral side of the abdominal aorta just below the origin of superior mesenteric artery. Variation of renal artery are more common than renal veins. They carry about 20% of the cardiac output to supply the kidneys, which represent less than 1/100<sup>th</sup> of the total body weight. In 70% of individuals, a single renal artery is present, in the remaining 30%, accessory renal arteries are seen. They arise from the abdominal aorta above or below the main renal artery and follow it to the hilum.[2]

The various authors have described different types of renal arteries (accessory, additional, supplementary, and aberrant), their positions, method of entry to the kidney, but the majority of authors have not been able to give the precise terminology for these arteries.[3,4] Since these vessels occupy a certain area of the kidney and there is no

anastomosis, either with the branches of the main or with branches of segmental renal arteries.[5] However, accessory renal vessels if present may enter the kidney either through the hilum or through the surface. And these surface arteries enter the kidney either from upper pole or lower pole as a polar artery. [6]

Renal artery variations are very common. There are many authors that showed variations regarding the origin and number of renal arteries.[7] Therefore this study is an attempt to explore the knowledge of renal artery variation in cadaver that can be useful for clinical as well as research purpose.[8]

### 2. Material and Method

This study was conducted on 97 subjects of age group between 18-65 years from 15<sup>th</sup> June 2015 to 14<sup>th</sup> June 2016 in Department of Forensic Medicine, Institute of Medicine (IOM), Maharajgunj Medical campus, Kathmandu Nepal. Prior to study ethical clearance was taken from institutional review committee of IOM. It was a descriptive cross sectional study with judgemental sampling

methods. Simple random sample cases selected from population of interest. Records from the date 15<sup>th</sup> June 2014 to 14<sup>th</sup> June 2015 were analyzed based on cause of death. Total no. of cases was 1364. Out of this, 760 were population of interest and remaining cases fell under exclusion criteria. In six months duration expected number of cases would be around 380. Every 4<sup>th</sup> case will be considered for dissection and this amounts to 95 cases to be studied. Selection Criteria was road traffic accidents without kidney injury, intact kidney in case of hanging, stab injury, poisoning, and myocardial infarction etc, Cadaver for the purpose of teaching learning. Exclusion criteria was renal injury, Putrified cadavers, Foreign nationals, Time of death after 24 hrs.

In block was taken from the cadaver (figure 1). An abdominal viscus was removed by dissection and kidney was identified. Covering of the kidney was removed by dissection and renal artery was identified. Then, renal artery was traced from their origin to distribution. Accessory renal artery if present was noted and documented by photography. all the data are interpreted using percentage.



Figure 1: Inblock from cadaver

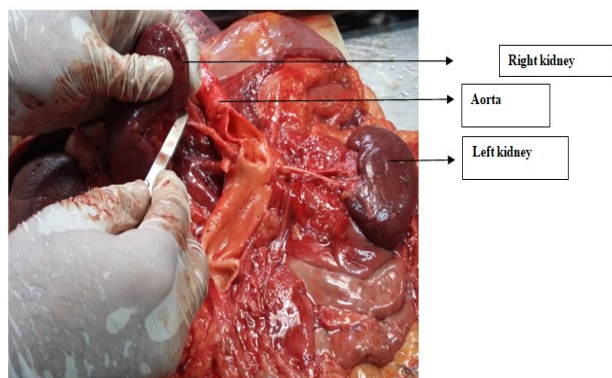


Figure 2: Tracing of renal artery

### 3. Results

The interest of the investigator behind the dissertation was to explore the variation of renal artery. In this study 97 cases (194 kidney) were included, out of which 21.64% (21 cases) showed variation of renal artery.

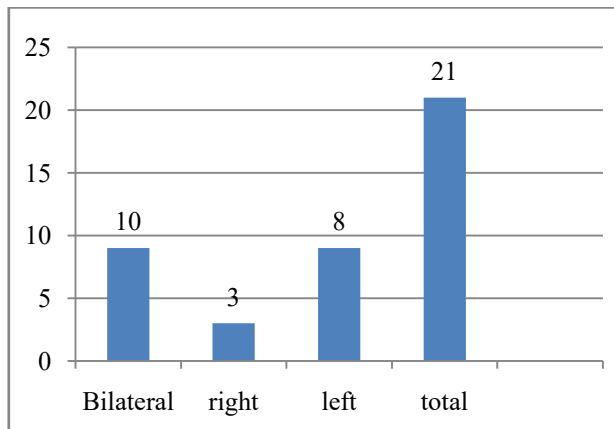


Figure 3: Variation of renal artery is according to the sides

Figure three showed the variation of renal artery according to the side involved. Out of the 21 cases, 10 cases (47.61%) showed bilaterally (B/L) variation of renal artery. Unilateral variation was observed in 11 cases (52.38%). Out of which three cases (14.28%) showed right sided variation of renal artery and eight cases (38.09%) showed left sided variation of renal artery. Variation was again divided into hilar and polar group. Hilar means artery going into the hilar region of the kidney and polar means artery going into the poles of the kidney.

Out of eight variation observed in left side, three was polar and five was hilar type of variation. Out of the three polar variation two was going into the superior pole and one into the inferior pole. Hilar variation shows multiple prehilar branching of the renal artery (Figure 4).

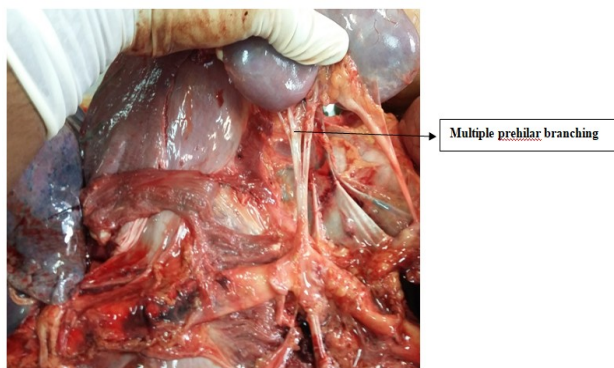


Figure 4: Prehilar multiple branching in the superior pole

Out of three variation observed in the right side of kidney, two were hilar type and one was polar. Out of the two hilar type observed in right kidney, one was with multiple prehilar branching (Figure 5) and one with duplication of renal artery in right side (Figure 6). Polar artery was observed in the upper pole of the right kidney

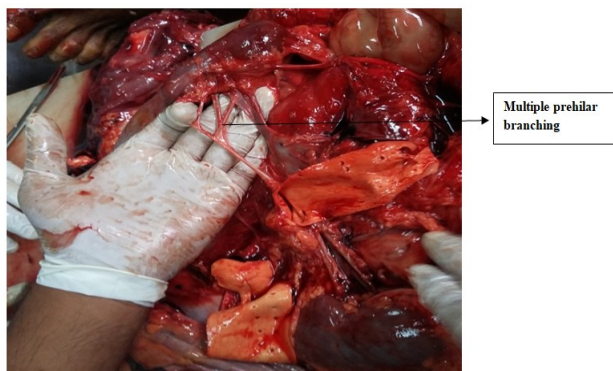


Figure 5: Prehilar Multiple branching in right side of kidney

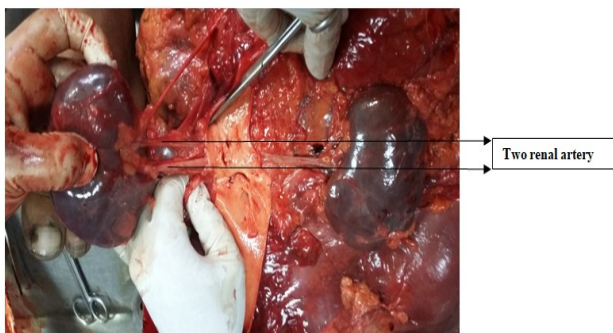


Figure 6: Duplication of renal artery in right side of kidney.

Ten cases showed bilateral variation of renal artery. Out of this four cases showed bilateral hilar variation, two cases showed polar variation, two cases showed left sided hilar with right sided polar variation and two cases showed right sided hilar with left sided polar. Bilateral hilar variation showed multiple prehilar branching in both side of the kidney (Figure 7). Bilateral polar artery were observed in the superior pole (Figure 8).

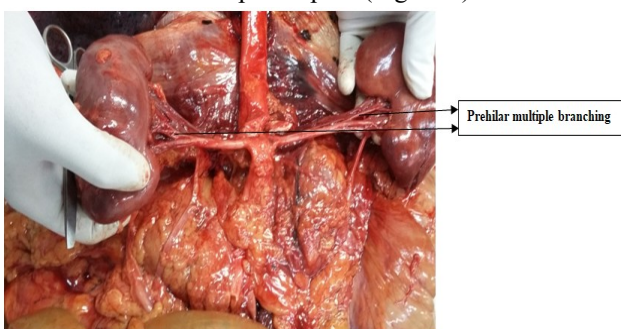


Figure 7: Prehilar multiple branching on both side of kidney

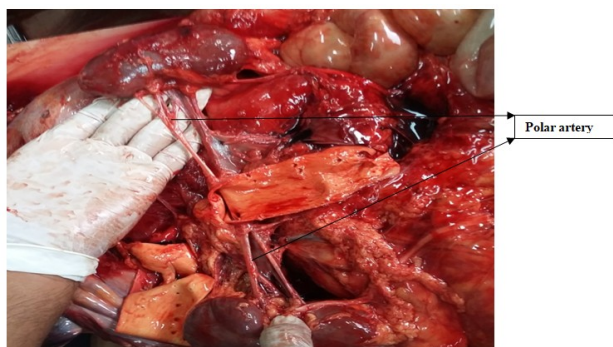


Figure 8: Bilateral polar artery in the superior pole.

#### 4. Discussion

Literature indicates that multiple renal arteries are found in 9-76% of cadavers. Aristotle et al (2013) observed 86.6% cases as a normal pattern of blood supply to the kidney [9]. In our study, we observed 78.3% as normal pattern of blood supply to the kidney.

Variation of renal arteries occur in both sides. Saldarriaga et al(2008) [10] reported that variation of renal arteries were found most frequently in left side. In our study also, we observed variation in both renal artery and most commonly in the left side.

Prehilar multiple branching of renal arteries were 11.66% and 21.6% reported by Budhiraja et al (2011)[11] and Ogeng'o et al.,(2010) [12]. In our study we observed prehilar multiple branching in the left side was five cases (5.15%), in the right side it was two cases (2.06%) and eight bilateral variation (8.24%) was observed in both kidney.

Similar study conducted by Budhiraja et al (2011) [11], reported superior polar artery in 22.6% cases. In our study we observed three polar artery in the left side of the kidney, one polar artery in the right side of the kidney and six bilateral variation of polar artery were observed in the both side of the kidney. So from this study we can say that, there is variation of renal artery and for any renal procedure, this information of vascular pattern in the renal artery should be consider.

#### 5. Conclusion

With the increasing demands for reno-vascular procedure, the possible variations in the renal arterial pattern are especially important. So from this study we can conclude that there are many variation of renal artery. These variation are almost three time more common in the left side of the kidney. Awareness of the normal as well variational anatomy is mandatory for the surgeons, radiologists and urologists, for doing any clinical procedures. Hence, this study will serve a useful guideline for the above mentioned procedures.

#### Reference

- [1]. Beregi J. P., Mauroy B., Willoteaux S., Mounier-Vehier C., Remy-Jardin M., Francke J. Anatomic variation in the origin of the main renal arteries: spiral CTA evaluation. *Eur Radiol.* 1999; 9(7):1330-4.
- [2]. Standring S, Ellis H, Healy JC, Johnson D, Williams A, Collins P. *Gray's Anatomy*. 39<sup>th</sup> ed. London: Elsevier Churchill Livingstone; 2005.
- [3]. Sykes D. The arterial supply of the human kidney with special reference to accessory renal arteries. *Br J Surg.* 1963; 50: 368-74.
- [4]. Singh G, Ng YK, Bay BH. Bilateral accessory renal arteries associated with some anomalies of the ovarian arteries: a case study. *Clinical Anatomy* 1998; 11(6): 417-20.

- [5]. Merklin RJ, Michels NA. The variant renal and suprarenal blood supply with data on the inferior phrenic, ureteral and gonadal arteries: a statistical analysis based on 185 dissections and review of the literature. *The Journal of the International College of Surgeons*. 1958; 29(1 Pt 1):41-76.
- [6]. Deshpande SH, Bannur BM, Patil BG. Bilateral multiple renal vessels: A case report. *Journal of clinical and diagnostic research* 2014; 8(1):144.
- [7]. Petru B, Elena Ş, Dan I, Constantin D. The morphology and the surgical importance of the gonadal arteries originating from the renal artery. *Surgical and Radiologic Anatomy*. 2007; 29(5):367-71.
- [8]. Sampaio FJ, Passos MA. Renal arteries: anatomic study for surgical and radiological practice. *Surgical and Radiologic Anatomy*. 1992; 14(2):113-7.
- [9]. Aristotle S, SundArAp Andi An CF. Anatomical study of variations in the blood supply of kidneys. *Journal of clinical and diagnostic research*. 2013; 7(8): 1555.
- [10]. Saldarriaga B, Pérez AF, Ballesteros LE. A direct anatomical study of additional renal arteries in a Colombian mestizo population. *Folia morphologica*. 2008; 67(2):129-34.
- [11]. Budhiraja V, Rastogi R, Asthana AK. Variant origin of superior polar artery and unusual hilar branching pattern of renal artery with clinical correlation. *Folia morphologica*. 2011; 70(1): 24-8.
- [12]. Ogeng'o JA, Masaki CO, Sinkeet SR, Muthoka JM, Murunga AK. Variant anatomy of renal arteries in a Kenyan population. *Annals of transplantation*. 2010; 15(1):40-5.