



A Cadaveric Study of Renal Artery Variation in Rajkot

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Abstract

Introduction: Renal artery is paired lateral branch of the abdominal aorta, it variates in number and origin from the abdominal aorta.

Aims and objectives: This study was conducted to study and identify the incidences of renal artery variation.

Material and Methods: 50 kidneys of 25 formalin fixed cadavers were dissected to study the renal artery.

Observations and Results: 48% (24 out of 50 kidneys) were with single renal artery and 52% (26 out of 50 kidneys) were with multiple renal arteries.

Summary and Conclusion: Renal artery variation is critical for interventions like renal artery angiogram, renal transplantation and renal surgeries, therefore the results of the studies are important for surgeon and clinicians.

Keywords: Renal Artery, Hilar artery, Superior Polar artery, Inferior Polar artery.

Introduction

Renal arteries arise from the lateral wall of the abdominal aorta at the level of L1 or L2 vertebra, 1.5 cm below the superior mesenteric artery. ^[1] the middle Suprarenal artery arises from the lateral aspect of the abdominal aorta, level with the Superior mesenteric artery. ^[2]

Renal artery morphology variates in number and origin from abdominal aorta. ^{[3]-[5]} In most of cases variations are discovered only at the time of intervention. ^[6] Sampion and Passos (1992) named them as multiple renal arteries and accordingly they are named as-hilar, superior polar and inferior polar.

Hilar renal artery enters through hilum of the kidney, superior polar enters through the upper pole of the kidney and inferior polar artery enters through inferior pole of the kidney. ^[7]

Identification and knowledge of the renal artery variation is important for various clinical interventions like renal artery angiography and renal transplantation.

Aims and Objectives

This study was conducted to identify the variation in renal artery and to determine the incidences double

renal artery, triple renal artery, superior and inferior polar artery.

Material and Methods

This study was conducted after approval from institutional ethical committee. 25 (16 males and 9 female) formalin fixed cadavers were dissected in the anatomy department during routine undergraduate and postgraduate abdominal dissection schedule. Renal arteries were dissected and explored meticulously to study the morphological variation.

Arteries originating from the abdominal aorta and supplying the kidney were defined as renal artery. Artery originating from the renal artery before hilum and supplying the kidney were defined as pre-hilar artery.

Numerical variation in renal artery was identified, noted and analyzed by statistical formulas.

In this study the classification of Sampson and Passos was followed: Hilar renal artery entering the hilum, superior polar renal artery entering the upper pole of the kidney and inferior renal artery entering the inferior pole of the kidney

Observation and Results

50 kidneys were dissected in 25 cadavers; out of them 48% (24 out of 50 kidneys) were with single renal artery and 52% (26 out of 50 kidneys) were with multiple renal arteries. (Table 1)

Right Side

56% (14 out of 25) kidneys were with multiple renal arteries; one kidney had superior and inferior polar artery without hilar artery.

Left side

48% (12 out of 25) kidneys were with multiple renal arteries; one kidney had superior and inferior polar artery without hilar artery.

Table 1: Renal artery numerical variation and frequency distribution.

Number of renal artery	Right n=25	Left n=25	Total n=50
Single renal artery	11 (44%)	13 (52%)	24 (48%)
Multiple renal arteries	14 (56%)	12 (48%)	26 (52%)
Double hilar arteries	4 (16%)	4 (16%)	8 (16%)
Three hilar arteries	2 (8%)	2 (8%)	4 (8%)
Hilar and superior polar artery	3 (12%)	2 (8%)	5 (10%)
Hilar and inferior polar artery	4 (16%)	3 (12%)	7 (14%)
Superior and inferior polar artery	1 (4%)	1 (4%)	2 (4%)
Total	25	25	50

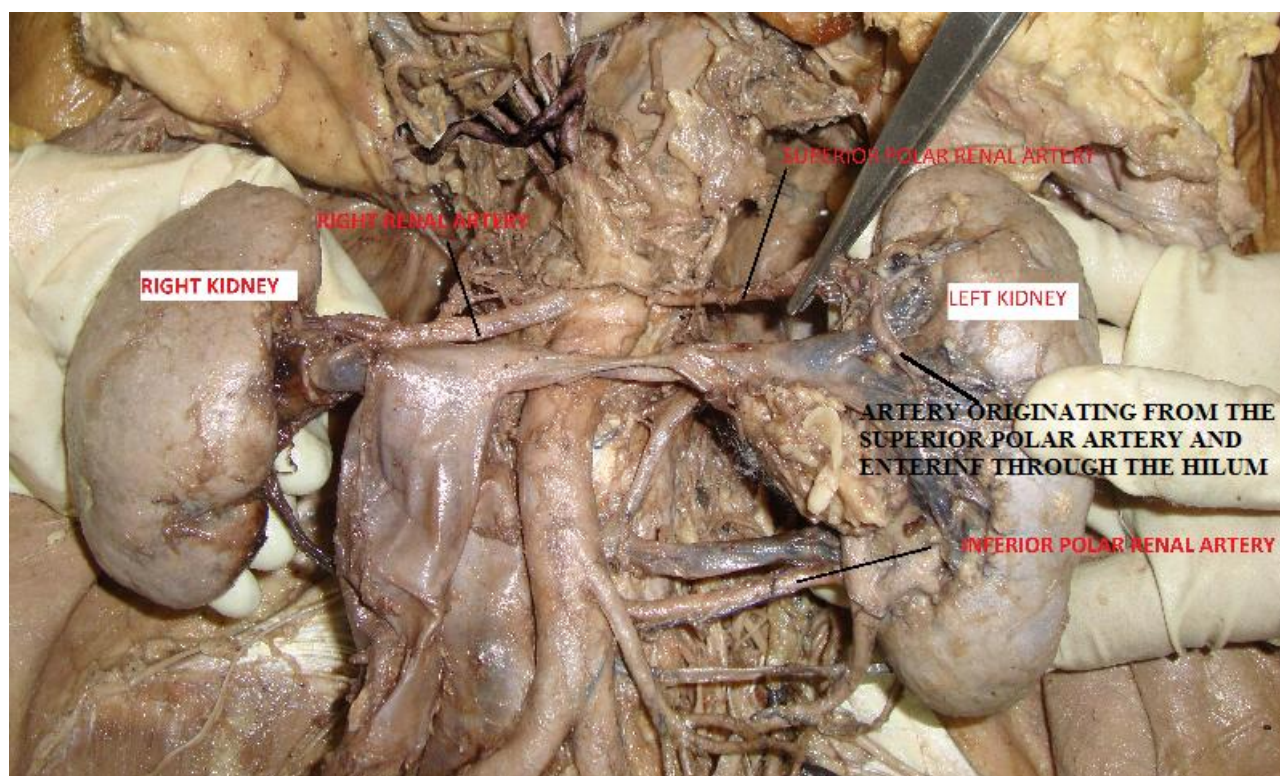


Image 1: Left side multiple renal arteries with one superior and one inferior polar artery.

There was not significant difference between right and left side of kidneys for renal artery variation (paired t test, 95% confidence interval)

In a 99-year-old female cadaver two left renal artery were found: superior Polar Renal artery and inferior Polar renal artery, both was direct branch of Abdominal Aorta. (Image 1) One was originating at the level of origin of superior Mesenteric artery from abdominal aorta. After reaching superior surface of kidney it divided into two branches small one entering the superior pole and second large branch reaching the hilum of kidney. (Image 1) Second left renal artery was 2.4 centimeter above the bifurcation of abdominal aorta and below the level of origin of inferior mesenteric artery. (Image

1). Right Renal artery was single in number originating directly from abdominal aorta. (Image 1).

Discussion

In this study 50 kidneys of 25 cadavers were dissected where 52% (26 out of 50) kidneys found with multiple renal arteries. In the present study, no significant difference was found in the incidence of multiple renal arteries between right and left side (paired t test), while multiple renal artery was reported more commonly on left side than that of right side by Harrison LH et al (1978), Singh G et al (1998), Koranafel U et al (2010).^[8-10]

Table 2: Comparison of multiple renal arteries in different population.

Authors	Population	Number of kidneys	DHA	THA	SPA	IPA
			Group			
Sampaio et al (1992) ^[7]	Caucasians	266	7.9%	1.9%	6.8%	5.3%
Khamanarong et al. (2004) ^[11]	Thai	534	7.0%	1%	7%	3%
Çiçekcibasi et al. (2005) ^[5]	Turkish	180	11.1%	-	3.3%	10.5%
Weld et al. (2005) ^[12]	American	146	12.3%	-	9.6%	15.1%
Talovic et al. (2007) ^[13]	Bosnian	78	9%	1%	2%	10%
Saldarriaga et al. (2008) ^[14]	Colombian	196	12.1%	-	4.3%	10.8%
Palmieri et al. (2011) ^[15]	Brazilian	80	45.5%	18.8%	9.4%	3.2%
Budhhiraj et al. (2013) ^[16]	Indian	84	22.6%	11.8%	13.1%	7.1%
Present study	Indian	50	16%	8%	14%	18%

DHA= Double Hilar artery, THA= Triple Hilar artery, SPA= Superior Polar Artery, IPA= Inferior Polar artery

Double renal arteries (Table 2)

Double renal arteries reported cases in this study was higher than the studies of Sampaio et al., Khamanarong et al. and Talovic et al. while that was lower than the studies of weld et al., Saldarriaga et al., Palmieri et al. and Budhhiraj et al.

Triple hilar artery (Table 2)

Triple hilar artery reported in this study was also higher than Sampaio et al., Khamanarong et al. and Talovic et al.

Polar artery (Table 2)

Superior and inferior polar arteries reported in this study was higher than the previous study.

Conclusion and Summary

This study found high number of renal artery variation which are critical for renal angiography, urological procedures, renal transplantation and surgical approach of kidney.

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