

Anatomical Study of Renal Arteries in Human Cadavers

Shashikala Patel¹, Anshuman Naik²

Abstract

Introduction: In our study, the aim was to study renal artery of human kidneys and its variation. We present double and triple renal arteries discovered during a routine dissection of abdomen at department of anatomy. *Material and method:* 50 human kidney were studied on different numbers by dissection method in Indian people. *Results:* the present study showed number of single renal artery found in 90%, double renal artery found in 6% and triple renal artery found in 4% in cases. *Conclusions:* Knowledge of these variations is important during management of renal surgery in hypertensive patient

Keywords: Double Renal Artery; Triple Renal Artery; Kidney.

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Introduction

The renal arteries arise from abdominal aorta below the origin of superior mesenteric artery, one on each side [1]. Near the hilum of the kidney, each renal artery divides into anterior and posterior branches, which in turn divides into number of segmental arteries supplying the different renal segments [2].

Classically a single renal artery supplies each kidney [3] but sometimes extra renal artery arises from either aorta or celiac trunk superior or inferior mesenteric artery etc and supply to the kidney.

The nomenclature of the variations of the renal arteries is still not clear, as different authors described them as additional, accessory, hilar, inferior and superior polar arteries [11].

In present study we used double, triple or multiple renal arteries. Variations of the renal arteries are not unusual. The aetiology of variations has been explained by embryological development from the lateral mesonephric branch of dorsal aorta [4].

Knowledge of the variations of renal vascular anatomy has importance in exploration and treatment of renal trauma, renal transplantation, renovascular hypertension, renal artery embolization, angioplasty or vascular reconstruction for congenital and acquired lesions, surgery for abdominal aortic aneurysm and conservative or radical renal surgery [5].

Materials and methods

The 50 kidneys were taken for the study. The renal arteries of the kidneys were studied by dissection methods. The kidneys separated along the renal arteries by discarding the piece of aorta and observed extra renal arteries before removal of the kidneys from the bodies, possibilities of additional renal arteries from the common iliac, internal iliac, lumbar, sacral, superior mesenteric, hepatic and inferior suprarenal arteries were a looked upon. The dissected specimens were numbered and allowed to dry for a time. The extra

Author's Affiliation: ¹Associate Professor, Department of Anatomy, ²Associate Professor, Department of Physiology, Hi-Tech Medical College, Rourkela, Odisha 769004, India.

Corresponding Author: Shashikala Patel, Associate Professor, Department of Anatomy, Hi-Tech Medical College, Rourkela, Odisha 769004, India.

E-mail: shashi_patel27@rediffmail.com

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renal were observed and photographed. Specimens were preserved in 5% formalin.

Result

Normally each renal artery run laterally and near hilum divides into anterior and posterior branch, (8) The present study shows normal course in 90%, whereas, variations in 10% of cases (5 specimens - 28, 31, 32, 45, 46)



Fig. 1:

Specimen No. 28 showed triple renal artery (2 hilar{crossed} with superior polar renal artery). Polar renal artery arising from celiac trunk run laterally and supply upper pole of kidney. Whereas both renal artery arising from aorta, cross each other. Further 1st renal artery continues as anterior division and 2nd as posterior division.

Specimen No. 46 showed triple renal artery (3 hilar), all arising from aorta. 1st renal artery continue as anterior division, 2nd as posterior division and 3rd renal artery divide into anterior and posterior division



Fig. 2:

Specimen Nos. 31 & 45 showed double renal artery (2 hilar), both arising from aorta and dividing into anterior and posterior division at the hilum.



Fig. 3:

Specimen No. 32 showed double renal artery (1 hilar with 1 superior polar artery) hilar renal artery that show normal extra renal course and superior or upper polar artery that arising from aorta, run laterally, to the upper pole of kidney.



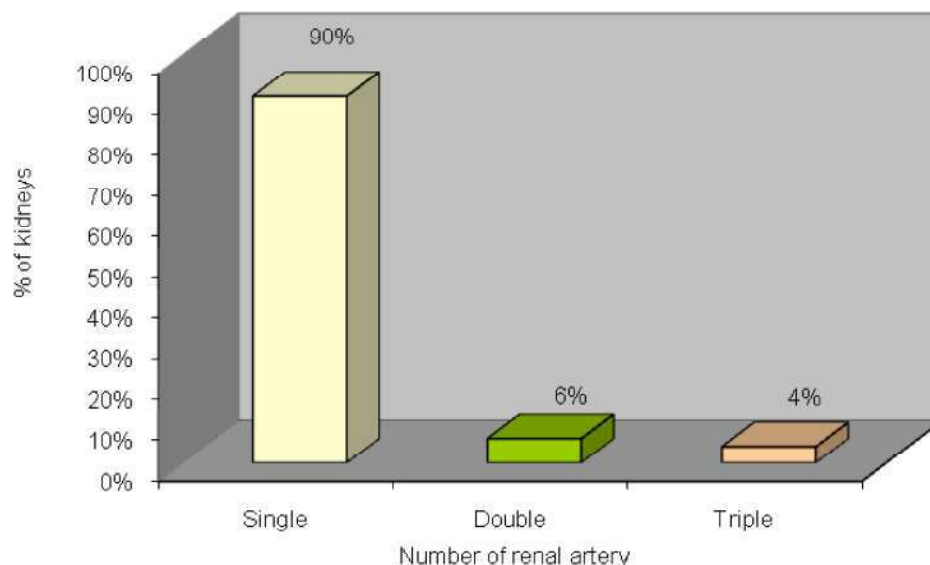
Fig. 4:

50 human kidneys were studied on numbers of renal arteries and variations also showed in table 1 and graph 1.

Table 1:

S. No.	No. of renal artery	No of kidney	Specimen no.	%
1	Single	45		90%
2	Double	3		6%
	2 HA	2	31.45	
	1 HA +1 SPA (UPA)	1	32	
3	Triple	2		4%
	3 HA	1	46	
	2 HA +1 SPA (UPA)	1	28	

X²- value =72.28, df = 2, Significant



Graph 1:

When subjected and statistical analysis, the difference is found to be significant.

Discussions

The nomenclature of the variations of the renal arteries is still not clear, as different authors described them as additional, accessory, hilar, inferior and superior polar arteries [11]. In present study, the following nomenclature was utilized to categorize the renal arteries: Hilar artery (HA), an aortic branch that penetrate the kidney in the hilar region; superior polar artery (SPA) or upper polar artery (UPA), an aortic branch that penetrate the kidney at its superior pole and inferior polar artery (IPA) or lower polar artery (LPA), an aortic branch that penetrate the kidney at its inferior pole [6].

In present study, analyzed the numbers of renal artery in 50 dissected kidneys and shows maximum frequency of 90% in single renal artery. This correlate well with those of Hegedius [7] (1972) who studied and report on 138 patients revealed that 120 kidneys (70.6%) were supplied by single renal arteries. Sampaio FJ and Passos MA [8] (1992) analyzed the renal arterial supply in 266 kidneys dissected from 133 fixed adults subjects and revealed that 147 kidneys (53.3%) were supplied by single (1hilar) renal arteries. Khamanarong K et al. [6] (2004) to established the incidence and characteristics of variations of renal arteries in Thais. They dissected total of 267 Thai cadavers in the anatomy laboratory. The anatomical findings included: a single hilar artery in 82% of cases. Wilson F S Busato et al. [9] (2003) studied in 30

human kidneys obtained single renal arteries in 90% (27 kidneys).

Present study shows double renal arteries in 6% (3 kidneys) with 2 hilar arteries in 4% (2 kidneys) and 1 hilar with 1 superior polar artery in 2% (1 kidney) it is similar with Hegedius (1972) who after studying 138 patients revealed that (27.6%) 47 were fed by two arteries Sampaio FJ and Passos MA (1992) analyzed the renal arterial supply in 266 kidneys dissected from 133 fixed adults subjects and revealed Double renal arteries found in 20.0% (with 2 hilar arteries in 7.9%, 1 hilar artery with superior polar artery in 6.8%, 1 hilar artery with inferior polar artery in 5.3%). Khamanarong K et al. [6] (2004) to established the incidence and characteristics of variations of renal arteries in Thais. They dissected total of 267 Thai cadavers in the anatomy laboratory double renal arteries in 17% of cases (with one hilar artery with an upper polar artery occurred in 7%; two hilar arteries in 7%, and one hilar artery combined with one lower polar artery in 3%). Wilson F S Busato et al. [9] (2003) studied in 30 human kidneys obtained Double renal artery in 6.66%. Satyapal et al. [10] (2001) described double renal arteries in 31.3% of the African population in his study, 30.9% of the white population, 18.5% of the half-caste population and 13.5% of the Indian population. Bordei et al. [11] (2004) found 54 double renal arteries originating from the aorta in 272 kidneys (78%) of them on one side and six of them were bilateral (11%).

Our finding goes hand in hand with those of Wilson F S Busato et al. [9] (2003).

Who studied in 30 human kidneys and obtained Double renal artery in 6.66%. Its not correlating

with observations of Hegedius [7] (1972), Sampaio FJ and Passos MA [8] (1992), Khamanarong K et al. [6] (2004), Satyapal et al. [10] (2001), Bordei et al. [11] (2004) who shows presence of double renal arteries in 27.6%, 20.0%, 17%, 13.5%, 20% respectively. It may be due to difference in sample size.

Present study shows triple renal arteries in 4% (2 kidneys) with 3 hilar arteries in 2% (1 kidney) and 2 hilar arteries with 1 superior polar artery in 2% (1 kidney) it correlates well with those of Hegedius [7] (1972) who reported triple arteries in 3 kidneys with separate origins from the aorta with Sampaio FJ and Passos MA [8] (1992) obtaining Triple renal arteries in 3.7% (with 3 hilar arteries in 1.9%, 2 hilar artery with superior polar artery in 1.1% and 2 hilar artery with inferior polar artery in 0.7%) and with Khamanarong K et al. [6] (2004) observing triple renal arteries occurred in 1% (with two hilar arteries with one upper polar artery in 0.4% and two hilar arteries with one lower polar artery in 0.6%) with Wilson F S Busato et al. (2003) who revealed triple renal arteries in 3.33%.

Conclusion

The study of renal arteries, shows 90% single renal artery with normal extra renal course and 10% abnormal (double and triple with frequency of 6% and 4% respectively). The presence of multiple (double and triple) renal arteries increases the complexity of renal transplantation, kidneys with multiple arterial supply being involved in a higher percentage of transplant failures than that of normal. The Inferior polar artery is more dangerous than the superior polar artery because the involvement of the inferior polar artery originating from the aorta with a retro-ureteral course is in the aetiology of hydronephrosis.

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