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Original Article

COMPREHENSIVE STUDY OF ANATOMICAL VARIATIONS OF RENAL ARTERY ON HUMAN CADAVERS WITH ITS CLINICAL SIGNIFICANCE

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ABSTRACT

Introduction: Renal artery is a paired branch of abdominal aorta at level of L1-L2. It divides into anterior and posterior branches. In maximum number of people this division into anterior and posterior branches takes place near the hilum but variation can be seen. Variations of renal artery is common and have different names such as supernumerary, accessory or aberrant. It is important for surgeons to have knowledge about such variations.

Materials and methods: In the Department of Anatomy, Subharti Medical College, Meerut, Uttar Pradesh, India 60 human adult cadavers were dissected and 120 kidneys along with their arteries were studied and observed for variations.

Results: Out of 120 specimens, supernumerary renal arteries were seen in 25 right kidney and 24 left kidneys. Out of 25 right supernumerary renal arteries 16 are of aortic origin and 9 are of renal origin. While in 24 left supernumerary renal arteries 14 are of aortic origin and 10 are of renal origin.

Conclusions: Elaborate knowledge of course along with variations in course of renal artery is of prime importance for any general surgeon, urologists, transplant surgeon or radiologist.

Keywords: Renal artery, Supernumerary, Abdominal aorta

INTRODUCTION

Kidney is one of the vital organs of the body and is supplied by renal arteries. Renal arteries are paired arteries which take about 20% of the cardiac output to supply the organs. They branch from the abdominal aorta laterally at right angle just below the origin of superior mesenteric artery. Near the hilum of the kidney, both left and right renal arteries divide into anterior and posterior branches [1]. The renal artery shows variations in respect to its origin, diameter, obliquity and its relations [2,3].

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According to Merklin and Michele classification, variations of renal artery can be given the following terms like supernumerary, aberrant or accessory [4]. Aberrant and accessory renal arteries are both types of extra renal arteries. Aberrant arteries supply the kidney without passing through the hilum while an accessory artery passes through the hilum and then supplies the kidney [5]. Nomenclature of supernumerary renal arteries is according to the area through which they enter the kidney. If the supernumerary artery enters the kidney through the hilum, it is called hilar supernumerary artery (HSA) and if it enters through superior pole and inferior pole, it is called upper polar supernumerary (UPSA) and lower pole supernumerary artery (LPSA) respectively [6-8]. Elaborate knowledge of such variations is important for urologists and transplant surgeons performing kidney transplants and this knowledge is also important for radiologists.

MATERIALS AND METHODS

In the Department of Anatomy, Subharti Medical College, Meerut, Uttar Pradesh, India, 60 human adult cadavers were dissected for routine dissection conducted for undergraduates and 120 kidneys along with their arteries were studied over a period of 3 years. Variations in renal arteries were studied and noted. As the present study was conducted on cadavers dissected for routine teaching of undergraduate students, no ethical committee clearance was needed. Variations in renal arteries were studied and classified into single renal artery and supernumerary renal artery. Further supernumerary renal artery was observed for its origin from aorta, main renal artery or any other structure.

RESULTS

Table 1 shows the presence of single and supernumerary renal artery in 60 pairs of dissected kidneys or 120 kidneys. Out of 120 kidneys single renal artery was present in 71 specimens (35 right and 36 left) and supernumerary renal artery was seen in 49 specimen (25 right and 24 left).

Out of 49 supernumerary artery 30 (16 right and 14 left) were of aortic origin and 19 (9 right and 10 left) were of renal origin. Out of 30 supernumerary renal arteries with aortic origin, 15 (8 right and 7 left) were hilar supernumerary artery (HSA), 11 (6 right and 5 left) were upper polar supernumerary (UPSA) and 4 (2 right and 2 left) were lower pole supernumerary artery (LPSA). Out of 19 supernumerary renal arteries with renal origin 9 (5 right and 4 left) were hilar supernumerary artery (HSA), 6 (2 right and 4 left) were upper polar supernumerary (UPSA) and 4 (2 right and 2 left) were lower pole supernumerary artery (LPSA).

DISCUSSION

In the present study, out of 120 kidneys supernumerary renal arteries were found in 49 (40.83%) cases which was higher in comparison to the study by Gupta et al (28.33%) [9] and Saldarriage et al (24.90%) [10]. On the other hand, it was found comparable to the study done by Eisendrath et al (45%)[11] and Rupert et al (61%)[12]. In our study incidence of supernumerary renal arteries of aortic origin was 25% which was more than the renal origin (15.83%). This result is similar

No. Of ARTERY	RIGHT KIDNEY	LEFT KIDNEY	TOTAL
SINGLE ARTERY	35 (58.33%)	36 (60%)	71 (59.16%)
SUPERNUMERARY ARTERY	25 (41.66%)	24 (40%)	49 (40.83%)
	60	60	120

Table 1: Number of renal arteries

Supernumerary artery		Right kidney	Left kidney	Total
(A) Aortic origin		16 (26.66%)	14 (23.33%)	30 (25%)
	HSA	08 (13.33%)	07 (11.66%)	15 (12.5%)
	UPSA	06 (10%)	05 (8.33%)	11 (9.16%)
	LPSA	02 (3.33%)	02 (3.33%)	04 (3.33%)
(B) Renal origin		09 (15%)	10 (16.66%)	19 (15.83%)
	HSA	05 (8.33%)	04 (6.66%)	09 (7.5%)
	UPSA	02 (3.33%)	04 (6.66%)	05 (4.16%)
	LPSA	02 (3.33%)	02 (3.33%)	04 (3.33%)

Table 2: Supernumaray renal artery

to the study done by Talvoic et. al. [13], as in their study, supernumerary renal arteries of aortic origin were 30.65% and of renal origin were 12.82%. Our study showed slight right sided dominance in supernumerary renal artery which were seen 41.66% on right and 40% on left, while in the study done by Libertino et. al. [14] left side dominance of supernumerary renal artery was seen.

According to our study upper polar supernumerary artery was seen in 13.33% specimens which was higher than lower polar supernumerary arteries (6.66%). This was

similar to the result seen in the study done by Budhiraja V et. al. [6]. In their study, superior polar arteries were seen in 13.1% specimens and inferior polar arteries was seen in 7.1% specimens. While in a study done by Sampaio and passos [15] superior polar arteries were seen in 6.8% specimens and Inferior polar arteries in 5.3% specimens.

CONCLUSION

Renal artery is subjected to show variations. Elaborate knowledge of course along with variations in course of renal artery is of prime importance for any general surgeon, urologist or transplant surgeons. It is also important for radiologist to know about such variations because many times, it is slightly difficult to identify accessory renal artery by angiographic investigation as they can be misdiagnosed as capsular or adrenal arteries. Therefore, it is important to have knowledge about such variations via cadaveric studies.

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