

Study Of Presegmental Arterial Pattern Of Human Kidneys In Local Population

Dr. Swati Shah *, Dr. Bharat Trivedi **, Dr. Dharmesh Shah***

*Assistant Professor, Anatomy Department, SMT.NHLMMC, Ahmedabad, ***M.D., PATHOLOGIST,

**Professor, Anatomy Department, M.K.Shah Medical College, Ahmedabad

Abstracts: Background: Anatomy embraces all areas of knowledge related to the structural organization of the human body. Like other systems of the human body, vascular system also shows many variations in terms of number, origin and branching pattern of vessels. This study Was conducted to observe the extra renal arterial pattern and its variations by dissection which provides reliable information to the anatomists for learning and teaching. Method: The study was conducted in the dissection hall of anatomy department of Smt.N.H.L. Municipal Medical College, Ahmedabad during the year of august 2013- November 2018. Result: In most cases (85%), point of origin of main renal artery was from the lateral wall of the abdominal aorta. In 6% cases double renal arteries were originating from lateral wall of the abdominal aorta. In present study single renal artery from its origin was dividing into pre segmental arteries entering into the hilum of the kidney. these branches were dividing into segmental and then lobular arteries inside the parenchyma of the kidney for micro circulation Conclusion: study that pre-segmental arterial pattern is different in many cases and knowledge of these branching variations is very useful during renal surgeries particularly when there is a great demanding era of renal transplantation and partial nephrectomy. [Shah S Natl J Integr Res Med, 2018; 9(6):50-53]

Key Words: Presegmental arterial pattern, kidney, Anatomy

Author for correspondence: Dr. Swati Shah, Assistant Professor, Anatomy Department, SMT.NHLMMC, Ahmedabad, E-mail: swatidharmeshshah@gmail.com

Introduction: "ANATOMY", the word is derived from the Greek word, Anatomy means cutting up.¹but today Anatomy is not merely the subject related to the dissection of human body and Separating the parts but , it is considered to be a part of many other disciplines and viewing the living frame as an extraordinary complex. Anatomy embraces all areas of knowledge related to the structural organization of the human body. Like other branches of science, anatomy is also continuously changing As new data transform image and concepts of the body's dynamic structural organization Human body is framed by harmonious functions of different systems Like nervous system, respiratory system, gastro-intestinal system, vascular system and many more.

The urinary system is an excretory system and voids waste from the human body in the form of urine through urethral opening. Different components of urinary system are: Paired kidneys, paired ureters, unpaired urinary bladder and unpaired urethra. Like other systems of the human body, vascular system also shows many variations in terms of number, origin and ranching pattern of vessels. Vessels also show different variations in their length and diameter from body to body.

Renal arteries are the largest collateral branches of abdominal aorta. From their point of origin, they run obliquely, downward and laterally,

towards the kidneys. The number of the terminal branches through which the artery approaches the kidney and the artery branching point is very variable. They represent the main element of the renal pedicle, around which the other elements are grouped: the renal vein, the lymph vessels and the nerves.^{2,3}

Aim And Objectives: Many anatomical as well as radiological studies for variability in renal artery branching pattern have been carried out in different population. Ethnical and geographical variations in the renal arterial system have been reported earlier.¹] In Gujarat population there is a lack of much researches on anatomical study of pre segmental arterial pattern of human kidneys which inspired me to carry out the present study and there for I decided to explore the Study of pre segmental arterial pattern of human kidneys in 100 cadavers

This study

- 1) Was conducted to observe the extra renal arterial pattern and its variations by dissection which provides reliable information to the anatomists for learning and teaching
- 2) Helps surgeons during operative procedures like renal transplantations, nephrectomies by providing important anatomical information of the kidneys
- 3) Helps to reduce the risk of injury to the renal artery during surgery

Material and Methods: The study was conducted in the dissection hall of anatomy department of Smt.N.H.L. Municipal Medical College, Ahmedabad during the year of august 2013- November 2018.during routine cadaveric dissection in dissection hall for undergraduate students, the study of pre segmental arterial pattern of human kidney was conducted. Cadavers were embalmed through the femoral artery or carotid artery with formaldehyde solution .then preserved in weak formalin solution in tank before dissection.

50 human cadavers were dissected and both kidneys were removed from 50 cadavers after doing dissection and of kidneys to study pre-segmental arterial pattern of renal artery. Cause of death and gender were ignored.

I did the dissection of abdominal region according to the Cunningham’s manual of practical anatomy, 15th edition. [2]

Instruments used: Gloves, knife, scalpel, cotton, scissor, toothedforceps, plainforceps, straight artery forceps, curved artery forceps.

Abdominal wall was dissected layer by layer and all the organs of peritoneal cavity were removed to reach to the posterior abdominal wall. Kidneys were identified and I observed origin of renal artery and its presegmental arterial pattern for variations.

Results: I observed in present study: In most cases (85%), point of origin of main renal artery was from the lateral wall of the abdominal aorta.[fig-1]

Fig-1: Main Renal Artery Arising From The Abdominal Aorta



In 6% cases double renal arteries were originating from lateral wall of the abdominal aorta.[fig-2]

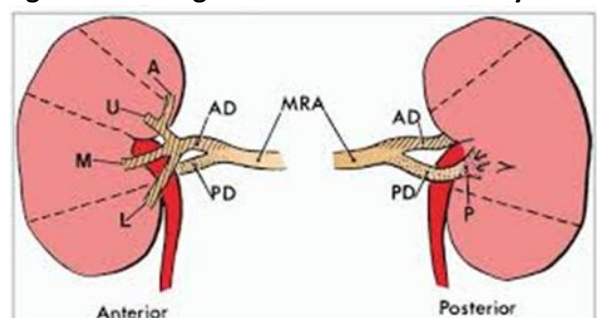
In present study single renal artery from its origin was dividing into pre segmental arteries entering into the hilum of the kidney. These branches were dividing into segmental and then lobular arteries inside the parenchyma of the kidney for micro circulation (perfusion of microscopic structures of kidney). Number of branches given by main renal artery was variable number ranges from 1-6 and site of origin was also variable from extra-hilar, hilar to intra-hilar[fig-3].

Out of 100 kidneys 83 kidneys were showing extra-hilar branches of pre-segmental artery In 15 kidneys the branching pattern was hilar that is in the hilum main renal artery was dividing into pre-segmental arteries in the hilum of the kidney. In 1 kidneys pre-segmental arteries originate from main renal artery in the parenchyma of the kidney (intra-hilar)

Fig-2: Double Renal Arteries Arising From The Abdominal Aorta



Fig-3: Branching Pattern Of Human Kidneys



In case of superior polar artery supplying the superior pole of the kidney, in most cases it was arising from the main renal artery [fig-4]. Inferior polar artery in all cases where it was present arising directly from the abdominal aorta [fig-5]

Discussion: The perihilar branching pattern of the main renal artery branching before it enters into the parenchyma of the kidney shows high individual variability in clinical practice. Despite

great variances in the extra renal division of the main renal artery, we divided individual cases in predictable patterns according to the number of pre-segmental and segmental arteries in the majority of kidneys.

Fig-4: Inferior Polar Artery Directly Arising From The Abdominal Aorta



Fig-5: Superior Polar Artery Arising From The Main Renal Artery



According to the study by Weld et al [8] the most frequent perihilar branching pattern consisted of only segmental arteries without any pre-segmental artery, whereas, I observe the most common perihilar branching pattern was one pre-segmental plus segmental arteries in my study .For the present study I follow the Sampaio and Passos classification³ . Our findings are as shown in Table 1 as per this classification.

Table 1: Arterial features

Arterial features	Right kidney	Left kidney	Total
Single renal artery	18/42 (42.9%)	20/42 (47.6%)	38/84 (45.2%)
Multiple renal arteries	24/42 (57.1%)	22/42 (52.4%)	46/84 (54.7%)
Double hilar	9/42 (21.4%)	10/42 (23.8%)	19/84 (22.6%)

arteries			
Three hilar arteries	4/42 (9.5%)	6/42 (14.2%)	10/84 (11.8%)
Hilar and superior polar artery	7/42 (16.6%)	4/42 (9.5%)	11/84 (13.1%)
Hilar and inferior polar artery	4/42 (9.5%)	2/42 (4.7%)	6/84(7.1%)

During my research work I explored that there is a large number of anatomical variations in the branching pattern of renal artery. We followed the nomenclature given by Sampaio and Passos who described for the first time that the main renal artery divides into presegmental arteries which further divides into segmental arteries.

The lesion of any branch of renal artery, regardless of its diameter, origin or destination will lead to ischemia of the related renal parenchyma, subsequently leading to renal hypertension^{3,4}. Selective renal arterial occlusion or ligation, particularly of the presegmental and lower polar segmental arteries allow laparoscopic partial nephrectomy to be performed with minimal ischemic risk to the remnant renal tissue.⁵ In conservative surgical procedures, a serious consequence of renal arterial lesion is the development of hypertension^{4,6}: Ligation of a segmental artery will not produce ischemia or interference with the blood supply of the neighbour in segments⁶.

Conclusion: We found that pre-segmental arterial pattern is different in many cases and knowledge of these branching variations is very useful during renal surgeries particularly when there is a great demanding era of renal transplantation and partial nephrectomy selective renal blood flow interruption because two or more segments of the kidney will be affected. Additionally, if access to a segmental artery is challenging, presegmental arterial ligation can still spare most of the kidney from an ischemic challenge.

References:

1. B.D Chaurassia. textbook of human anatomy (lower limb , abdomen) volume 11 , 5th edition 2010 ; 319 -324

2. G.J.ROMANES. Cunningham's manual of practical anatomy (thorax and abdomen) Vol. 2, 15th edition.
3. Weld K. J , Bhayani S.B et al .Extra renal vascular anatomy of kidney : assessment of variations. 1978; 188(1): 83-9
4. Khamanarong K Prachaney ' et al , Anatomy of renal arterial supply , clinical anatomy , 17;334-336
5. Harrison LH, Flye MW, Seigler HF. Incidence of anatomical variations in renal vasculature in the presence of normal renal function. Ann Surg.1978; 188(1): 83-9
6. Graves FT. The Anatomy of the intrarenal arteries and its application to segmental resection of the kidney. pro J. Surg.1954,42:132-139

Conflict of interest: None

Funding: None

Cite this Article as: Shah S, Trivedi B, Shah D. Study Of Presegmental Arterial Pattern Of Human Kidneys In Local Population. Natl J Integr Res Med 2018; 9(6):50-53
--