

“CASE REPORT: VARIATIONS IN THE RENAL AND TESTICULAR ARTERIES”

¹SUDESHNA MAJUMDAR , ²KALYAN BHATTACHARYA, ³PANCHANAN KUNDU

⁴SUBHRA MANDAL , ⁵HIRONMOY ROY

¹ Professor, Department of Anatomy,
Nilratan Sarkar Medical College, Kolkata – 700014, West Bengal, India.

²Associate Professor, Department of Anatomy,
R.G.Kar Medical College, Kolkata-700004, West Bengal, India.

³Professor, Department of Anatomy,
Medical Super and Vice Principal, Bankura Sammilani Medical College,
Bankura -722102, West Bengal, India.

⁴Assistant Professor, Department of Anatomy,
Malda Medical College and Hospital, Malda – 732101, West Bengal, India.

⁵Assistant Professor, Department of Anatomy,
North Bengal Medical College, Darjeeling-734432, West Bengal, India.

Corresponding author: Dr. Sudeshna Majumdar , E -mail I.D. : sudeshnamajumdar.2007 @ rediffmail.com

ABSTRACT:

Introduction: Variations in the number and arrangement of renal vessels are very common. There may be additional renal arteries and renal veins which are important in different investigative and surgical procedures, particularly during renal transplantation. There are also different variations of the gonadal (testicular in males or ovarian in females) arteries.

Study Design: During routine dissection in the department of Anatomy, Bankura Sammilani Medical College, West Bengal, variations were detected in the renal and testicular arteries of a 70 year old male cadaver. Dissection was done minutely, relevant structures were painted and photographs were taken.

Observations: In this case both the testicular arteries arose from the respective renal arteries along with the presence of one accessory renal artery on the left side. Embryologically, these arteries are the lateral splanchnic branches of abdominal aorta.

Conclusion: These findings have importance for any investigation or surgery involving genitourinary organs and the abdominal arteries concerned; at the same time these are important anatomical variations.

Key words: Renal artery, accessory or supernumerary renal artery, testicular artery.

BACKGROUND:

Renal arteries take origin from the aorta bilaterally just below the superior mesenteric artery. Similarly the gonadal arteries (testicular arteries in males and ovarian arteries in females) also take origin from the aorta a little inferior to the origin of the renal arteries. Embryologically these arteries are the lateral splanchnic branches of abdominal aorta ^[1] [Figure-1].

One or two accessory renal arteries are present in 30% individuals ^[2]. They frequently arise, (specially on the

left side) usually from the aorta, above or below the main artery (the former is slightly more often), enter the kidney above or below the renal hilum; if below, the vessel passes anterior to the ureter and on the right side, usually also anterior to the inferior vena cava.

The testicular or ovarian artery may arise as a common trunk from the aorta (at the same or different levels), or one or both may arise from a renal or accessory renal artery, a suprarenal artery or other branches of aorta ^[2,3].

MATERIALS AND METHODS: During routine dissection in the department of Anatomy, Bankura Sammilani Medical College, West Bengal, variations were detected in the renal and testicular arteries of a 70 year old male cadaver. The structures concerned were dissected properly, painted and relevant photographs were taken.

OBSERVATIONS :

- a) Renal arteries arose from the abdominal aorta as usual, to reach the hilum of the respective kidney, but the testicular arteries emerged from the respective renal arteries on both sides. On the right side the testicular artery took origin from the renal artery just distal to the origin of the latter from the abdominal aorta and it passed downwards posterior to the inferior vena cava instead of passing anterior to it (Figure- 2). On the left side the testicular artery passed anterior to the left ureter (Figure-3).
- b) In addition, one accessory renal artery emerged from the left side of the abdominal aorta, passed laterally, posterior to the plane of the left renal vein, above the main left renal artery and reached the upper pole of the left kidney to enter the parenchyma of the organ (Figure-3).

DISCUSSION:

Embryological Consideration: This is a rare variation that the testicular arteries were arising from the concerned renal arteries. Embryologically, both are the lateral splanchnic branches of the dorsal aortae. These lateral splanchnic branches supply the mesonephros, metanephros, gonads (testis and ovary) and the suprarenal gland. All these structures develop, in whole or in part from the intermediate mesenchyme or mesonephric ridge [1]. The renal artery branches from the most cranial suprarenal artery.

Precocious origin of a segmental artery may be present as an accessory renal artery [4].

Incidences:

In an extensive study, Pick and Anson [5] stated that 40.5% of all kidneys examined had more than two vessels and supernumerary arteries are found in 32.25% of kidneys. For most part of the body, variations or anomalies of veins are far more frequent than those of arteries, but this is reverse in case of the vascular pedicle of kidney. According to Merklin et al [6], about 12% of kidneys have two or more arteries of aortic origin with one entering the hilum of the kidney and the other one pole of the kidney. According to Dhar et al [7], multiple (accessory) renal arteries are observed in 20 % of the specimens while unilateral anomaly (15 %) being more commonly encountered than bilateral anomaly (5 %).

Lippert and Pabst [8] pointed out that the right testicular artery originates from the right renal artery in 6% cases. Ravery et al [9] reported that the testicular artery has a high or aberrant origin in 20% cases, in 5-6% of these cases the origin is from a main renal artery or from a supernumerary renal artery. In their study, Asala et al [10] found that in 2.6% cases testicular arteries branched from the renal artery.

Previously Recorded Cases with Similarity :

In 1992, Bergman et al [11], reported about a case with doubled renal and testicular arteries on the right side. The kidney had two renal arteries, one at its usual mid organ (hilar) position and one inferior polar. One testicular artery arose from the mid-point of the usual renal artery and the second testicular artery arose from the inferior polar renal artery.

In 2005, Deeptinath et al [12] stated that there may be multiple variations in the renal or gonadal arteries. While

multiple variations in the renal or gonadal arteries. While dissecting a 45 year old male cadaver they found an additional renal artery on the left side which went to the upper pole of the left kidney.

Rusu ^[13], in 2006, reported a case with bilateral doubled renal arteries - on the right side superior and inferior hilar renal arteries and on the left side superior hilar and inferior polar renal arteries emerged from the abdominal aorta. Bilateral doubled testicular arteries were found in the same case. On the right side the medial testicular artery emerged from the abdominal aorta while the lateral one from the superior renal artery. On the left side both the testicular arteries emerged as a common trunk from the abdominal aorta.

In 2009 Sylvia et al ^[14], reported a case with bilateral variant testicular arteries and double renal arteries. The right upper renal artery after its origin from the abdominal aorta crossed anterior to the inferior vena cava and reached the hilum of the right kidney and provided origin to the right testicular artery. The left lower renal artery arose from the abdominal aorta and before entering the hilum, gave origin to the left testicular artery. Soni et al ^[15], in 2010, found a case with double renal and testicular arteries on the left side. The superior testicular artery arose from the inferior renal artery and the inferior one arose from the abdominal aorta.

Clinical Anatomy: Supernumerary renal arteries, if unidentified and accidentally injured during renal surgery may cause avascular necrosis of the supplied renal segment ^[16]. Derrick and Hooks stated that implicated aberrant renal arteries are involved in 10 out of 18 cases of renal hypertension ^[17]. The accessory renal artery crosses the anterior aspect of the pelviureteral junction or the ureter and may cause

hydronephrosis (obstruction to the outflow of urine with dilatation of pelvis and calyces) by compressing the ureter ^[13, 15]. This vascular variation shows a major significance in various endourologic procedures and innumerable interventional techniques, in partial or total nephrectomy, nephrotomy, in renal transplant, surgery for abdominal aortic aneurysm and during the post operative management ^[7, 14]. So there is importance of the arteriography or Doppler ultrasound examination of the renal hilum, prior to any surgical procedure within the region ^[14, 15].

A gonadal artery originating from an inferior renal artery may be injured during the percutaneous treatment of the obstruction of pelvi-ureteral junction ^[9, 15]. The anatomy of the gonadal arteries has assumed importance because of the development of new operative techniques for varicocele and undescended testes to avoid any vascular trouble to the gonads ^[18].

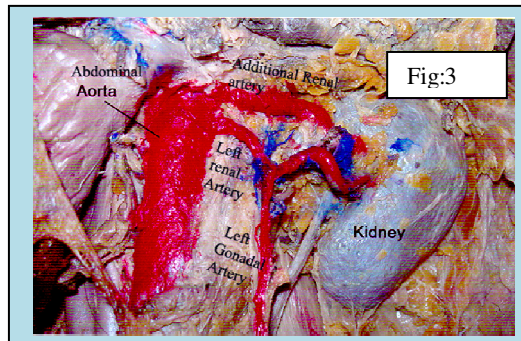
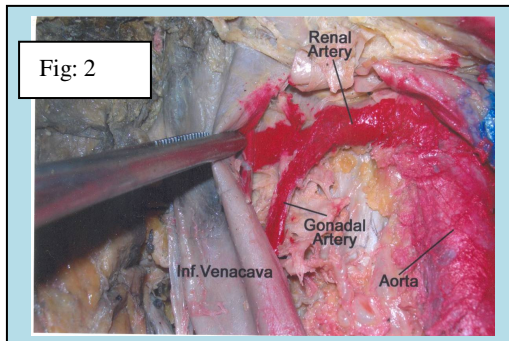
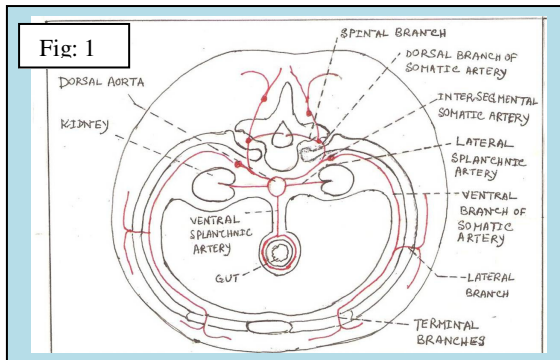
CONCLUSION : The awareness about these vascular variations is important in radiology, nephrology, urology, general surgery. This case will also enhance our knowledge in anatomy.

REFERENCES:

1. Williams PL, Bannister HL., Martin M B., Collins P., Dyson M., Dussek E.J., Ferguson W, J.M, Glabella (1995); Gray's Anatomy, In: Embryology and Development and Cardiovascular Section, 38th Edition.; Churchill and Livingstone; London ; pp:316-318 and 1557-1558.
2. Standing S, Healy JC, Borley NR, Collins P, Wigley C, (editors) (2008). Gray's Anatomy, The Anatomical basis of clinical practice. In: Kidney and Ureter and Male Reproductive System. 40th Edition. Spain. Elsevier Churchill Livingstone: 1231, 1263-1264.

3. Hollinshead WH (1971). Anatomy for Surgeons, Thorax, Abdomen and pelvis; In: The Kidneys, Ureters and Suprarenal Glands; 2nd Edition, Vol. 2. New York, San Francisco, London. Medical Department, Harper & Row Publishers: 533 - 535.
4. Datta AK (2006). Essentials of Human Anatomy, Thorax and Abdomen (part -1) In: Urinary System. 7th Edition. Kolkata, Mumbai. Current Books International: 272- 275.
5. Pick JW, Anson BJ (1940). The renal vascular pedicles; An Anatomical Study of 430 Body Halves. Journal of Urology; 44: 411.
6. Merklin RJ, Michels NA (1958). The variant renal and suprarenal blood supply with data on the inferior phrenic, ureteral and gonadal arteries ; Journal of International Coll. of Surgeons; 29:41.
7. Dhar P, Lal K (2005). Main and accessory renal arteries – A Morphological Study; Italian Journal of Anatomy & Embryology. 110(2):101-110.
8. Lippert H, Pabst R (1985). In: Arterial Variations in Man, Classification and Frequency. Bergman JF, editor. Verlag, Munchen : 25–29.
9. Ravary V, Cussenol O, Desgrandchamps F, Teillac P, Martin Boyer- Y, Lassau JP, Leu Duc A (1993). Variations in arterial blood supply and the risk of haemorrhage during percutaneous treatment of the pelviureteral junction obstruction; report of a case testicular artery arising from an inferior polar renal artery. Surg.Radiol. Anat.: 15(4): 355-9.
10. Asala S, Chaudhary SC, Masumbuko-Kahamba N, Bidons M (2001). Anatomical Variations of Human Testicular Blood Vessels. Annals of Anatomy. 183 (6): 545-549 [Pub Med].
11. Bergman RA, Cassell MD, Sinoglu K, Heidger PM Jr. (1992). Human doubled renal and testicular arteries; Pub Med. Gov. US, Annals of Anatomy. August, 174 (4): 313-5.
12. Deeptinath R, Nayak Shatheesha B, Mehta RB, Rodrigue SV, Samuel PV, Venkatraman V, Prasad AM (2005). Case Report- Multiple Variations in the paired Arteries of Abdominal Aorta; Clinical Anatomy; (on line publication, 10th Nov.)
13. Rusu MC (2006). Human Bilateral Renal and Testicular Arteries with a left testicular arterial arch around the left renal vein; Romanian Journal of Morphology and Embryology;47(2): 197- 200.
14. Sylvia S, Kakartapudi SV, Vollala UR, Potu VR, Jetti R, Bolla SR, Rao M, Padmini M (2009). Bilateral Variant Testicular Arteries with double Renal Arteries; Pub Med. Gov, US Journal. February, 2(1):114.
15. Soni S, Wadhwa A (2010). Multiple Variations in the paired arteries of abdominal aorta - acalonical implications; Experimental Research. June, 4(3): 2622-2625.

16. Sykes D (1963). The arterial supply of the human Kidney with special reference to accessory renal arteries. *British Journal of Surgeons*.50: 368.
17. Derrick JR, Hooks CA (1962). Surgical significance of vascular variations in systematic hypertension with social reference to aberrant renal arteries, *Journal of Urology*; 87: 273.
18. Siniluoto TM, Hellstrom PA, Paivansalo MJ, Leinonen AS (1988). Testicular infarction following ethanol embolization of a renal neoplasm. *Cardiovasc Intervent Radiol*. 11(3):162–164.doi: 10.1007/BF02577110. [PubMed] [Cross Ref.].



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