

Case Report:

A rare bilateral variation in renal vascular pedicle

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Abstract:

Variations in the structures of renal hilar area is commonly reported and are very important to know because of increasing surgical and radiological interventions in this region. During routine dissection for 1st year M.B.B.S. students on a 65 yr old female cadaver in the region of abdomen, a variation was found in the vascular pattern and renal hilar structures. While inspecting the renal hilar area, we observed that the right kidney was supplied by two renal arteries. One renal artery was a branch of abdominal aorta and other was coming from the right common iliac artery supplying the inferior pole of the kidney. Both the kidneys were drained by three renal veins. One renal vein was opening in the inferior vena cava and rest two in the gonadal vein on both the sides. On the right side the ureter was crossed by inferior polar artery from behind and one of the renal veins from front, near the lower pole of kidney. These variations are important for surgical and academic point of view.

Key words: abdominal aorta, renal artery, inferior polar artery, renal vein, gonadal vein

Introduction:

Variations in the number and arrangement of renal vascular pedicle are common but they are usually asymptomatic and diagnosed accidentally during diagnostic angiography, surgery or dissection. There may be multiple renal arteries and renal veins which are important in different investigative and surgical procedures.

Normally, the kidney is supplied by a single renal artery arising from lateral aspect of abdominal aorta below the origin of superior mesenteric artery at the upper lumbar level. Anatomical variations of renal artery are frequent in the literature including their number, source, course and distribution in renal parenchyma. Unrecognized presence of an accessory renal artery is a hazard in surgery. There is danger of damage to them during surgical procedures that can result in segmental infarct or unexpected bleeding.

Apart from that, the lower polar arteries may obstruct the ureter and result in hydronephrosis. Distension of lower polar vessels which apparently obstruct the ureter necessarily produces infarction of a variable sized segment of kidney, since there are no free anastomoses within the substance of the kidney (Anson, 1966)¹.

The renal veins lie anterior to renal artery and open into the inferior vena cava at the level of L2 vertebra. Variations of renal vein can be in form of number and drainage pattern but rare as compared the renal arteries. These vascular variations in renal hilar area are of major significance in renal surgery, in partial or total nephrectomy and in renal transplant (Dhar & Lal, 2005)². One such case involving variation in number of renal artery, renal vein and drainage pattern of renal veins is reported here.

Material and method:

While performing routine dissection for 1st year M.B.B.S. students on 65 yrs old female cadaver in the region of abdomen, we observed variations in the renal area. All the abdominal viscera were removed according to Cunningham’s manual of practical anatomy (Romanes, 1986)³ except kidneys and their blood supply. The renal area was well exposed along with the abdominal aorta, inferior vena cava with its tributaries and coloured. The measurements were taken by digital vernier caliper & photographed by digital camera.

Case report:

While inspecting the renal hilar area, we found variation in the vascular pattern and arrangement of structures. We observed that the right kidney was supplied by two renal arteries. The first renal artery

was a branch of abdominal aorta and the other renal artery was a branch of right common iliac artery (fig. 1). The lower renal artery was entering the kidney through the inferior pole. Both the kidneys were drained by three renal veins. On the right side, one renal vein was opening in the inferior vena cava and rest two in the gonadal vein (fig.1). The lowermost renal vein while joining the gonadal vein was crossing ureter from front and at that same time the inferior renal artery was crossing ureter from behind (fig. 2).

On left side, the kidney was supplied by one renal artery and drained by three renal veins. One renal vein was opening into inferior vena cava and rest lower two in the gonadal vein (fig.3). The length and diameter of renal vessels was measured on both the sides (table 1).

Table 1: Measurement of length and diameter of renal vessels on right and left side

Right side			Left side		
	Length (in mm)	Diameter (in mm)		Length (in mm)	Diameter (in mm)
Renal artery 1	18.28mm	4.25mm	Renal artery 1	24.8mm	6.32mm
Renal artery 2	36.55mm	2.92mm			
Renal vein 1	9.15mm	6.52mm	Renal vein 1	46.87mm	10.63mm
Renal vein 2	10.01mm	1.48mm	Renal vein 2	18.44mm	2.9mm
Renal vein 3	5.6mm	1.81mm	Renal vein 3	20.5mm	1.83mm

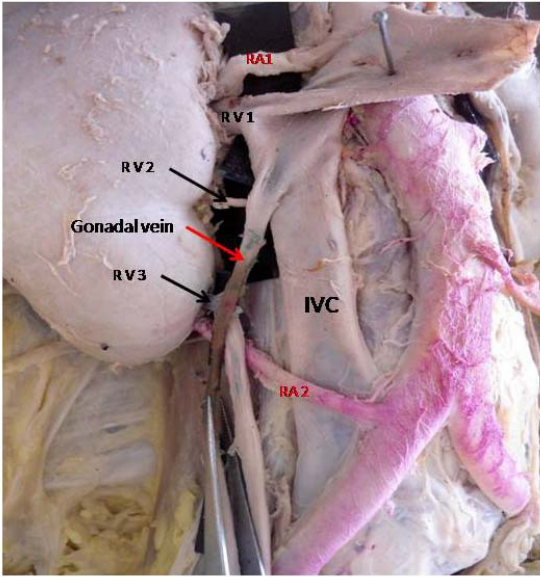


Figure 1: Photograph showing presence of two renal arteries (RA1 & 2) and three renal veins (RV 1,2 & 3) on right side. RV 2 and RV 3 are opening in the gonadal vein

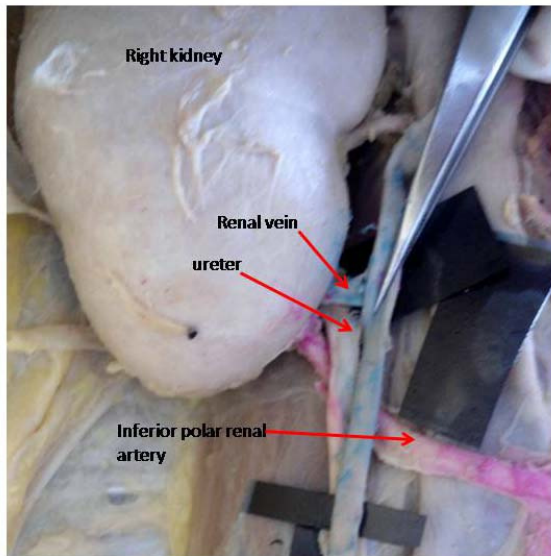


Figure 2: Photograph showing the crossing of ureter, renal vein and inferior polar renal artery on right side

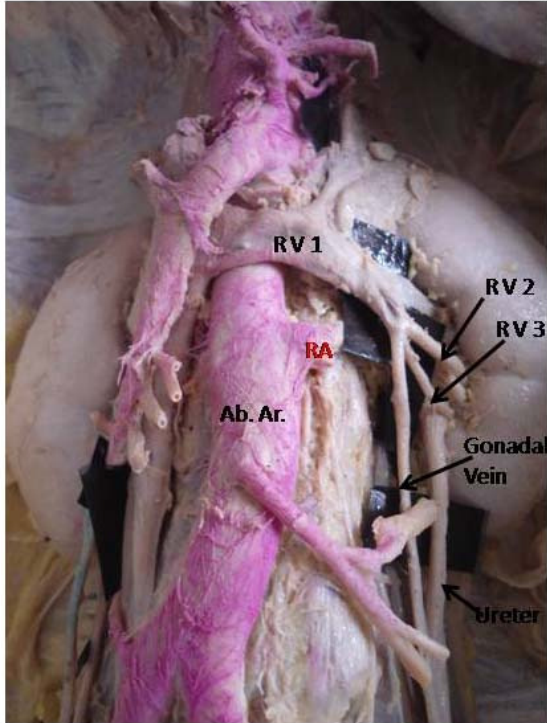


Figure 3: Photograph showing three renal veins on left side (RV1,2& 3). RV 1 and RV 2 are opening in the gonadal vein

Discussion:

For performing surgeries on the renal area, morphology of the renal vessels is of special significance, since variations and anomalies may strongly influence the technical feasibility of the operation. The recent trend in surgical branches is to move towards minimally invasive surgeries like laparoscopic procedures. However, conversion of laparoscopic approach to the open approach is not infrequent and for that vascular injuries are the most common reason. Therefore, special attention must be paid to preharvest assessment of donor renal vessels and collecting systems for selection of a suitable donor and for planning surgery (Richstone et al, 2008)⁴.

Various reports have claimed their occurrence in about 30–35% of population, most common being accessory renal artery arising above or below the

main renal artery (RA) which were reported in 20% of cases (Dhar & Lal, 2005)². Talovic et al (2007) found 28.2% cases with accessory renal artery originating from aorta, most common being lower polar RA, as described in present case. Lower polar RAs are the most common type of accessory RA and extremely important clinically. In some cases, they are direct and surgically correctable cause of hydronephrosis due to compression of ureter; and may also provide blood supply to the proximal portion of ureter, making it liable to necrosis in case of injury to these arteries⁵.

The variations in RA anatomy can be explained on the basis of embryological development of mesonephric arteries which extends from C6 to L3 level. Most cranial vessels disappear while caudal arteries supply the future metanephric kidney, developed in pelvic cavity. They derive their blood

supply from branches of neighboring iliac artery. As embryo grows, kidneys ascend to reach the lumbar region and consequently their blood supply also shift from the iliac arteries to abdominal aorta. The accessory renal arteries present in adults are either due to persistence of cranial mesonephric vessels or embryonic arteries formed during renal ascend. (Hamilton & Mossman, 1979)⁶.

In an extensive study, Pick and Anson (1940) found that for most part of the body, variations or anomalies of veins are far more frequent than those of arteries, but this is not true of the vascular pedicle of kidney. Supernumerary veins are present in 14.4% and supernumerary arteries are present in 32.25% of the kidneys. They also stated that additional renal veins were more commonly present on the right side⁷. In another study, Satyapal et al (1995) reported additional renal arteries were quite high as compared

to the additional renal veins. They also reported that incidence of additional renal veins was higher on right side than on the left side⁸. In present case, we reported two additional renal veins found bilaterally.

During 5th to 7th week of the embryo, a number of additional veins are formed, among them the supracardinal veins drain the body wall by way of the intercostal veins; the azygos veins and the subcardinal veins drain mesonephros and connected to the postcardinal veins^{9,10}. The inferior vena cava is formed from a complicated process involving development, regression, anastomosis, and replacement of these three pairs of veins. The development of renal veins is a part of the developmental process of the inferior vena cava. As it is a complex process it can result in variations of renal vein.

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