

An Obliquely Coursed Renal Vein of a Lobulated Left Kidney into Left Common Iliac Vein with Right Kidney Showing Dromedary Hump

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ABSTRACT

The Renes/kidneys are always a subject of variations including their form, location, surfaces and borders may show variations.. The cadaveric dissection revealed a lobulated Left Kidney which is drained by a long obliquely coursed renal vein into the left common iliac vein, instead of draining horizontally into the inferior vena cava. The left supra renal vein was extending vertically to drain into the main renal vein of the left kidney. Also the left gonadal vein was seen opening into the renal vein adjacent to the hilum medial to the ureter. The hilar anatomy was normal with the vein being most anteriorly placed followed by the artery and ureter placed posteriorly. There were three prominent lobulations seen on the anterior surface of the left kidney. The right kidney along its convex lateral border presented a focal bulge – dromedary hump (DMH).

Keywords: Lobulations, Obliquely coursed, Renal Vein, Dromedary hump.

Abbreviation: DMH - Dromedary hump, IVC- Inferior Vena Cava, DMSA - Dimercapto Succinic acid scintigram.

1. INTRODUCTION

The kidneys are the paired excretory organs located retroperitoneally, the right kidney being lower than the left kidney due to the presence of the liver in the right hypochondrium. The renal vasculature (vein and artery) are prone and known for their variations in number course and placement. Good anatomical insight is an essential prerequisite besides the surgical expertise. Multiple lobulations are seen throughout the foetal life (Williams, 1995). Most of these lobulations disappear during the first year but at times may persist throughout the life. It is not unusual to see a focal bulge in the mid lateral contours of both the right and left kidneys called as dromedary hump occurring due to the down ward pressure of liver on right side and spleen on left side (Walsh, 2002). Comparably, the renal venous pattern of the right side bears little resemblance to that of the left. In its relatively short course from the kidney to the inferior vena cava, the right renal vein rarely receives a tributary. The longer left renal vein (LRV); on the contrary, regularly receives the following tributaries: suprarenal and inferior phrenic, from above, frequently joined; gonadal (testicular or ovarian) from below; and renolumbar vein posteriorly, often by a confluent with the gonadal vein (Anson, 1948; Baptista-Silva JCC, 1995).

1.1. Embryological basis

The human kidneys evolve as distinct lobules that fuse in the process of development. Persistent lobulation is a normal variant seen occasionally in adult kidneys due to incomplete fusion of the developing renal lobules. Interruption or complete arrest of any developmental stage of the IVC may produce various anomalies in the drainage site, branches and course of the renal veins (Bass, 2000;

Macchi, 2003). It is suggested that the observed variations / anomalies in the length and course of the left renal vein could be attributed to defects in the embryonic development of the renal segment and ventral parts of the renal collar. Hence, because of the regression of the renal segment, the right renal vein drained into the pre-renal segment of the IVC. Furthermore, the left renal vein elongated and joined the IVC with an oblique course due to the adhesion of the pre-renal segment to the post-renal segment and the persistence of the dorsal portion of the left sub-supracardinal anastomosis (Bass 2000, Macchi, 2003).

2. SCOPE OF THE STUDY

Comparison

The venous variations are relatively rare when compared to the arterial variations. In about sixty –seventy percent of cases each kidney may be supplied by two or more accessory renal arteries having a single vein draining it. There may be two large tributaries forming one large single renal vein or rarely an additional renal vein may be present. The left renal vein is longer than the right renal vein as it has to run over the aorta to reach the inferior vena cava. It receives many tributaries such as Left Adrenal Vein, Left Gonadal Vein, and Inferior phrenic vein in the present case a long single renal vein was present with oblique course draining into left common iliac vein.

Content

Radiologically the Dromedary hump is considered as a pseudotumor as it mimics a renal mass. Persistent fetal lobulation is often seen on ultrasound, CT or MRI as smooth indentations of the renal outline *in between* renal pyramids. They should be distinguished from renal cortical scarring, which generally overlie the pyramids.

Renal Hilar anatomy:
The arrangement of blood vessels in the hilum of the kidney is called the renal hilar anatomy. The vein (V) is placed anteriorly followed by the artery (A) and the Pelvis (P) is placed posteriorly (VAP).

Vena Cavae:
These are largest veins of the cardiovascular system present in the body which return back the blood to the right atrium of the heart they are two in number. Superior vena Cava collects the deoxygenated blood from the head neck and upper limbs. Inferior vena cava collects the deoxygenated bloods from lower limbs and abdomen.

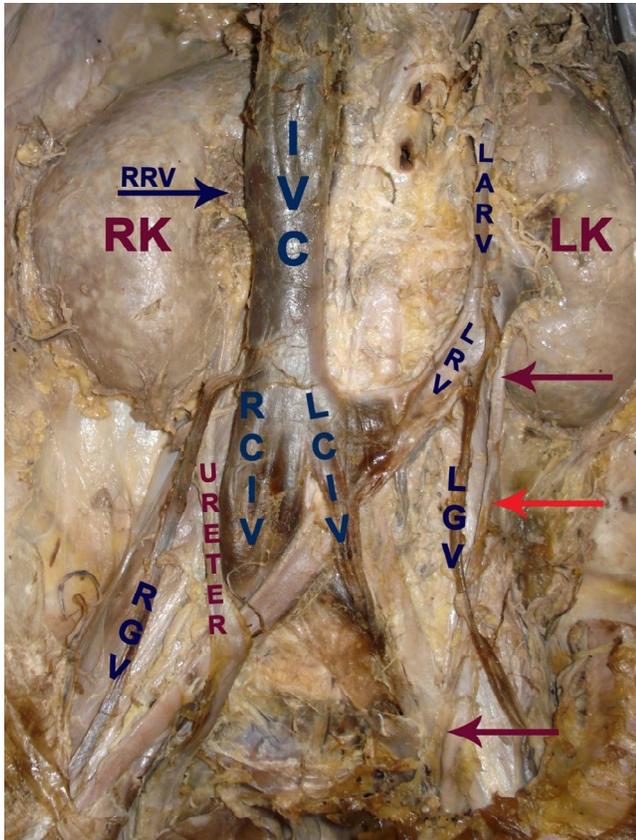


Figure 1

Anterior view of dissection of kidneys (In situ)
IVC – Inferior Vena Cava, RCIV – Right Common Iliac Vein, LCIV – Left Common Iliac Vein, LGV – Left Gonadal Vein, RGV – Right Gonadal Vein, LARV – Left Adrenal Vein, LRV – Left Renal Vein, RRV – Right Renal Vein, RK – Right Kidney, LK – Left Kidney. **NOTE:** The LCIV and RCIV are the formative tributaries of IVC, RED ARROW – Indicates Left Gonadal Artery, Two Meganta Colored Arrows – Indicate the Left Ureter, Both the Right and Left Kidneys are at Same Level.

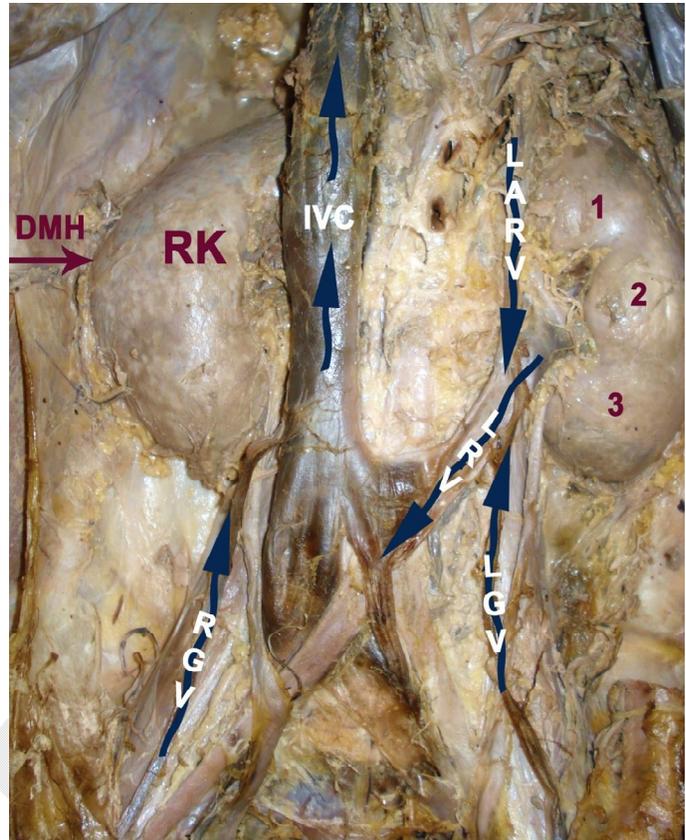


Figure 2

Anterior view of dissection of kidneys (In situ); RK – Right Kidney, DMH – Dromedary Hump, 1, 2, 3 – lobulations seen on the anterior surface of the left left kidney. **NOTE:** the blue coloured arrows drawn over the veins depict the flow of blood from the different veins, Into the inferior vena cava. The left kidney did not present any dromedary hump

Persistent fetal lobulation:

It is defined as adult kidneys showing the lobulations instead of the smooth anterior surface. It occurs when there is incomplete fusion of the developing renal lobules. Embryologically, the kidneys originate as distinct lobules that fuse as they develop and grow.

Dromedary hump:

It is a prominent focal bulge on the lateral border of the kidney. It is caused by the splenic impression on the left kidney and by hepatic impression on the right kidney.

It is crucial to know the anatomy of the renal vessels during a retroperitoneal approach to prevent bleeding by accidental tearing (Cooley, 1978). The venous variations are clinically dormant and the venous bleeding is a troublesome intraoperative hazard. The bleeding can be aggravated by oblique course of the renal vein as in the present case. The understanding of these venous variations may also provide safety guidelines for endovascular procedures, such as angioplasties and therapeutic embolisation. In laparoscopic nephrectomy, the left kidney is preferred owing to its longer vein. Furthermore, it is technically easier to remove and provides a more optimal vessel for venous re-anastomosis in the recipient. Anatomical knowledge of the presented variants is of immense importance for the appropriate selection of operative techniques during surgical interventions as well as for postoperative management.

2.1. Materials

An embalmed elderly male cadaver along with Routine instruments like a Scalpel, Blade, Surgical forceps, Anatomical forceps, a pair of gloves,, Dissector, Metallic Scale with Calibrations are required.

Reagents / Chemicals

The embalming fluid was prepared by mixing the following components in the right proportions. 1. Formaldehyde, 2. Industrial Methylated Spirit, 3. Distilled Water, 4. Phenol, 5. Glycerol

2.2. Methodology

During the routine pro-section hours as a teaching program for undergraduate medical students of 1st year M.B.B.S at Shadan Institute of Medical Sciences Teaching Hospital & Research Centre, gross anatomical dissection, in accordance to the description given in the standard anatomical dissection manual was followed step by step. A midline vertical incision was made extending from xiphoid process to pubic symphysis. The large Skin flaps were reflected laterally. The Musculoaponeurotic anterior abdominal wall was dissected layer by layer. The folds of peritoneum were traced vertically and horizontally. The visceral organs like liver stomach intestines were all studied in Situ and dissected out. The duodenum, pancreas and spleen were all dissected away from the abdominal cavity and the peritoneum was stripped to visualize the kidneys. The fat and fascia from the anterior surfaces of both the kidneys was removed. The lobulated left kidney along with obliquely coursed left renal vein draining into the left common iliac vein was seen. The right kidney showed a smooth anterior surface with dromedary hump.

3. RESULT

The cadaveric dissection revealed the reported variations involving both right and left kidneys. Both the kidneys were lying at the same vertebral level (Figure 1). The left kidney showed up to three prominent lobulations on its anterior surface. The right kidney in the middle of its lateral border showed a focal bulge-dromedary hump (Figure 2 & 3). The anterior surface was smooth without any lobulations. The left lobulated kidney presented an obliquely coursed left renal



vein draining into the left common iliac vein. Instead of draining horizontally into the inferior vena cava (Figure 1 & 2). The left supra renal vein was extending vertically downward to drain into the main renal vein of the left kidney. Also the left gonadal vein was seen opening into the renal vein adjacent to the hilum medial to the ureter (Figure 2). The hilar anatomy was normal with the vein being most anteriorly placed followed by the artery and ureter placed posteriorly. There were no reno lumbar veins draining into it. The right and left ureter were seen coursing superficially the right and left common iliac arteries (Figure 3). Neither the vein encircled the aorta nor was retro aortic. No such venous variation was seen on the right side but the right kidney along the middle 1/3rd of its lateral border presented a dromedary hump. Its anterior surface showed no lobulations

4. DISCUSSION

Interesting variations in the left sided renal veins were reported after performing 342 nephrectomies in living donors (Jose Carlos Costa Baptista-Silva, 1978). According to Silva the left renal vein was always unique (311/311) and had two tributaries (suprarenal and gonadal veins) in 100 per cent and one or more renolumbar veins in 65.27 per cent, encircling the aorta in 1.07 per cent, was retroaortic in 1.4 per cent. In the present case the left renal vein (LRV) had the left supra renal vein and left gonadal vein as its tributaries. There were no reno lumbar veins draining in to it. The vein neither encircled the aorta nor was retro aortic. The trajectory of the renal vein was oblique directed downwards and forwards to open into the left common iliac vein. In abdomino aortic diseases and in cases of trauma to the left renal vessels it is very important to do the ligation and section of the renolumbar, testicular and suprarenal veins in a cephalad direction for better mobilization of the left renal vein (Cooley and Wukasch, 1978). By increasing the mobility of the left vein and the inferior vena cava, this maneuver provides excellent exposure of the both renal arteries and precludes the necessity of transecting the left renal vein (Naito, 2006). In the present case the right renal vein was short but the left renal vein was long enough with an oblique trajectory and could be easily mobilized. Clinically, persistent left renal vein hypertension can cause the development of collateral veins and varicocele (Nishimura, 1956). He also reported that 88% (14 of 16) of patients with left renal bleeding of unknown origin had left renal vein hypertension. The results suggest that the left renal vein hypertension is a cause of haematuria in a large percentage of patients with left renal bleeding of unknown origin. Compression of left renal vein by the arteries particularly when the subject is in the erect position may raise the venous pressure in the vein and be a factor in the aetiology of varicocele and proteinuria (Nathan, 1958; Notkovich, 1956). In the present case the left renal vein was seen coursing superficial to the left common, iliac artery. The right renal vein was very short. In both right and left kidneys the veins were placed anteriorly followed by artery and the most posteriorly placed structure was ureter.

Knowledge of possible existence of arching of gonadal vessels in relation to the renal vein could be of paramount importance to the vascular surgeons and urologists during surgery in the retroperitoneal region. The left gonadal vein coursed upwards and drained into left renal vein close to the medial border of the left kidney below the hilum just medial to the ureter. The right gonadal vein was shorter and drained

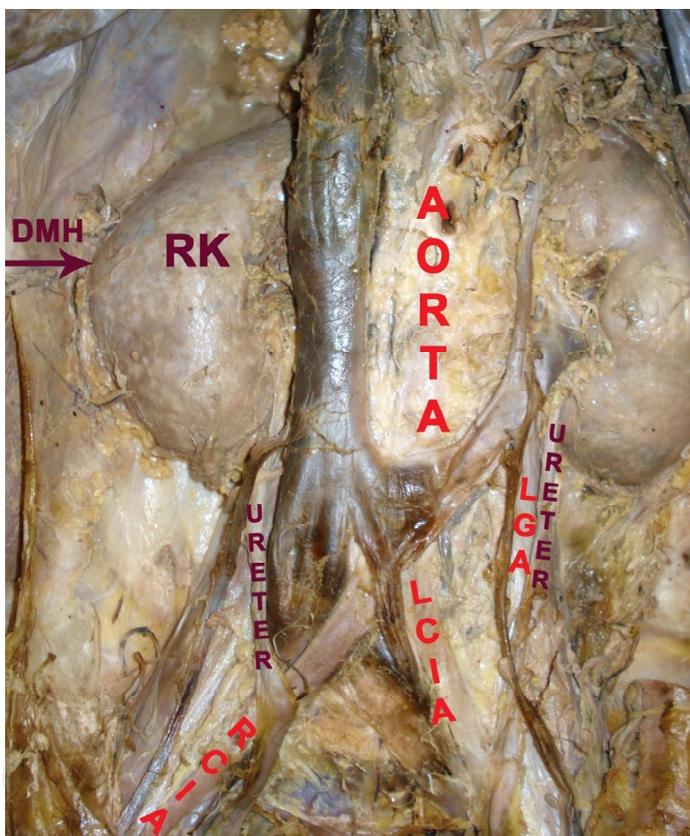


Figure 3

Anterior view of dissection of kidneys (In situ)
 RK – Right Kidney, DMH – Dromedary Hump, LCIA – Left Common Iliac Artery, RCIA – Right Common Iliac Artery, LGA – Left Gonadal Artery. NOTE: both the right and the left ureters are seen coursing superficially the right and left common iliac arteries respectively.

in to the IVC (Notkovich, 1956). A relatively low lying left kidney had anomalous pattern of its renal vein which had an oblique retro-aortic course and received two lumbar veins. It bifurcated near its drainage point into the inferior vena cava (Seyed Hadi Anjamrooz, 2012). In the present case the left renal vein had an oblique course with only suprarenal and gonadal veins as its tributaries. Both the right and left kidneys were at the same level indicating that the left kidney was relatively at a low position as reported by him. In the present case report three lobulations were noticed on the anterior surface of the left kidney adjacent to the hilum. The persistent fetal lobulations should be distinguished from pathological scarring by the site of irregularity in the renal surface. The lobulations cause foldings of the column of cortex as the divisions lie in between the calyces unlike in cortical scarring where the loss of cortex overlies a calyx which can be demonstrated on contrast enhanced CT images. To investigate the renal scarring dimercepto succinic acid scintigram [DMSA] is used (Balter, 2007).

5. CONCLUSION

The present case report is a discovery of bilateral renal variation lying silent and buried deep in the abdomen. I wish to state that merely variation does not mean an accessory or multiple blood vessels. Any deviations from the normal course of the blood vessel or its termination should also be accounted as a variation as they can challenge the skills of concerned medical personnel. A pre-operative assessment of the renal vasculature in the living donors must be made as a protocol so that any variation if present can be identified much early and accordingly suitable procedures can be planned.

SUMMARY OF RESEARCH

1. This case report provides a good anatomical insight which is an essential prerequisite besides the surgical expertise for the operating surgeons, about the rare occurrence of obliquely coursed left renal vein draining into the left common iliac vein.
2. This case report cautions the radiologists regarding the persistent fetal lobulations which can be confused with the pathological scarring. Also the dromedary hump of the kidneys can lead to diagnostic errors of renal tumors.

FUTURE ISSUES

The anatomical variations are compatible with life hence remain unnoticed. But during surgical interventions and diagnostic procedures can lead to iatrogenic injuries that could have been avoided. In the era of machine vision and non-invasive, cost effective radiological investigations it is necessary for the subject to undergo a preoperative assessment of renal vasculature enabling the discovery of clinically silent variations. Thus helping the medical personnel to face the unexpected situation with confidence rather than surprise.

DISCLOSURE STATEMENT

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