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Case Report

Retro-aortic left renal vein with left suprarenal vein draining into inferior vena cava

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ABSTRACT

During a routine undergraduate dissection of abdomen of a 50-year-old male cadaver, a variant pattern of left renal and suprarenal veins was encountered. The left renal vein coursed behind the aorta to drain into inferior vena cava at the level of lower pole of left kidney. The left suprarenal vein coursed in front of aorta to drain directly into inferior vena cava instead of left renal vein. A knowledge of such patterns is important for renal surgeons operating for renal transplantation, renal trauma and nephrectomy. Further the ontogenic basis and clinical implications of the anomalies are discussed in the detail. © **IJAV. 2010; 3: 134–137.**

Key words [retro-aortic left renal vein] [left suprarenal vein]

Introduction

Variant patterns of arteries and veins are seen more frequently in abdomen than in any other part of the body. A knowledge of different types of variations depicted by renal and suprarenal veins is extremely important in exploration and treatment of renal trauma, renal transplantation, renovascular aneurysm and conservative or radical renal surgery [1–3]. The different patterns of renal vasculature are well described by Gillot [4], and Bergman et al. [5] . These may be in the form of double right or left renal veins, retro-aortic left renal vein, left suprarenal vein draining into the inferior vena cava (IVC) directly, renal collar, tortuosity of different vessels and so on. One such case with variant pattern of venous drainage of left kidney and suprarenal gland was encountered in our department which is being reported here.

Case Report

During the routine undergraduate dissection of abdomen of a 50-year-old male cadaver in the Department of Anatomy, Govt. Medical College, Amritsar, India, the following variants of renal and suprarenal venous drainage were encountered.

• The left renal vein instead of passing in front of aorta, passed behind it to drain into the IVC –defined as a retro-aortic left renal vein (RA-LRV). Instead of passing horizontally, it coursed obliquely downwards and joined IVC at the level of inferior pole of left kidney (Figure 1). Relations in the hilum of left kidney were as usual.

• The left suprarenal vein which usually drains into the left renal vein, passed horizontally to the right in front of aorta and drained directly into IVC (Figure 2).

• No other malformation like scoliosis of spine or varicocele was seen in the body.

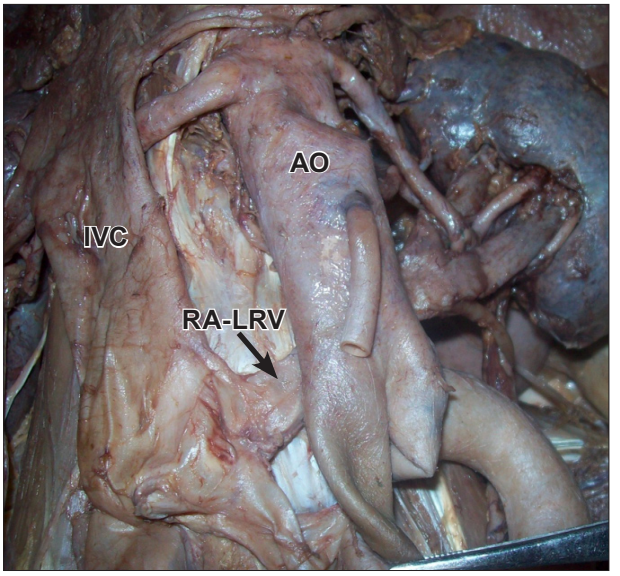

Figure 1. Retro-aortic left renal vein. (***IVC:*** *inferior vena cava;* ***RA-LRV:*** *retro-aortic left renal vein;* ***AO:*** *aorta)*

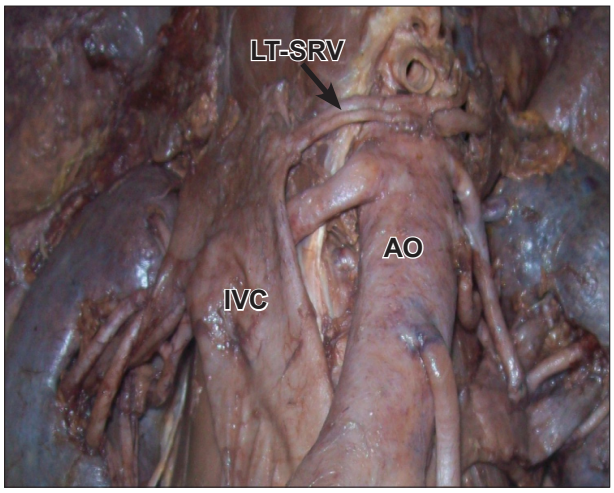

Figure 2. Left suprarenal vein draining into IVC. (***IVC:*** *inferior vena cava;* ***LT-SRV:*** *left suprarenal vein;* ***AO:*** *aorta)*

Discussion

Table 1. Incidence of RA-LRV.

Authors & Year	Incidence	Remarks
Pick & Anson, 1940 [6]	3.4% 16.83%*	* Renal collar
Almagro et al., 1992 [7]	1.72%* 2.35%#	* In dissected specimens # Study by CT scan
Turgut et al., 1998 [8]	1 case	RA-LRV joining Lt. CIV
Kalsey et al., 1999 [9]	1 case	
Jafarpour & Mofidpour, 2002 [10]	6.25% 6.5%*-	*Renal collar
Andrade et al., 2000 [11]	1 case	
Mendizabal, 2005 [12]	22.22%	Children presenting with hematuria
Karazincir et al., 2007 [13]	9.3%* 2.2#	*RA-LRV in pts with varicocele #in patients without varicocele
Hemalatha et al., 2008 [14]	0.5% 0.3%*	*Renal collar

*(**Lt. CIV:** left common iliac vein)*

Table I shows the incidence of the retro-aortic left renal vein as reported by earlier authors. It varies from 0.5% to 6.25% [10,14]. This is true for a single left renal vein passing retro-aortically. However, the incidence of 2 left renal veins, one passing anterior and other posterior to aorta i.e. renal collar or circum-aortic venous ring varies from 0.3% to 16.83% [6,14]. Occasional sporadic cases of RA-LRV have also been reported in the literature [8,9,11]. Table I further shows that incidence of RA-LRV was higher in patients with left sided varicocele i.e. 9.3% and in children presenting with hematuria i.e. 22.22%. Thus it may be held responsible for these 2 situations.

A close look at Table I shows that though the persistent renal collar is reported by some of the authors [6,10,14], none have found associated variant of left suprarenal vein draining directly into IVC (persistent anterior limb of renal collar, vide infra).

Ontogeny

According to Singh and Pal [15], veins of abdomen are derived from a series of longitudinal venous channels (Figure 3) viz right and left posterior cardinal veins (1); right and left subcardinal veins (2); right and left supracardinal veins (3); intersubcardinal anastomosis which may be anterior/posterior or both to aorta (4); supracardinal-subcardinal anastomosis (5); and anastomosis between subcardinal and right hepatocardiac channel (HCC) (6).

The left renal vein is derived from (Figure 4):

a) Mesonephric vein that originally drains into left subcardinal vein (1 in Figure 4).

b) A small part of left subcardinal vein (2 in Figure 4).

c) Intersubcardinal anastomosis which may be pre-aortic or post-aortic (3 in Figure 4).

As the anastomosis which lies in front of aorta usually persists and the one which lies behind the aorta disappears, left renal vein has similar relationship with aorta. Also the part of right subcardinal vein where intersubcardinal anastomosis joins forms part of IVC so left renal vein drains into IVC.

The left suprarenal vein is remnant of the part of left subcardinal vein above the intersubcardinal anastomosis (4 in Figure 4). Thus it drains into left renal vein.

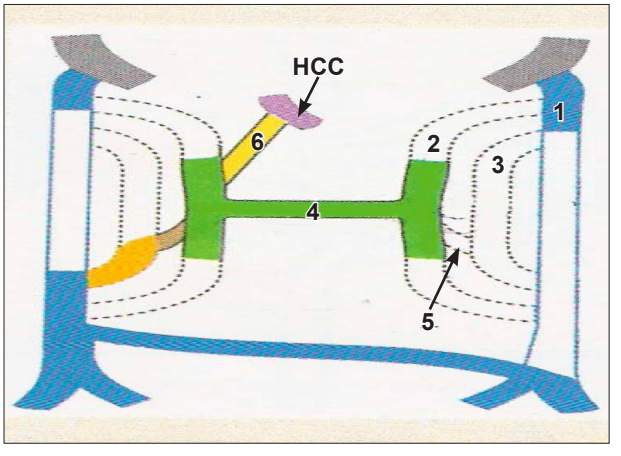

Figure 3. Normal development of abdominal veins. (***HCC:*** *right hepatocardiac channel;* ***1:*** *posterior cardinal veins;* ***2:*** *subcardinal veins;* ***3:*** *supracardinal veins;* ***4:*** *intersubcardinal anastomosis;* ***5:*** *supracardinal–subcardinal anastomosis;* ***6:*** *anastomosis between subcardinal vein and HCC)*

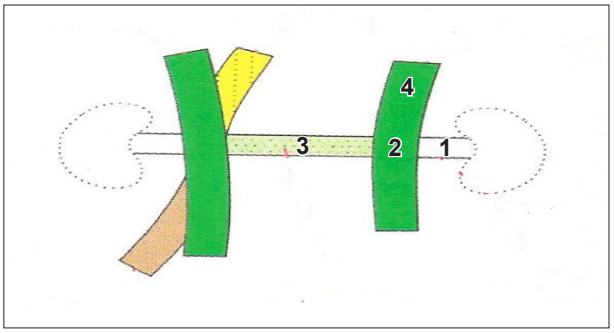

Figure 4. Normal development of left renal vein and left suprarenal vein. *(**1:** left mesonephric vein; **2:** part of left subcardinal vein opposite the intersubcardinal anastomosis; **3:** intersubcardinal anastomosis; **4:** part of left subcardinal vein above the level of intersubcardinal anastomosis)*

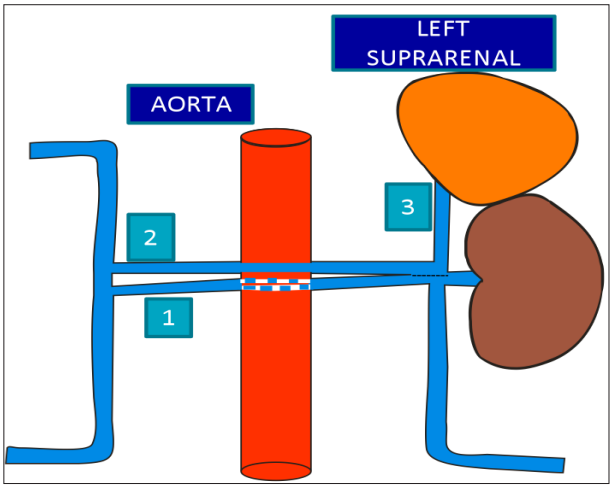

Figure 5. Development of RA-LRV and left suprarenal vein draining into IVC. *(**1:** persistent posterior limb of renal collar; **2:** persistent anterior limb of renal collar; **3:** part of left subcardinal vein above the intersubcardinal anastomosis)*

Ontogeny in present case

Arey [16] reasoned out the anomalous blood vessels to be due to any of:

I. Choice of unusual paths in the primitive vascular plexuses

II. Persistence of vessels normally obliterated

III. Disappearance of vessels normally retained

IV. Incomplete development

V. Fusion and absorption of parts usually distinct.

The variant pattern observed in the present cadaver may be explained ontogenically as follows (Figure 5):

1. The retro-aortic left renal vein can be explained by the persistence of posterior limb of renal collar (1 in Figure 5).

2. The left suprarenal vein opening directly into the IVC can be explained by the simultaneous persistence of anterior limb of renal collar (2 in Figure 5).

Thus, in this case left suprarenal vein seems to develop from:

a) A part of left subcardinal vein above the intersubcardinal anastomosis (3 in Figure 5).

b) Anterior intersubcardinal anastomosis (2 in Figure 5).

Clinical implications

RA-LRV may be compressed between the aorta and the lumbar spine leading to left renal venous hypertension which is known as Posterior Nutcracker Syndrome which is manifested by left flank and abdominal pain with or without hematuria [12,14,17] . Compression of RA-LRV can cause left renal to gonadal vein reflex resulting in lower limb varices and varicocele which may produce difficulties in spermatogenesis and may leads to infertility [10,13,14,17,18].

In patients presenting with hematuria, the possibility of RA-LRV should be ruled out as it is reported to be associated with 22.22% of such children by Mendizabal et al., [12]. RA-LRV has been also associated with Pelvic Congestion Syndrome in females which is characterized by lower abdominal pain, dysmenorrhoea, dyspareunia, vulval, gluteal or thigh varices and emotional disturbances [14,19]. RA-LRV may be obstructed by pressure from retro-peritoneal growths leading to congestion of kidney. If prolonged, it may give rise to a form of Chronic Interstitial Nephritis [20]. RA-LRV may have multiple caval terminations resulting in formation of hiatuses in pre-vertebral venous plexus enroute to IVC. Occasionally internal spermatic artery passes through a hiatus and may be clamped while doing surgery in this region [6].

Conclusion

The anatomic knowledge of abdominal vasculature and its variations is of importance for a surgeon that approaches retroperitoneal region for various surgical procedures like renal transplantation, vascular reconstruction for congenital and acquired lesions, repair of abdominal aortic aneurysm etc. Identification of RA-LRV is very important in proper planning for nephrectomy, partial nephrectomy, and living donor nephrectomy. Failure to recognize this variant can lead to inadvertent injury and major venous bleeding.

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