

## Original Article

# Retro-aortic Left Renal Vein and Hypertension

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### Abstract

Retro aortic left renal vein (RALRV) anomaly is a relatively uncommon condition which leads to left renal vein hypertension (LRVH) syndrome, otherwise called as Nutcracker syndrome. In this paper, we report the case study of a patient who had labile hypertension and left sided varicocele, but no other clinical features of RALRV anomaly. In cases of labile hypertension, investigations are directed towards detection of adrenal pathology. However, after observing this case, we would like to emphasize the relevance of including RALRV in the differential diagnosis of labile hypertension. For this purpose, a CT Scan of Abdomen, is of great value because a simultaneous detection of adrenal pathology as well as RALRV anomaly is possible. This would spare many unwanted investigations and make early and proper diagnosis feasible.

### Introduction

The left renal vein passing behind the abdominal aorta is termed Retro-Aortic Left Renal Vein (RALRV) (Figs. 1 and 2) and this anomaly is a relatively uncommon condition. A total of 1.125 contrast enhanced abdominal CT scan was examined to identify RLRVS. RLRVS were found in nine women (1.6%) and ten men (1.7%).<sup>1</sup>

*Clinical Study* : (retrospective analysis):  
a) radiological study, 104 renal venograms;  
b) live related renal transplantation, 148 donor left kidneys; c) abdominal aortic aneurysm surgery, 525 patients. Total sample size; 1008. Renal collars observed in 0.3%; retro aortic vein 0.5%; additional veins 0.4%, posterior primary tributary 23.2%, (16.7% Type IB; 6.5% Type IIB, cadaveric series, only). Our results differ significantly in incidence

to that reported in the literature; renal collar 0.2-30%; retro-aortic vein 0.8-7.1%; additional renal vein 0.8-6%.<sup>2</sup>

The embryology of the left renal vein has been described extensively.<sup>3,4</sup> As the anastomoses between the two supracardinal veins and the two subcardinal veins regress, a ventral renal vein is formed. During the normal formation of the left renal vein, the dorsal vessel degenerates and the ventral vessel becomes the renal veins.<sup>5</sup> However, in the case of retro-aortic left renal vein, the ventral vessel degenerates and the dorsal vessel becomes the renal vein.<sup>6</sup>

The left and right renal veins are of large size placed in front of the renal arteries and open into the inferior vena cava almost at right angles. The left renal vein is thrice the length of the right (2.5 cm to 7.5 cm) and has a much thicker muscular layer than the right. The left renal vein crosses the posterior abdominal wall lying behind the splenic vein and the body of the pancreas, and, near its termination, the left renal vein passes in front of the aorta (Fig. 3) just below the origin of the superior mesenteric artery.<sup>7</sup> The two

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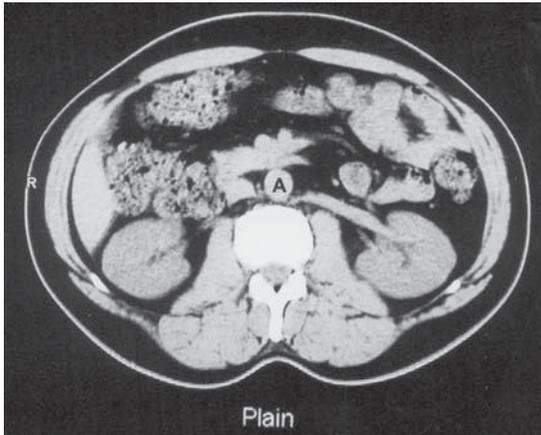


Fig. 1 : Plain CT scan abdomen showing retro aortic left renal vein of the patient. (A - Aorta)

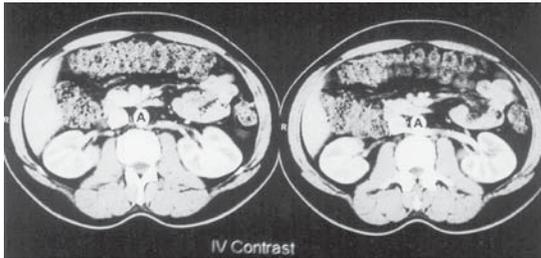


Fig. 2 : Contrast CT scan abdomen showing retro aortic left renal vein of the patient.

important non-renal branches that empty into the left renal vein are inferiorly the gonadal vein and superiorly the left adrenal vein. Occasionally the left renal vein may be duplicated, and in these cases one vein passes behind the aorta to join the inferior vena cava.<sup>8</sup>

The left renal vein hypertension (LRVH) syndrome or 'Nutcracker syndrome' was first described by Deschepper in 1972.<sup>9</sup> It defines the compression of left renal vein with the development of renal venous hypertension, that if transmitted backwards to the parenchyma, could result in various symptoms like unilateral haematuria, varicocele left. The compression mechanism or the nutcracker phenomenon is diverse, the most frequent type being vein trapping in the aortic-mesenteric space which is due to

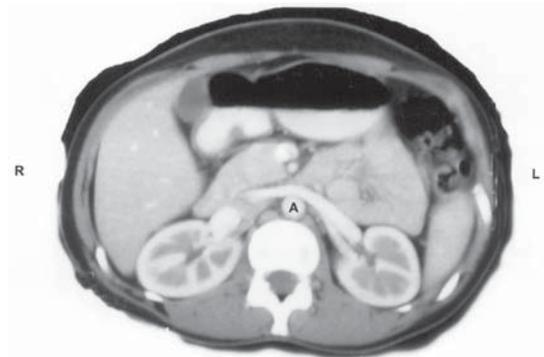


Fig. 3 : CT scan abdomen revealing normally placed left renal vein. (A - Aorta)

aneurysmal dilatation of aorta (anterior Nutcracker phenomenon). This mechanism is also described in the retro-aortic space due to the abnormality of the renal vein path, which is trapped between the aorta and the lumbar spine (posterior Nutcracker phenomenon). The consequence, in all the cases is a backward venous renal hypertension because of vena cava drainage impairment and the development of compensating collateral circulation. In our case, it was observed that the patient has posterior nutcracker phenomenon.

The clinical features reported are breathlessness, fatigue, back pain, haematuria with or without left flank pain, varicocele in the male, abdominal menstruation in females, less frequently arterial hypertension, anaemia, proteinuria (microscopic finding) occasionally orthostatic, nocturnal by the lying position or by gestation. A case of LRVH occurring without many of the above clinical features (especially haematuria which is a very common presenting symptom) but with hypertension (that too only labile) with left sided varicocele is reported by us.

A 41 year old male with good health in the past presented with chest discomfort and palpitations. His past medical and family histories were unremarkable. His blood

pressure was recorded to be 150/110 mm Hg. His 24 hours excretion of Vanilyl Mandelic Acid in urine was estimated and found to be 7.8 mg/24 hrs (Normal 8 mg/24 hrs). He had no urinary symptoms, and his urine microscopy was normal. The results of other investigations showed haemoglobin of 15.0 gm%, White Blood Cell count: 9,550 cells/cumm. DC: P 65%, E 2%, L 33%. ESR: 1/2 hour: 3 mm, Sugar: 115 mg/dl. Urea: 27 mg/dl. Serum cholesterol: 184 mg/dl and creatinine: 0.8 mg/dl. Ultrasonography of the abdomen was reported normal. His systemic examination revealed left sided varicocoele.

Physical examination revealed fluctuating Blood Pressure. CT scan of upper abdomen taken with the purpose of identifying any adrenal pathology was reported normal but for "Incidental Retroaortic Left Renal Vein" and the left renal vein showing mild distension before its course under the aorta. Blood pressure when checked in supine position was 130/110 mm Hg and in hyperextension of lumbar spine was found to be 160/110 mm Hg. Peripheral plasma renin with patient in supine position was found to be (0.10 ng/ml/hr) (normal 0.15-2.33 ng/ml/hr) and in hyperextension of lumbar spine it was (0.10 ng/ml/hr). Selective renal vein renin analysis was not done as the patient was not willing for the investigation. The patient was treated with antihypertensives and his Blood Pressure was under control, he was advised to avoid postures likely to impede left renal vein flow e.g. hyperextension of the lumbar spines. He was advised a regular follow up.

### **Discussion**

Posterior Nutcracker syndrome is caused by compression of the left renal vein between the lumbar spine and the aorta which results in left renal venous hypertension. The syndrome is manifested by left flank and abdominal pain with or without unilateral

haematuria. Other common presentation is as "Pelvic Congestion syndrome" in females characterized by symptoms of dysmenorrhoea, dyspareunia, lower abdominal pain, vulval, gluteal or thigh varices and emotional disturbances. Likewise compression of the left renal vein can cause left renal to gonadal vein reflex resulting in lower limb varices and varicocoeles in males.<sup>10</sup> Apart from Computed Tomography or MRI, selective left renal vein phlebography, renal vein pressure measurements and selective renin estimation are helpful for establishing the diagnosis of Nutcracker phenomenon.

In our case of a hypertensive, but otherwise healthy, middle aged male, with left sided varicocoele, and symptoms of giddiness, palpitation but no haematuria a posterior nutcracker phenomenon was identified on a CT scan, during the work up done for his labile hypertension. We would like to emphasize the importance of including retro aortic left renal vein in the differential diagnosis of labile hypertension. Early proper diagnosis would spare many unwanted investigations.

It is noted that, if the renovascular hypertension is due to the involvement of one kidney, as in retro aortic left renal vein, the affected kidney will show excessive secretion of renin, but the contra lateral kidney will demonstrate suppression of renin release. From this it can be understood that the increase in renin concentration, due to excess secretion by one kidney, is compensated by decreased secretion by the other kidney. As a result of which, it is likely that in the case of a patient with renovascular hypertension due to involvement of one kidney as in RALRV, the total renin levels may remain within the normal range. In our case also the patient who was an hypertensive and had RALRV, the renin levels were within limits.<sup>11,12</sup>

For asymptomatic patients with no haematuria, the treatment is conservative. For symptomatic patients various surgical treatments including left renal vein transposition, left renal autotransplantation, or endovascular stenting of left renal vein to restore adequate luminal flow have been performed successfully.<sup>13</sup>

### Conclusion

This case study showed that a patient with labile hypertension and left sided varicocele only, and not showing other clinical features of retro aortic left renal vein (RALRV) could yet have a RALRV anomaly. Whenever, we come across a patient with labile hypertension, investigations are directed towards the detection of adrenal pathology. This case study has emphasized the importance of non-invasive CT scan which would throw light on both adrenal pathology and retroaortic left renal vein.

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### DIABETES AND HYPERTENSION

Blood pressure is an important determinant of the risks of vascular complications in type 2 diabetes. The ADVANCE trial assessed the effects of fixed combination of the ACE inhibitor perindopril and the diuretic indapamide on serious vascular events in patients with type 2 diabetes and at least one additional risk factor, irrespective of initial blood pressure levels or the use of other blood-pressure-lowering drugs.

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