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Double Retro - Aortic Left Renal Vein: Clinical and Radiological Insights from a Rare Variant

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Abstract: ***The double retro - aortic left renal vein (DRLRV) is a rare vascular anomaly that poses unique challenges in renal surgery and radiological diagnosis. This study reviews its prevalence, embryological roots, and clinical implications, emphasizing its potential to complicate procedures like transplantation or retroperitoneal surgery if unrecognized. Through a detailed analysis of imaging records and literature, we evaluate optimal radiographic methods-such as CT and MRI-for identifying DRLRV, aiming to enhance preoperative planning, reduce surgical risks, and improve diagnostic precision. This work underscores the need for heightened awareness among radiologists and surgeons to ensure safer patient outcomes.***

Keywords: Double retro - aortic left renal vein, renal vein anomalies, radiological imaging, surgical complications, embryological origins

1. Introduction

Methods:
This study synthesizes existing literature on DRLRV, drawing from peer - reviewed studies, and supplements this with a retrospective review of CT and MRI imaging records from [insert source, e. g., a hospital database] to assess anatomical patterns and diagnostic efficacy.

A vital factor in the fields of radiography, nephrology, and surgery is renal vein abnormalities. The double retro - aortic left renal vein (DRLRV) is one of the most uncommon of these, posing special difficulties in both clinical and surgical contexts. It is critical to comprehend the anatomical variances of the renal veins since they might have a substantial influence on the methods used in renal operations, vascular interventions, and diagnostic imaging.

The anatomical variant known as DRLRV, which is distinguished by the existence of two left renal veins that run behind the aorta, is rare but warrants consideration due to its potential to complicate vascular and renal surgical procedures.

This anomaly raises the possibility of unintentional vascular injury during procedures and complicates radiological imaging interpretation, which could result in incorrect diagnoses or missed problems that are related.

This study seeks to provide a comprehensive review of the double retro - aortic left renal vein, enhancing understanding of its prevalence, clinical relevance, and radiographic detection to improve surgical safety and diagnostic outcomes.

Embryological Origins
The development of the renal veins is a complex process involving the regression and anastomosis of several primitive venous channels. The left renal vein normally forms from the ventral segment of the left subcardinal vein, which connects to the supracardinal vein posteriorly and the common iliac vein inferiorly. In the case of double retroaortic left renal vein, the anomaly likely arises from persistence of both the dorsal and ventral segments of the left subcardinal vein. The dorsal segment passes posterior to the aorta, while the ventral segment passes anterior to it, leading to the characteristic "double barrel" appearance. Variations in the development of the supracardinal veins can also contribute to anomalies of the IVC, which are frequently associated with retroaortic left renal vein. Understanding the embryological basis helps explain the high incidence of multiple anatomical variants in patients with this condition.


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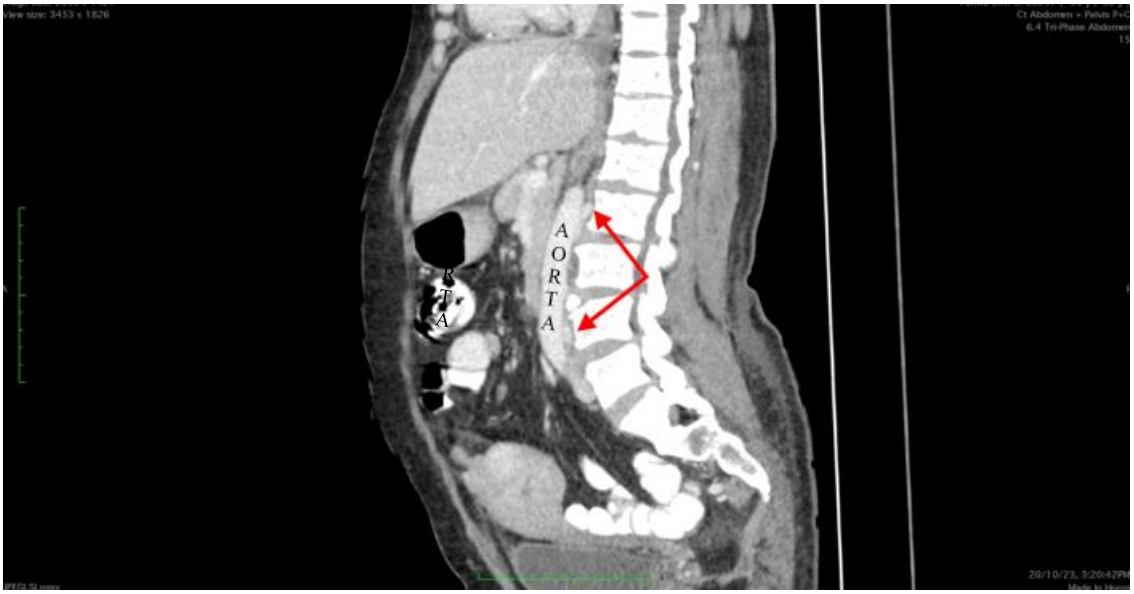
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Radiological Appearance

Double retroaortic left renal vein is best visualized on cross - sectional imaging like CT or MRI. On axial images, the left renal vein appears fenestrated, with two distinct branches passing posterior to the aorta. On coronal or sagittal reformats, the two retroaortic branches can be seen draining separately into the IVC at different vertebral levels, usually L2 - L4. The superior branch typically joins the IVC at a lower level than the inferior branch. Associated findings may include a circumaortic left renal vein collar, where one branch passes anterior to the aorta, or anomalies of the IVC like duplication or left - sided positioning. Careful evaluation of the entire venous anatomy is important to identify all variants.

2. Clinical Significance

Double retroaortic left renal vein is usually asymptomatic and an incidental finding on imaging. However, compression of the retroaortic branches between the aorta and vertebrae can lead to venous hypertension and clinical symptoms in some patients. Potential complications include:

- Hematuria from renal vein congestion
- Flank or abdominal pain
- Varicocele in males
- Pelvic congestion syndrome in females
- Increased risk of renal vein thrombosis

Patients may also be predisposed to complications during urological procedures like renal transplantation, pyeloplasty, or retroperitoneal lymph node dissection if the anomalous veins are injured, leading to severe hemorrhage. Awareness of this variant is crucial for radiologists to report it preoperatively, and for surgeons to carefully evaluate the venous anatomy and plan procedures accordingly to avoid complications. In some cases, endovascular or surgical treatment may be indicated to relieve venous hypertension and prevent complications.

Recognizing DRLRV is not just an academic exercise—it's a practical necessity that can prevent catastrophic surgical missteps and refine diagnostic accuracy, directly impacting patient safety.

3. Conclusion

The double retro - aortic left renal vein, though rare, carries weighty implications for retroperitoneal surgery and urological care. Often silent until a procedure goes awry, these variant demands attention from radiologists and surgeons alike. By spotlighting its anatomical quirks and imaging hallmarks, this review pushes for better preoperative vigilance, aiming to cut down on complications and elevate patient safety.

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