

Circumaortic Left Renal Vein: Case Report

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ABSTRACT

Introduction: the knowledge of anatomical variations in renal vessels is clinically important for surgeons during preoperative assessment and renal surgical procedures.

Case Report: during the study of branches of the descending abdominal aorta in a male cadaver from the Anatomy Laboratory of Santa Maria University Center (UNIFSM), in the city of Cajazeiras, state of Paraíba, the presence of multiple renal veins on the left side was observed. It was identified duplicity of the left renal vein and, also, a case of circumaortic left renal vein (CLRV), which was composed of two trunks emerging from the kidney, the superior left renal vein crossing anteriorly to the abdominal descending aorta, and the inferior branch of the left renal vein passing posteriorly to the descending abdominal aorta.

Conclusion: these findings highlight the significance of studying and reporting the incidence of variations in the left renal vein and its tributaries, emphasizing the need for preoperative imaging examinations, especially in renal transplants, to prevent injuries during surgeries.

Keywords: Anatomy; Circumaortic; Left renal vein; Anatomical variation.

Introduction

Organs that perform important functions in the human body are recognized for their rich and complex vascularization, as stated in the classic work “*Traité D’Anatomie Humaine*” by Testut¹. Human kidneys exhibit a wide range of anatomical variations and blood supply due to their crucial role in the excretion of the final products of metabolism and in the homeostasis of body fluids².

Anatomically, the renal veins originate at the renal hilum, through the anastomosis of five to six veins, following a transverse direction, draining blood from the kidneys into the inferior vena cava at a right angle. The right renal vein (RRV) is about three times shorter than the left renal vein (LRV), which takes a path anterior to the abdominal aorta, passing inferiorly to the origin of the superior mesenteric artery. Additionally, it can be duplicated, with one branch passing posterior and the other anterior to the aorta, before they both empty into the inferior vena cava^{2,3}.

Due to the longer course of the LRV, the left kidney gains priority for nephrectomy in live donor transplant cases. On the other hand, its proximity to the aorta facilitates clamping during surgeries for treatment of aortic aneurysm without causing damage to the kidney, provided that the appropriate technique is followed⁴.

Variations in the number and tributaries of veins are frequently described in studies and may occur

either unilaterally or bilaterally. The three most common variations include multiple renal veins, a retroaortic renal vein, and a circumaortic renal vein⁵. Understanding these variants is important as they can influence the success of procedures performed in trauma episodes, tumor resections, correction of secondary hypertension, as well as in surgical approaches for renal transplantation^{6,7}.

This study aims to report an anatomical variation of the LRV identified in a dissected cadaver at an Anatomy Laboratory situated in the hinterlands of Northeastern Brazil.

Case Report

During the study of the vessels in the abdominal cavity of a male cadaver from the Anatomy Laboratory of Santa Maria University Center (UNIFSM), in the city of Cajazeiras, state of Paraíba, fixed in 10% formalin, it was observed the presence of multiple renal veins on the left side. The cadaver had the renal pedicle already exposed, allowing for the visualization and individualization of its structures. Duplicity of the left renal vein and a case of circumaortic LRV (Figures 1 and 2) were identified.

The superior left renal vein (SLRV) measured 4.15 cm in length, leaving the renal hilum with a subtle caudal obliquity, anterior to the left renal artery and superior to the inferior left renal vein (ILRV), until they anastomosed forming the left renal vein (LRV), 2.53



Figure 1. Anatomical variation of the left renal vein.

Legend: In red - 1. Descending Abdominal Aorta; 2. Inferior Polar Artery. In blue: 1. Inferior Vena Cava; 2. Left Renal Vein (LRV); 3. Left Suprarenal Vein; 4. Superior Left Renal Vein (SLRV); 5. Inferior Left Renal Vein (ILRV); 6. Upper Branch of Inferior Left Renal Vein; 7. Lower Branch of Inferior Left Renal Vein.

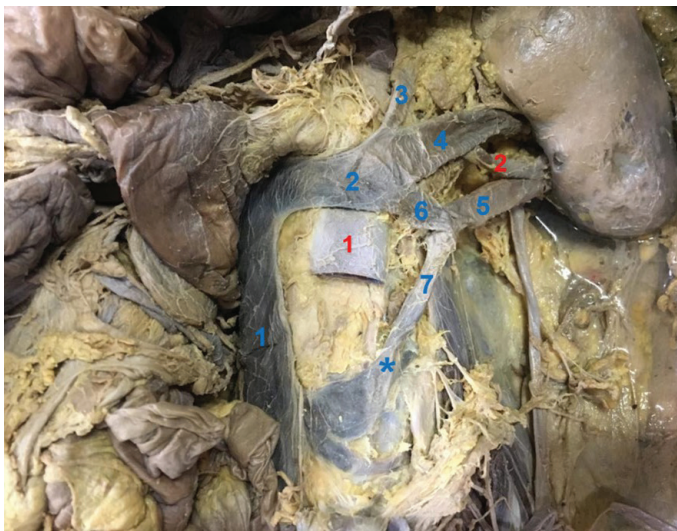


Figure 2. Identification of the circumaortic left renal vein.

Legend: In red - 1. Descending Abdominal Aorta; 2. Inferior Polar Artery. In blue: 1. Inferior Vena Cava; 2. Left Renal Vein (LRV); 3. Left Suprarenal Vein; 4. Superior Left Renal Vein (SLRV); 5. Inferior Left Renal Vein (ILRV); 6. Upper Branch of Inferior Left Renal Vein; 7. Lower Branch of Inferior Left Renal Vein. *Circumaortic Left Renal Vein.

cm from the confluence on the left lateral side of the inferior vena cava (Figure 2).

The inferior left renal vein (ILRV) measured 5.22 cm long and exited the renal hilum with an inferior obliquity, positioned posteroinferiorly to the inferior polar artery. At a distance of 4.10 cm from the renal hilum, the ILRV bifurcated into two veins. The upper division (1.12 cm in length) anastomosed with the SLRV, forming the left renal vein. The lower division of the ILRV, measuring 5.65 cm long, descended obliquely, passing posteriorly to the descending abdominal aorta until it joined the left lateral side of the inferior vena cava, 4.48 cm below the LRV (Figure 2).

In this cadaver, a case of circumaortic left renal vein (CLR) was identified, which consisted of two

branches emerging from the kidney, the SLRV crossing anteriorly to the aorta, and the lower division of the ILRV, passing posteriorly to the descending abdominal aorta (Figure 2).

Discussion

The knowledge about anatomical variations is extremely important, especially in surgical contexts, as it helps prevent injuries and consequent harm to patients⁸. Regarding the LRV, it is typically singular, with variations primarily observed in its tributaries and their respective courses. However, in the presented study, a case of multiple renal veins on the left side was identified, which was described as duplication of the LRV. Also, it was observed a circumaortic, also known as periaortic, left renal vein.

According to the classic anatomy literature, renal veins are blood vessels that originate from the renal hilum, formed by the anastomosis of five or six veins and running transversely to drain blood from the kidneys into the inferior vena cava. The LRV is longer than the RRV, taking a ventral course to the abdominal aorta and passing inferiorly to the origin of the superior mesenteric artery. The left suprarenal vein, the inferior phrenic vein, and left gonadal vein (testicular in males, ovarian in females) drain into the LRV at a slightly higher level when compared to the RRV^{2,3}.

In its embryological development, the left renal vein (LRV) originates from the intersubcardinal anastomosis, running anteriorly to the aorta, and its retroaortic trajectory is established when the intersubcardinal anastomosis regresses and renal drainage through the intersupracardinal anastomosis is established posteriorly to the aorta⁹⁻¹¹. When both anastomoses (intersubcardinal and intersupracardinal) persist, a renal vein is formed with one branch anterior and the other posterior to the aorta, creating the retroaortic vein, also known as circumaortic^{9,11}.

The circumaortic left renal vein can be solely composed of a trunk emerging from the kidney and, before anastomosing with the inferior vena cava, it bifurcates into two veins, where one crosses anterior and the other posterior to the aorta. According to Arévalo Pérez *et al.*¹², the circumaortic vein has a variable incidence that ranges from 0.3% to 17% of cases, making it the most common variation found in the LRV.

As this variation is silent, it does not exhibit exacerbated clinical signs and is typically detected only through imaging exams, surgical procedures or during autopsy. However, this anomaly may be clinically associated with increased renal venous pressure in cases of varicocele, hematuria, pelvic congestion syndrome¹³, and hematuria and abdominal/flank pain¹⁴ due to compression of left renal vein^{15,16}. Therefore, the performance of preoperative examinations before nephrological surgeries is of utmost importance.

Conclusion

Anatomical variations of VRE are common, as observed in the reported case, where the presence of a circumaortic renal vein was identified. This variation may occur in approximately 0.3% to 17% of the population.

It is clear the importance of studying and reporting the incidence of variations in the LRV and its tributaries, emphasizing the need for preoperative imaging exams, especially in renal transplants, to prevent injuries during surgeries.

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Mini Curriculum and Author's Contribution

- Jalles Dantas de Lucena: discussion of the results and writing of the manuscript, conception and design of the study.
- Larissa Thaís de Melo Filizola: discussion of the results and writing of the manuscript.
- Karen Maria Ferreira Tavares: discussion of the results and writing of the manuscript.
- Inácio Andrade Torres Júnior: discussion of the results and writing of the manuscript.
- Jefferson Pereira Sarmento: discussion of the results and writing of the manuscript.
- Ana Emília Santos de Queiroz: discussion of the results and writing of the manuscript.
- Anaylle Vieira Lacerda de Oliveira: writing of the manuscript and orthographic revision of the manuscript.
- Eulámpio José da Silva Neto: dissection of the corpse and discussion of the results.

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