

Case Report

Retro-aortic, Left Inferior Renal Capsular Vein

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ABSTRACT. In our case report, abdominal multi-detector computed tomography was used for the pre-operative anatomy evaluation in a living kidney donor. The early phase of the test revealed normal kidneys in the donor. The vascular phase detected a venous variant on the left side: An inferior renal capsular vein, which had a loop and a retro-aortic course. This pre-operative knowledge was crucial for the laparoscopic nephrectomy as a surgical procedure for harvesting kidney from the living donor.

Introduction

Variations of the renal veins are usually clinically silent and are understudied compared with the arterial variants.¹⁻⁴ Because of the longer course and complex embryogenesis, the anatomy of the left renal vein may have a sizeable number of variations.¹⁻¹⁰ The knowledge of such possible venous variations is crucial for surgeons to avoid vascular injury, especially during laparoscopic nephrectomy for harvesting kidneys from living donors.⁶ Abdominal multi-detector computed tomography (MDCT) is the technique of choice for the pre-operative anatomy evaluation of living kidney donors.⁴⁻⁶

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We report a case of a living kidney donor who underwent abdominal MDCT that revealed a left inferior renal capsular vein with a loop and a retro-aortic course.

Case Report

A healthy, 31-year-old female with normal renal function was evaluated as a potential living kidney donor transplantation to her sister. She was evaluated by abdominal MDCT for kidney anatomical information about the parenchyma, the arteries, the veins and the collecting system. The protocol of the MDCT included an unenhanced kidney phase, an artery phase and a nephrographic (venous) phase. All these phases were performed from the diaphragm to the pubic symphysis. The imaging examination was concluded with an abdominal conventional radiography at 5 min after the MDCT examination to evaluate the renal collecting system and ureters. All these MDCT images were sent to the workstation

for the post-processing evaluation. During this process, axial multiplane reformatting (MPR), maximum intensity projection (MIP) and volume rendering technique (VRT) images were analyzed. These images showed normal kidneys, renal arteries, collecting system and ureters. In the nephrographic phase, a left side venous variant was noted: An inferior renal capsular vein with a loop and a retro-aortic course (Figure 1). The maximum diameter of this vein was 2.3 mm.

After all screening investigations, this potential living kidney donor was approved for donation. The left kidney was chosen for laparoscopic living donor nephrectomy for its longer venous pedicle and its relative technical ease of removal. With the knowledge of the congenital venous capsular variant, the transplant surgeons carried out the left side laparoscopic nephrectomy without vascular complications and the kidney was successfully transplanted to her sister.

Discussion

The development of renal veins is associated with the complex developmental process of the inferior vena cava (IVC).^{1-3,8,10} The process starts from the fourth week of fetal life and progresses rapidly with formation of three pairs of parallel veins during the eighth week of fetal life.^{1,3} These three precursor venous systems are the posterior cardinal veins, the subcardinal veins and the supracardinal veins. The renal veins are formed by anastomosis of the subcardinal and supracardinal veins. Two renal veins form as dorsal and ventral; the dorsal vein usually degenerates and the ventral vein forms the renal vein.³ The highly complex embryological development of the left renal vein can result in the following variations: Additional renal veins, circumaortic renal collateral vein, retroaortic vein and posterior primary tributary (collateral) vein.^{1,8-10} Additional renal vein is defined as an additional vein that drains

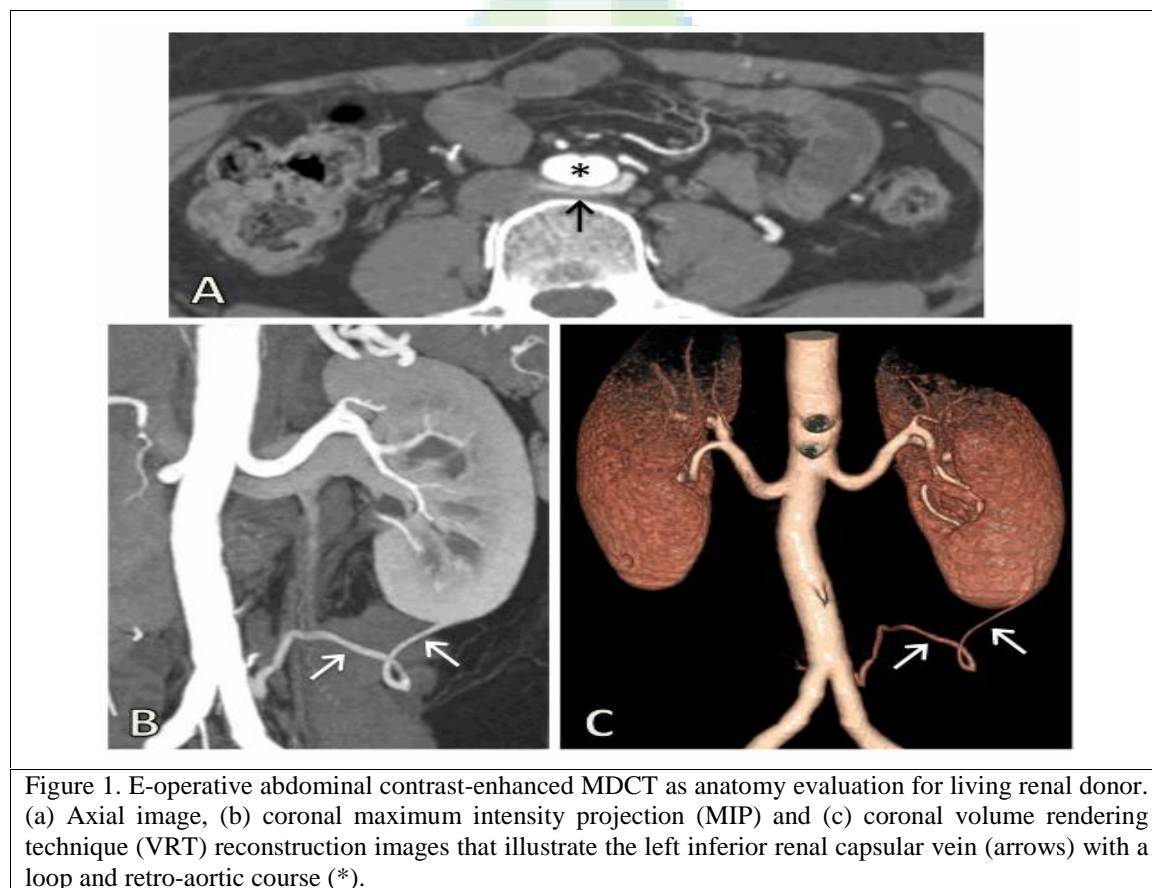


Figure 1. E-operative abdominal contrast-enhanced MDCT as anatomy evaluation for living renal donor. (a) Axial image, (b) coronal maximum intensity projection (MIP) and (c) coronal volume rendering technique (VRT) reconstruction images that illustrate the left inferior renal capsular vein (arrows) with a loop and retro-aortic course (*).

separately from the kidney and independently into the IVC.⁷ The renal capsular vein is a minor vascular variation. It is defined as a tributary of the renal vein draining blood from the renal capsule.⁹ The renal capsular veins may provide an extra- or intra-renal communication; however, these veins typically join the adrenal vein. To the best of our knowledge, looped and retro-aortic left inferior renal capsular vein images have not been illustrated previously in the literature.

The renal capsular vein variation that drains blood from the renal capsule independently into the IVC can be classified as an additional renal vein.

Pre-operative knowledge of vascular variations helps the surgeons during laparoscopic nephrectomy, avoiding any possible transections of these vessels that may cause hemorrhage. The MDCT is the first-line technique for pre-operative evaluation of living renal donor.^{4,6} It provides a complete evaluation of anatomy about the donor's renal parenchyma, arteries, veins and collecting system. Analysis of vascular variations is a challenge that requires the use of multiple workstation tools, including MPR, MIP and VRT images, which are useful for the follow-up of the courses of these vessels.⁶

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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