

ROLE OF MULTI-DETECTOR CT ANGIOGRAPHY IN ASSESSMENT OF THE NORMAL ANATOMY AND VARIANTS OF RENAL ARTERIES AND VEINS

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INTRODUCTION

Multi-detector computed tomography angiography (MDCTA) is considered a non-invasive, fast, and safe technique. MDCT plays an important role for surgeons before renal operations, for renal vascular anatomy evaluation. It also helps in the detection of renal vascular variants as the number, size, and course as well as the relation between renal vessels, which help to avoid hemorrhagic complications during operation.

Normally, both renal arteries are arising at level L1-2 from the abdominal aorta, inferiorly from the origin of the superior mesenteric artery by about 1 cm, while normally the left renal vein runs anteriorly between the SMA and the aorta to drain into the medial aspect of the inferior vena cava while the right drains into the lateral aspect of the inferior vena cava.

For renal arterial variants; accessory renal arteries are the most common renal vascular variant which represented one-third of cases 30% of them are unilateral and 10 % are bilateral accessory renal arteries. Other renal arterial variant is extra-hilar or early branching renal artery.

For renal venous variants, it is important to demonstrate variations such as circum-aortic, retro-aortic, or multiple renal veins to avoid vein incisions that lead to bleeding during different surgical procedures such as donor nephrectomy.

AIM OF THE WORK

The aim of this study was to describe the importance of multi-detector CT angiography in studying a wide range of normal anatomical positions of renal artery and vein and their variants.

SUBJECTS AND METHODS

At the Radiology Department of Alexandria University Hospital, individuals who were subjected to abdominal CTA scans, regardless of the objective, were included for assessment of the normal anatomy and variants of renal arteries and veins.

Inclusion criteria:

1. Age ≥ 14 years
2. Donors for a kidney transplant.
3. Donors for a liver transplant.
4. Hypertensive patients who are suspected to have renal artery stenosis.

Exclusion criteria:

1. Previous abdominal aortic surgery.
2. Any contraindication to CT or CTA scan as.:
 - Pregnancy
 - Known patient with allergy with history of sever or hypersensitivity to contrast material
 - Renal function impairment.

Pre-imaging work up:

Before MDCTA scanning, all individuals are closely assessed by:

- Medical history especially the history of previous exposure to contrast study or contrast allergy.
- Routine laboratory tests especially serum creatinine and creatineclearance.

RESULTS

Table 1: A summarization of renal arterial anatomical variants

Arterial anatomic variants No (%)	Right side	Left side	Bilateral	Triple on the right side
Accessory arteries	9 (22)	7 (17.1)	6 (14.6)	3 (7.3)
○ Upper pole	0 (0)	2 (4.9)	0 (0)	0 (0)
○ Hilar	6 (14.6)	3 (7.3)	3 (7.3)	3 (7.3)
○ Lower pole	3 (7.3)	2 (4.9)	3 (7.3)	3 (7.3)
Early division	6 (14.6)	1 (2.4)	0 (0)	
Other tributaries testicular artery)	1 (2.4)	0 (0)	0 (0)	

Table 2: A summarization of renal veins anatomical variants.

Venous anatomic variants No (%)	Right side	Left side	bilateral
Accessory veins	7 (17.1)	---	1 (2.4)
Retro-aortic left renal vein	---	7 (17.1)	---
Circum-aortic	---	2 (4.9)	---
Late confluence	0 (0)	3 (7.3)	0 (0)

Case presentation: A 60 years old male patient presented with lower limb ischemia and underwent CTA.

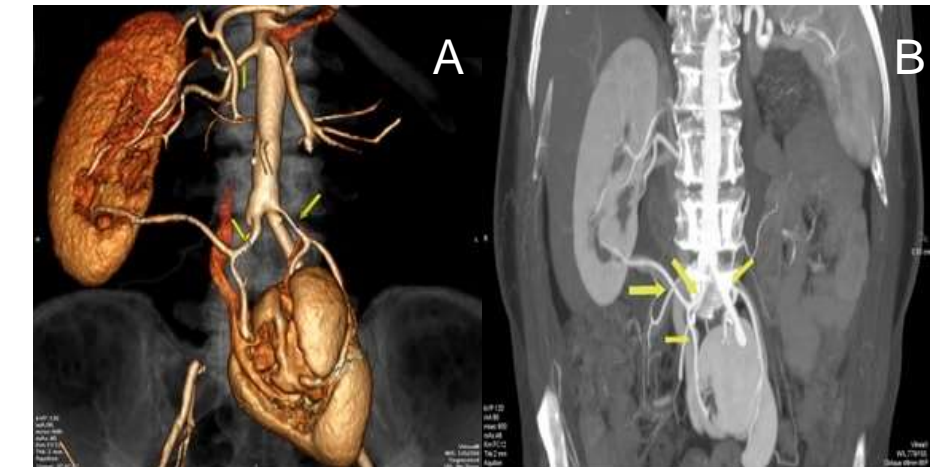


Figure 1: Volume Rendered image (A) and Maximum Intensity Projection image (B) show bilateral accessory renal arteries.

Case presentation: A 70 years old male patient did MDCTA for suspected vascular stenosis.

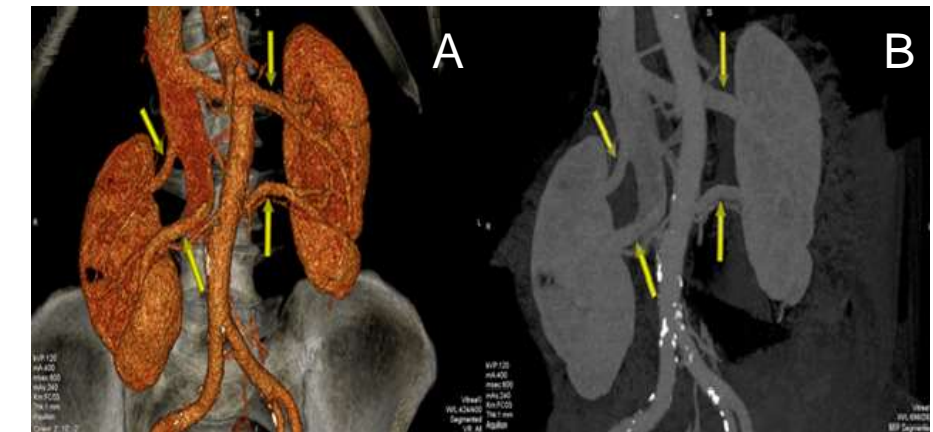


Figure 2: Volume rendering (A) and MIP image (B) show bilateral double renal veins.

CONCLUSION

Multi-detected CT angiography is a best imaging modality in examination of normal renal arteries and veins and their variants. The MDCTA is easy and accurate in detection the number and course of renal arteries and veins. Knowledge of the renal vascular anatomy and variants is very important in pre-surgical work-up of any renal or aorto-iliac pathology to avoid possible complications.