

# THORACIC ORIGIN OF THE RIGHT RENAL ARTERY: AN INCIDENTAL FINDING

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## Abstract

*Thoracic origin of a single renal artery with a normal position of the kidney is a very rare anatomical variant with just a dozen cases depicted in the medical literature. In this case report we describe an incidental finding of a main renal artery arising from the thoracic aorta at the 11th thoracic vertebral level in an asymptomatic 57 year-old man in a routine computed tomography (CT) on follow-up for chronic pancreatitis.*

## INTRODUCTION

The renal arteries are the most variable branches of the abdominal aorta regarding the site of origin and number, in such that anatomic variants of renal arterial supply are a common abdominal CT finding and frequently not reported by abdominal radiologists.<sup>1,2</sup> Knowledge of variations of the origin and course of the renal arteries is important for the management of renal trauma, surgery or transplantation and aortic surgery.

In a series of 855 consecutive patients studied by angiography, Özkan U et al found that in 98% of the times the origin of the main renal arteries of the aorta was between the upper margin of L1 and lower margin of L2 vertebra,<sup>1</sup> but renal arteries originating from the thoracic aorta are exceedingly rare. In this case report we describe and discuss an incidental detection of a thoracic renal aorta via contrast enhanced computed tomography (CT).

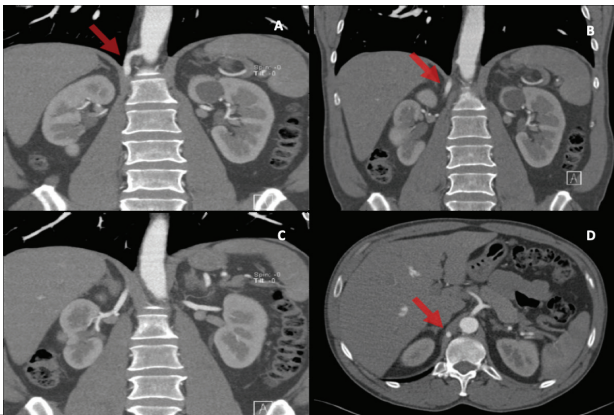
## CASE REPORT

Mr. MC, a 57 year-old man, underwent an abdomi-

nopelvic CT exam at our institution to follow-up complications related to a recent exacerbation of a known chronic pancreatitis. Biphase contrast-enhanced CT examination revealed a thoracic origin of the right main renal artery at the level of T11 vertebral body (Figure 1). The artery originated along the lateroposterior aspect of the aorta at 7 o'clock position and showed a linear course caudally through a hiatus in the right crus of the diaphragm to reach the renal hilum (Figure 2). Contralateral renal artery had a common origin at the level of L1 and there were no accessory arteries on both kidneys. There was a single vein for each kidney and a symmetrical renal enhancement was observed.

## DISCUSSION/CONCLUSION

Renal arteries can be categorized as main renal arteries, accessory branches and accessory arteries, according to their origin and point of renal entry.<sup>2,3</sup> The main renal artery usually originates from the abdominal aorta below the superior mesenteric artery. Accessory renal branches, as their name implies, originate from the main renal artery



**Figure 1**

Contrast enhanced abdominal CT (arterial phase) depicting a thoracic right renal artery on the coronal plane (A-C) and in the axial plane (D).

before the hilum, while accessory renal arteries have a separate aorta origin and can enter the kidney at any point, most commonly at the poles. Renal arterial variations are common and the most common variation is the presence of an accessory artery, seen in about one-third of the population.<sup>2</sup>

All of these variations in renal vasculature are due to the existence of several mesonephric arteries during fetal life.<sup>2,3</sup> These arteries develop in the embryologic phase laterally to the aorta between the level of C6 and L3 vertebrae and are divided into cranial, middle and caudal group. Over

time, they progressively degenerate leaving only one mesonephric artery, usually in the caudal group, which becomes the main renal artery.<sup>2</sup> Persistence of cranial mesonephric vessels results in a high anomalous renal arterial supply with the renal artery originating above the celiac axis.<sup>2-4</sup>

Renal arteries arising from the thoracic aorta are very uncommon, with our literature search revealing less than 15 reports of such variation, most of the times between T11 or T12. The first case was reported by Doppman in 1967, describing a case originated at the level of the T11 vertebra and arising beneath the right crus of the diaphragm.<sup>5</sup> The majority of these case reports describe a single ectopic renal artery located on the right side, though similar anomaly can also occur on the left side.<sup>3,6,7</sup> Renal artery vascular variants increase the risk surgical of complications, being more technically challenging, but other than these surgical considerations there are no indications that an thoracic origin of the renal artery have any major clinical implication for the patients.<sup>2</sup>

On reviewing patient's previous CT examinations, including an abdominal CT angiography, no consideration was made to the presence of any renal vascularity variant on the radiologist' report, highlighting a need for radiologists recognition of renal vasculature variations, frequently not valued nor reported.

In conclusion, we incidentally identified a very rare right renal artery originating from the thoracic aorta with penetration though the diaphragm on a CT examination. It is very important for surgeons and radiologists to be aware of rare renal arterial anomalies and ectopically originating renal arteries must be considered when evaluating the suitability of renal donors for renal transplantation.



**Figure 2**

Cinematic Rendering CT highlighting the right renal artery (red arrow). Left renal artery with a usual abdominal origin.

REFERENCES

1. Özkan U, Oğuzkurt L, Tercan F, Kızılkılıç O, Koç Z, Koca N. Renal artery origins and variations: angiographic evaluation of 855 consecutive patients. *Diagn Interv Radiol* 2006;12:183-186.
2. Ichikawa T, Iino M, Koizumi J, Takuya H, Kazama T, Sekiguchi T, et al. A case of right renal artery originating from the thoracic aorta. *Jpn J Radio* 2014;32(12):716-20.
3. Ishida M, Namik Y, Watanab M. Thoracic renal artery: a rare case of the renal artery originating from the thoracic aorta and literature review. *Anat Sci Int* 2016;91(2):211-214.
4. Gadabanahalli K, Bhat V. Thoracic Origin of Single Right Renal Artery: Some Interesting Facets. *Int J Angiol* 2017;26:264-266.
5. Doppman J. An ectopic Renal artery. *Br.J. Radiol* 1967; 40:312-313.
6. Saddoud N, Bouktif I, Gmiha B. Left renal artery originating from the thoracic aorta: Threedimensional imaging findings. *Diagn Interv Imaging* 2017; 98(4): 359-361
7. Stinson J, MD, Rivard A, Mitchell M. Intrathoracic origin of the left renal artery. *Vasc Surg* 2016;64:1851-2.