Case report

BILATERAL DOUBLING OF RENAL ARTERIES IN AN ETHIOPIAN MALE CADAVER: A CASE REPORT

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RESUMEN

Con los recientes avances en transplantes renales, y con los crecientes avances en reconstrucciones reno-vasculares a través del conocimiento profundo de la anatomía normal y que sus variantes en la vascularización renal son muy importante. En relación a esto dado el interés académico para anatomistas, así como para los médicos. Se presenta un caso de duplicación bilateral de los vasos renales. Hemos observado la presencia de la duplicación bilateral de vasos renales. En el lado derecho de las arterias renales, uno superior y otro inferior surgiendo de la aorta abdominal. La arteria superior emerge justo por encima del origen de la arteria mesentérica superior, mientras que la arteria renal inferior derecho se levanta alrededor de 1 cm del origen de la arteria mesentérica superior. En el lado izquierdo también había dos arterias renal estas surgían de la aorta abdominal del origen de la arteria mesentérica superior. También se observó la presencia de venas renales dobles en el lado izquierdo. El conocimiento de estas variaciones es de gran importancia clínica para los radiólogos, nefrólogos y urólogos en la creciente formación y en el procedimiento urológico pudiendo ayudar a evitar las complicaciones clínicas, especialmente durante los exámenes radiológicos o en el abordaje quirúrgico de esta región.

***Palabras clave**: Arteria renal, vena renal, variaciones, renovascular, glándula suprarrenal.*

ABSTRACT

With recent advancements in renal transplantations, renovascular reconstructions and imaging advances, thorough knowledge of the normal and variant anatomy of the renal vasculature is very much important. These are of academic interest for anatomists as well as clinicians. Hence we report a case of bilateral duplication of renal vessels. We observed the presence of bilateral duplication of renal vessels. On the right side the renal arteries, one superior and one inferior arose from abdominal aorta. The superior artery arose just above the origin of superior mesenteric artery while the right inferior renal artery arose about 1cm below the origin of superior mesenteric artery. On the left side also there were two renal arteries both arose from the abdominal aorta below the origin of superior mesenteric artery. We also observed the presence of double renal veins on the left side. Knowledge of these variations is of great clinical significance to radiologists, nephrologists, and urologists in imaging and urological procedure and may help to avoid the clinical complications especially during radiological examinations or surgical approaches in this region.

***Key words**: Renal artery, renal vein, variations, renovascular, supra renal gland.*

INTRODUCTION

Blood supply of kidney is carried out via single renal arteries which are the direct branches of abdominal aorta arising just below the origin of superior mesenteric artery (Susan, 2008).

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Right renal artery is longer than left renal artery and runs behind the inferior vena cava and right renal vein. Left renal artery runs behind the left renal vein. Near the renal hilum the arteries divide into anterior and posterior divisions. The renal veins lie anterior to the renal arteries and drain into inferior vena cava. The left renal vein is longer than right renal vein and it receives left gonadal vein and left suprarenal vein. Right renal vein is shorter and drain into inferior vena cava.

The definitive kidney develops from metanephros and the definitive renal artery is developed from inferior suprarenal artery (Gray et al, 1995). The renal artery which is single on each side at the renal sinus divides into segmental branches. The kidney is divided in to various segments, each supplied by a single end arterial branch that generally courses from main artery (Alan et al, 2012).

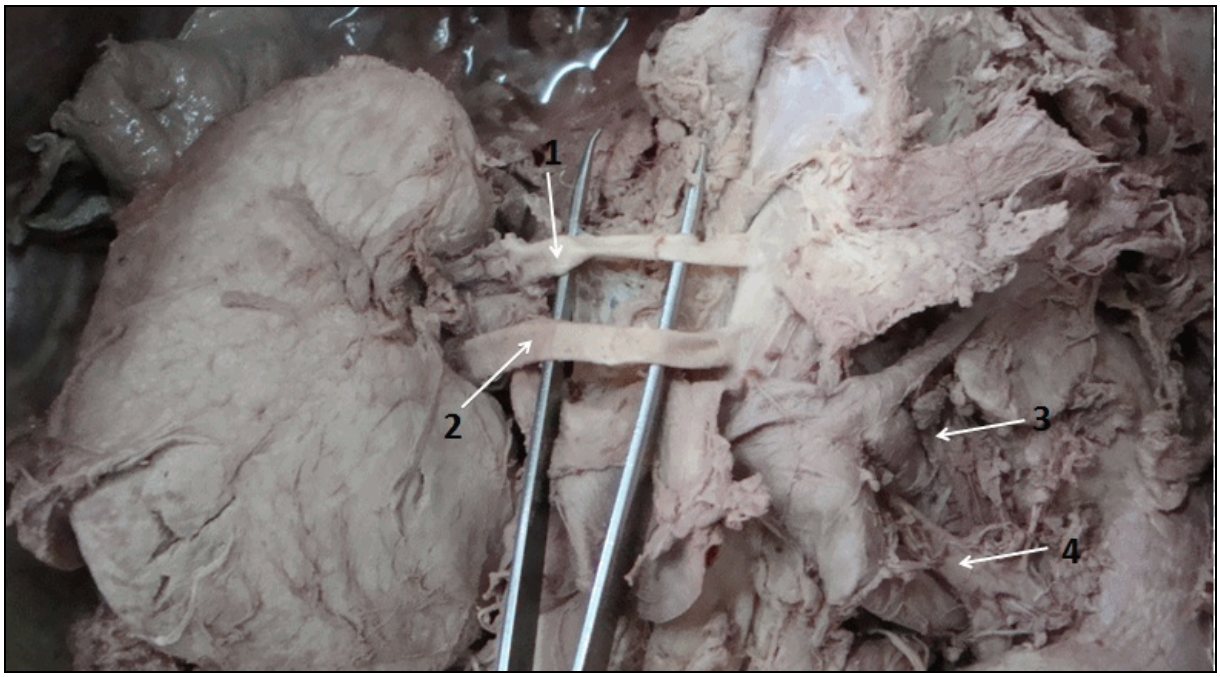

Figure 1- It shows double renal arteries. **1**: Right superior renal artery, 2: Right inferior renal artery, 3: Left superior renal artery, 4: Left inferior renal artery.

CASE REPORT

During routine dissection at the Department of Human Anatomy, College of Medicine and Health Science, Hawassa University, we observed the presence of bilateral duplication of renal vessels; there were double renal arteries on each side in a middle-aged male, formalin-fixed cadaver of indigenous Ethiopian descent.

On the right side, the two renal arteries, one superior and one inferior arose from abdominal aorta. The superior artery arose just above the origin of superior mesenteric artery while the right inferior renal artery arose about 1cm below the origin of superior mesenteric artery (Figure 1). Then they passed laterally and parallel to each other towards the renal hilum, behind the renal vein. In the renal hilum, each artery further divided into two branches. The right superior renal artery was about 45 mm long before branching and had an average diameter of 5 mm. The right inferior renal artery was about 40 mm long before branching and the diameter is 5 mm.

On the left side also there were two renal arteries both arose from the abdominal aorta below the origin of superior mesenteric artery. The superior left renal artery arose about 1 cm above the origin of the inferior left renal artery. Then they passed laterally and parallel to each other towards the renal hilum, behind the renal vein. In the renal hilum, they further divided into two branches (segmental branches). The left superior renal artery was about 3.3 mm long before branching and had an average diameter of 6 mm. The right inferior renal artery was 4 mm long and the diameter was 4 mm.

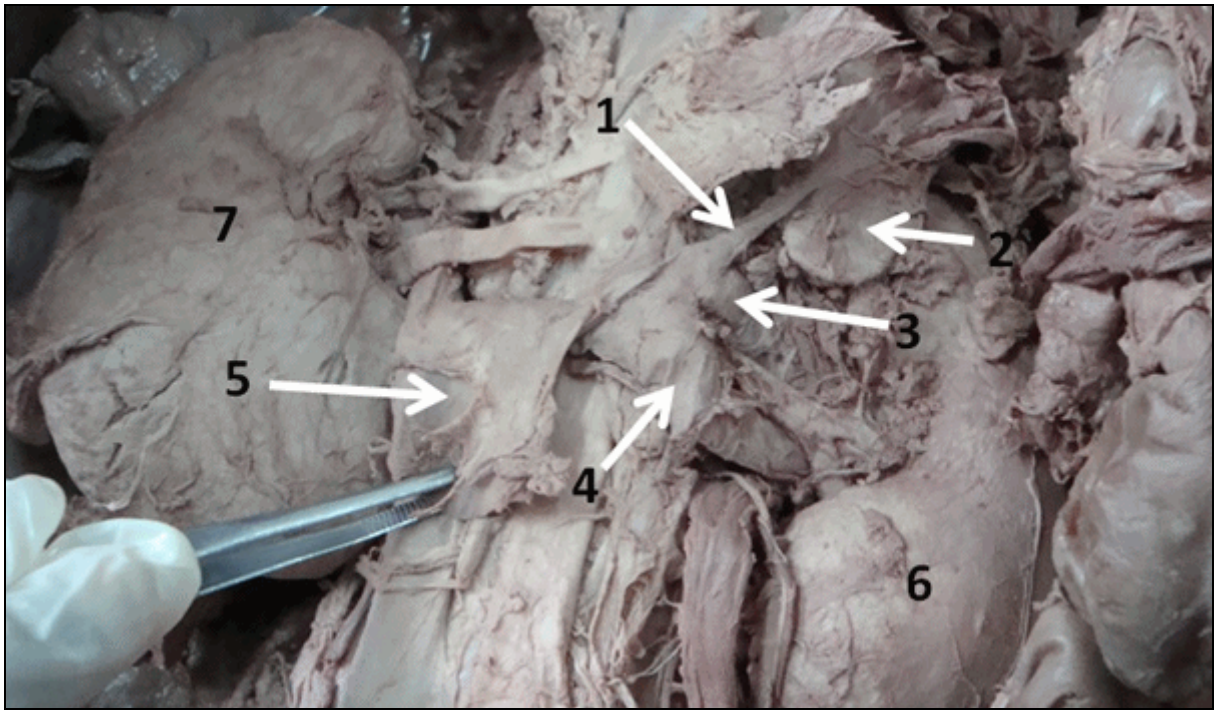

Figure 2- It shows kidneys and variant left renal vein. **1**: Left supra renal vein, **2**: Left suprarenal gland, **3**: Left superior renal vein, **4**: Left inferior renal vein, **5**: Inferior vena cava, **6**: Left Kidney, **7**: Right kidney.

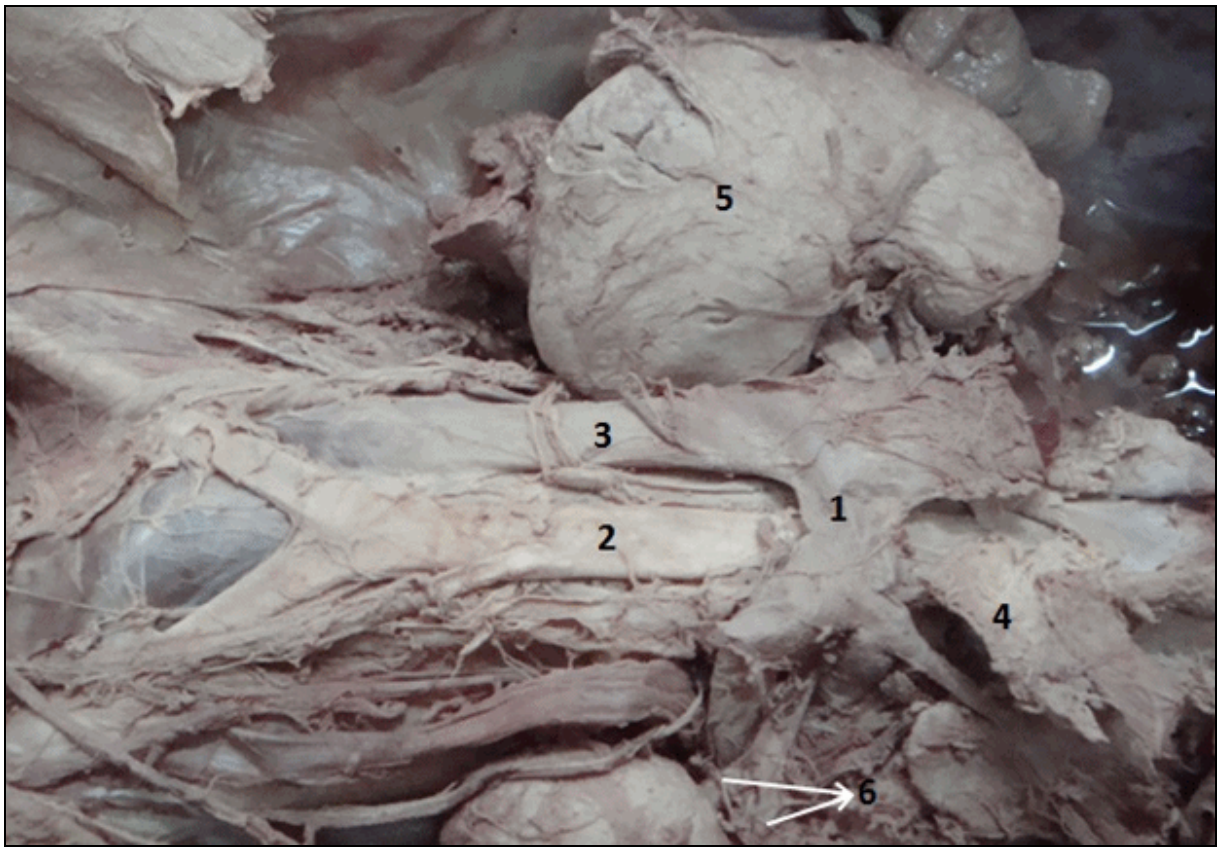

Figure 3- It shows the branching of renal arteries before entering the hilum. **1**: Left renal vein, **2**: Abdominal aorta, **3**: Inferior vena cava, **4**: Superior mesenteric artery, **5**: Right Kidney, **6**: Branched left inferior renal artery.

We also observed unilateral double renal veins. On the left side, there were superior and inferior renal veins which emerged from the respective parts of the hilum of kidney. They ran medially, parallel to each other and after a short course the superior renal vein joined with the inferior and finally drained into inferior vena cava. The superior left renal vein, received the left suprarenal vein where as the inferior renal vein received the left testicular vein (Figures 2 and 3).

DISCUSSION

Renal vasculature variations are quite common. The variations in the renal vessels are mainly due to various developmental positions of the kidney (Moore and Persaud, 2008). During the early stages of development of the kidneys, the renal arteries are branches of the common iliac arteries. Later on, the kidneys receive their blood supply from the distal end of the aorta. When the kidneys are positioned at a higher level during ascent of kidney, they receive new branches from the aorta. Normally the caudal branches of the renal vessels undergo involution and disappear. The position of the kidneys becomes fixed when they come into contact with the suprarenal glands in the ninth week of development. The kidneys receive their most cranial arterial branches from the abdominal aorta and finally these branches will become the permanent renal arteries (Moore and Persaud, 2008). Occasionally, the caudal renal arteries will not undergo involution as a result of which accessory renal artery arises. Accessory renal arteries are seen in 30% of individuals, and usually arise from the aorta above or below (most commonly below) the main renal artery and follow it to the renal hilum (Susan, 2008). Peter et al (2013) studied 302 CT scans to evaluate the presence of accessory renal arteries in Caribbean population and found that accessory renal arteries were present in 36.1% of the CT scans out of that 23.5% of patients are with accessory arteries on the left and 17.9% had them on the right. Of these 14.7% patients had bilateral accessory renal arteries.

Khamanarong et al (2004) conducted a study in 267 Thai cadavers and observed a single hilar artery in 82% of cases, 17% double renal arteries and 1% of triple renal arteries. Saritha et al (2013) studied 50 kidneys from 25 formalin fixed cadaver and observed the presence of multiple renal arteries in 3 cadavers out of that bilaterally accessory renal arteries were found in 8% of the kidneys (4 kidneys). An angiographic study of renal vasculature in 855 consecutive patients by Ugur et al (2006) reveled that of all the extra renal arteries present in their patients, the percentage of accessory and aberrant renal arteries were 49% and 51%, respectively. Jigna et al (2012) observed presence of an accessory renal artery on the right kidney in 6.6% of the studied cases and on the left kidney in 13.3% of the studied cases.

Even though transplantation of kidney with single renal artery is technically feasible than the one with multiple renal arteries, allograft with multiple renal arteries can be used successfully in kidney transplantation (Makiyama et al, 2003). In kidney allograft with multiple renal arteries, the rate of late renal artery stenosis was higher but the results of kidney transplants using allograft with multiple versus single arteries are similar (Benedetti et al. 1995). Hence, the awareness about these vascular variations is important in surgical aspects like renal transplantation. They are also useful for radiologists in renal angiographic studies and interpretation of angiograms. Knowledge of this duplication of renal vessels prevents the inadvertent damage to them during renal surgeries especially in transplantation.

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