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Evaluation of a Fused Supernumerary Kidney Using MDCT: A Rare Case Report

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Abstract: *One of the rarest congenital anomaly of the urinary tract is fused supernumerary kidneys. Worldwide reported incidence of such an anomaly is less than 100 cases. The following case report a right sided fused supernumerary kidney, that was diagnosed in 36 years old female patient using triple phased 64-slice multi-detected computed tomography (MDCT). MDCT examination shows separate renal arteries supplying each of right kidney and multiple renal veins, which form common trunk, to drain into the inferior vena cava.*

Key Words: *Congenital anomaly, Multi Detector Computed Tomography, Renal, Supernumerary kidney, Urinary tract.*

I. Case Report

A 36 year old female patient reported with a presenting complaint of vague abdominal pain since two years. Other haematological and biochemical investigations carried out were within normal limits.

A tri-phasic 64-slice multi-detector computed tomography (MDCT) performed with intravenous contrast administration with the following scanning parameters: 0.6 mm collimation, 5 mm slice thickness, 1.5 mm increment, 120 kV, 150 mAs, and a pitch of 1.2. Intravenous contrast material was administered through a catheter in the right cephalic vein. It was injected at a flow rate of 2.5 ml/second applying an automatic injector. MDCT showed normal left kidney measuring 11.6 x 4.7 Cms. The shape and location were normal with a good concentration and prompt excretion of contrast. Two right kidneys could be observed which were partially fused with each other by a parenchymal bridge. The cranially located kidney measured 8.8 x 4.0 Cms and caudally located kidney measured 6.6 x 3.0 Cms. The caudally placed kidney was malrotated with its hilum facing laterally. (Figure 1 A & B)

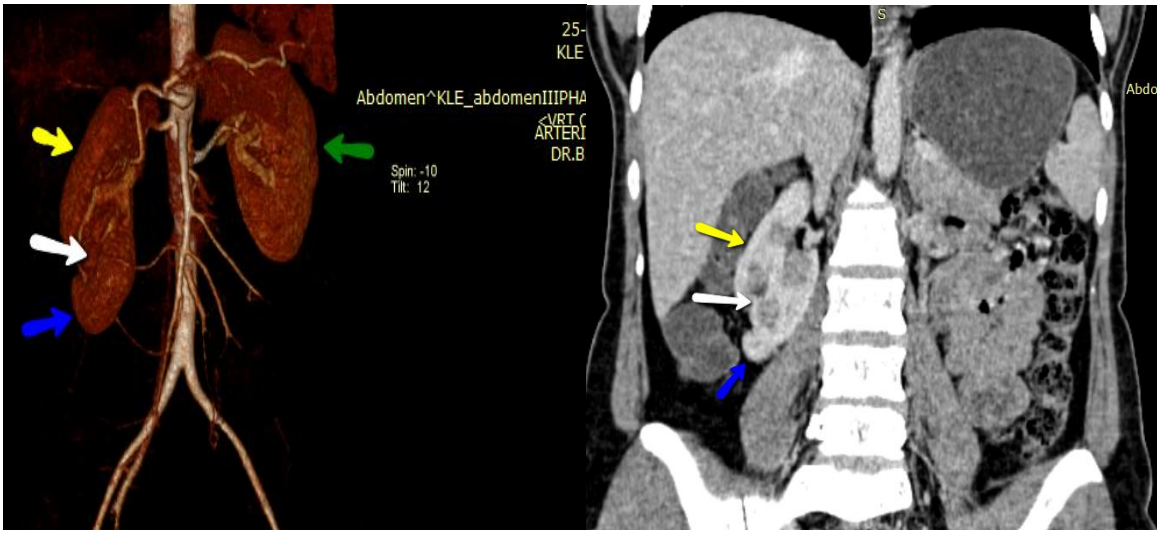

Figure 1(A) **Figure 1(B)**

Figure 1(A & B): Images of a 36 year old female with a complaint of vague abdominal pain since two years. Triphasic 64- slice MDCT with intravenous contrast administration, 3-D volume rendering image of arterial phase(A) & contrast image(B) showing normal left kidney (green arrow in Figure 1A) and two right kidneys. The cranially placed kidney (yellow arrow in Figure 1A & 1B) and the caudally placed kidney, which is malrotated(blue arrow in Figure 1A & 1B) appear fused by a parenchymal lining (white arrow in Figure 1A & 1B).

Three separate main renal arteries can be demonstrated which supply the fused right kidney. A branch of the abdominal aorta provided arterial supply to the cranially placed kidney, whereas two other arteries arising from the abdominal aorta supplied the caudally placed kidney. The left kidney received its arterial supply from another branch of the abdominal aorta. (Figure 2)

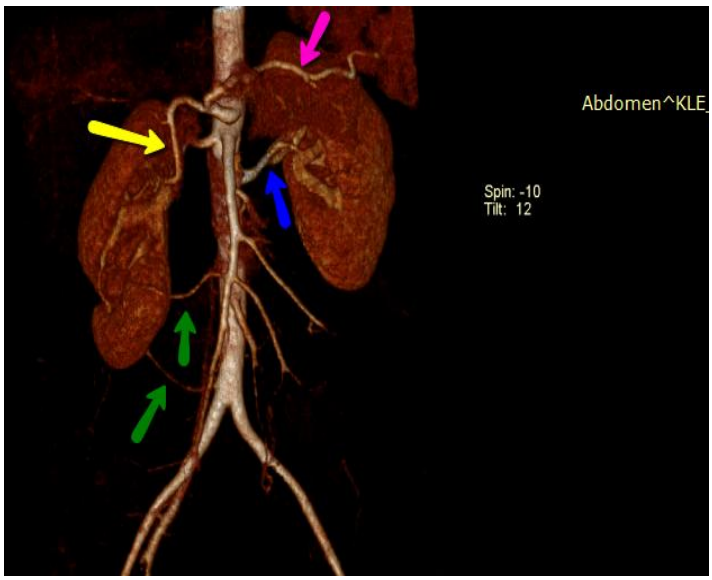

Figure 2: Triphasic 64- slice MDCT with intravenous contrast administration, 3-D volume rendering image of arterial phase shows a branch of abdominal aorta (yellow arrow) supplying cranially placed right kidney. Two branches (green arrows) arising from abdominal aorta supplying the caudally placed right kidney can be appreciated. Left kidney received its arterial supply from a branch of abdominal aorta (blue arrow). Splenic artery (pink arrow) is also visible.

The cranially placed kidney on right side drained through one renal vein and caudally placed kidney on right side drained through another renal vein. These veins in turn formed a common trunk and drained into the inferior vena cava. The left kidney drained through single renal vein(Figure 3 A & B).

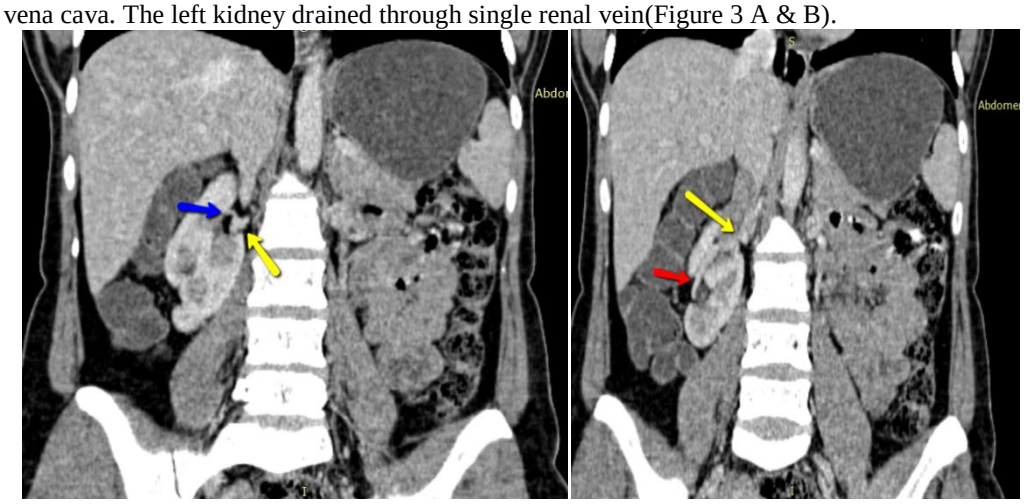

Figure 3(A) **Figure 3(B)**

Figure 3 (A & B): 36 year old female with vague abdominal pain since two years. Triphasic 64- slice MDCT with intravenous contrast administration, venous phase shows two renal veins, one renal vein(blue arrow in Figure 3A) arising from the cranially located right kidney and the other renal vein(red arrow in Figure 3B) from caudally located right kidney. Both drain into a common trunk(yellow arrow in Figure A & B) before joining inferior vena cava.

On excretory phase, contrast excretion was seen normally by both the kidneys with no delay in excretion of contrast. The ureter from the cranially placed kidney on right side passed anteriorly and joined the pelvis of the caudally placed kidney, which is also passed anteriorly, at the pelviureter junction to form a single ureter. (Figure 4 A & B)

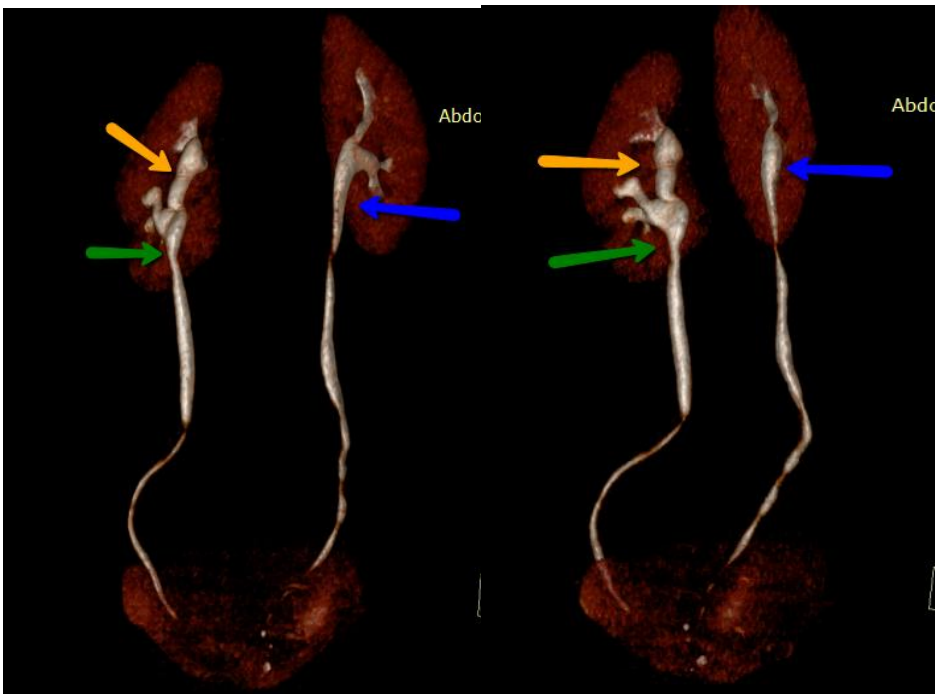

Figure 4(A) **Figure 4(B)**

Figure 4 (A & B): Triphasic 64- slice MDCT with intravenous contrast administration, 3-D volume rendering image of excretory phase showed that the ureter(yellow arrow) from the cranially placed kidney on right side passed anteriorly and joined the pelvis of the caudally placed kidney, which is also passed anteriorly, at the pelviureter junction to form a single ureter(green arrow). Left pelvicalyceal system and ureter(blue arrow) originate normally.

There was no obvious evidence of dilatation of pelvicalyceal system seen on either sides. The pelvicalyceal system of cranially placed kidney on right side was located normally. The pelvicalyceal system of caudally placed kidney on right side faced anteriorly. Right pelvicalyceal system and left ureter did not show any anatomical variation. Vesicoureteric junctions on both sides appear normal. Urinary bladder appeared normal.

II. Discussion

Supernumerary kidney is among the rare congenital anomalies of the urinary system[1,2,3]. Worldwide incidence of less than 100 cases has been reported. Embryologically, several theories to explain the occurrence of a supernumerary kidney: a) bifurcation of the ureteral bud with independent penetration of the buds in the metanephrogenic blastema that develop and divide in two kidneys; b) two independent ureteral buds that penetrate the metanephrogenic blastema that divides in two and c) fragmentation of the metanephrogenic blastema due to linear infarcts[4].

Usually a supernumerary kidney is small in size and located caudally to the ipsilateral normal kidney. It is encountered more frequently on left side of the abdomen[5]. More often, a bifid ureter is present with a caudally located supernumerary kidney[5]. In cases where the supernumerary kidney is present cranially, two separate ureters are seen which may ectopically enter into the urinary bladder or vagina[5]. Under such circumstances, the presenting complaints of the patient may include urinary incontinence. At times, associated pathologies such as hydronephrosis, pyelonephrosis, pyonephrosis, renal calculi and carcinoma may accompany such an anomaly[6,7].

An important differential diagnosis to a supernumerary kidney is a duplex kidney which is more often encountered. Duplex kidneys have two pelvicalyceal systems that are associated with a single or double ureter. The supernumerary kidney is considered to be an accessory organ with a separate arterial supply, venous drainage, collecting system and distinct encapsulated tissue. It may be totally separate from the normal kidney or connected to it by loose areolar tissue acting as a bridge between the two kidney[5].

Other anomalies that may be associated with supernumerary kidneys include urethral atresia, vaginal atresia, horseshoe kidney, duplication of urethra and penis with ectopic opening into the vagina or introitus, imperforated anus, ventricular septal defects, meningomyelocele and coarctation of aorta[8,9,10].

Diagnosis of supernumerary kidney can be accomplished using intravenous pyelography, ultrasonography, nuclear scintigraphy, CT and MRI. Treatment of supernumerary kidney depends on symptoms

and function of kidney. If no symptoms are present, no treatment is required. If kidney is non-functional or diseased than nephrectomy is the treatment of choice[7,9].

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