

Pelvic kidney in organ donation: case study

An ectopic kidney is a rare congenital anomaly that occurs when the kidney fails to ascend to its normal position. Often an ectopic kidney is asymptomatic and the kidney is an unexpected finding during organ recovery. The kidney described in this case report had normal function and could have been used for transplantation, if it had been recovered without 2 renal arteries being damaged because of anatomic variation. The renal vasculature in this type of abnormality usually ascends from the iliac vessels, and this variation in anatomy should be taken into consideration by the recovering surgeon during arterial cannulation for organ flushing. (*Progress in Transplantation*. 2009;19:362-364)

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An ectopic or pelvic kidney is a congenital anomaly that occurs when the kidney fails to ascend to its normal position in the renal fossa to meet the adrenal gland. Because of incomplete rotation, the ectopic kidney has a flattened shape and is also referred to as a pancake kidney, cake kidney, or lamp kidney.^{1,4} Often the pelvic kidney is asymptomatic and the anomaly is found during an autopsy.⁴ In the case described here, the ectopic kidney was found during organ recovery for transplantation.

Case Study

A 64-year-old white woman complained of a headache and was found unresponsive by her daughter several hours later. Emergency medical services were summoned and intubated the patient and brought her to the emergency department at a local hospital. As part of her evaluation, she received a computed tomography scan of the head, which revealed a massive intracranial hemorrhage with extension into the fourth ventricle. The patient was then transferred to a tertiary care hospital for advanced care. Upon arrival at the tertiary care hospital, the patient was seen by a neurosurgeon. A ventriculostomy was performed, and mannitol therapy was initiated. Despite these measures, the patient remained areflexic and unresponsive. On the next day, the patient was evaluated according to the hospital's

protocol for brain death and declared brain dead. The hospital referred the patient to the organ procurement organization as a possible donor. The family was approached and provided consent for donation of all solid organs and tissues.

The patient's medical history included multiple sclerosis (patient had been receiving interferon treatment), hypertension, and a fracture of the left ankle 1 year prior. The laboratory profile revealed an initial creatinine level of 0.9 mg/dL, peak 1.5 mg/dL, and terminal 1.3 mg/dL (to convert to micromoles per liter, multiply by 88.4). Results of urinalysis were within normal limits. During the surgical recovery of donor organs, the right kidney was in the normal position and normal in size (length 12 cm, width 7 cm, depth 4 cm), but the left kidney was small (length 8 cm, width 4.5 cm, depth 2.5 cm) and located in the left pelvic fossa without an adrenal gland. The left kidney's 4 arteries derived from the lower portion of the aorta and the left iliac artery. Two arteries were damaged during recovery. The kidneys' 2 veins were derived from the iliac vein. The kidney was flat without a renal pelvis (Figure, A). Instead of forming the renal pelvis, every renal pyramid resulted in a "primary" ureter and these 5 "primary" ureters came together to form a very short main ureter (Figure, B).

The left kidney was recovered, and the main renal artery was cannulated with a 7 × 20 seal ring cannula

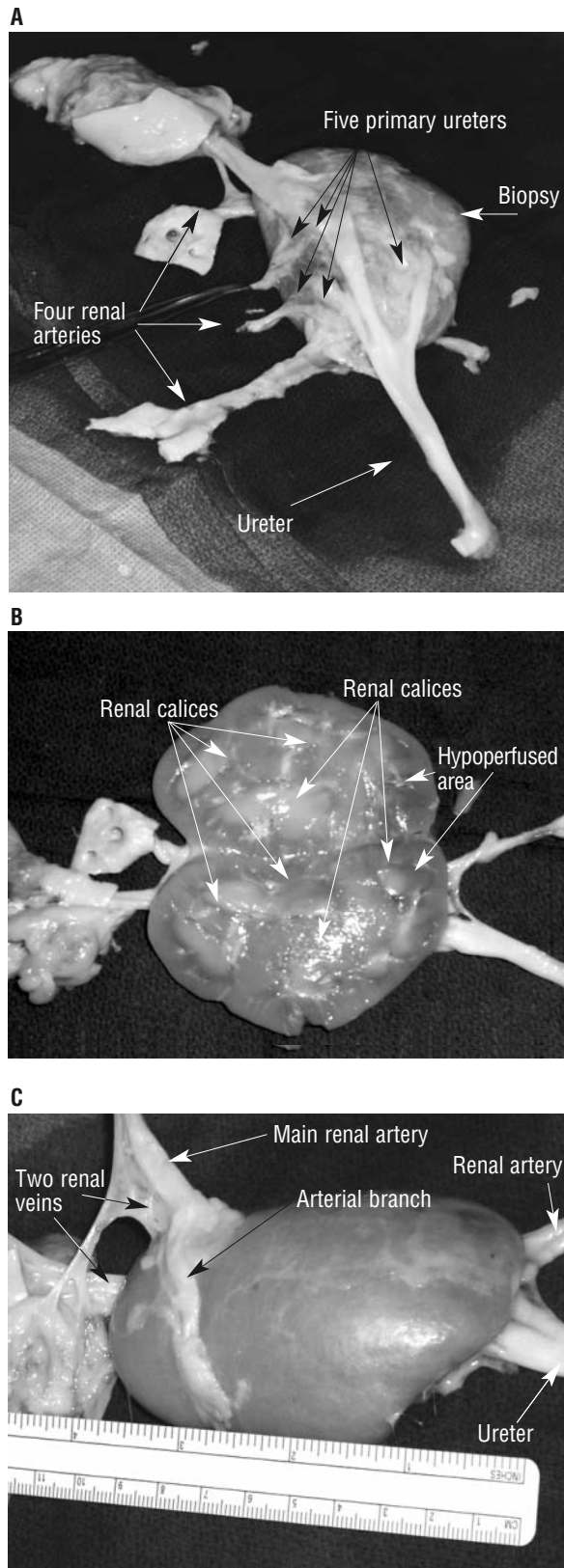


Figure A, Kidney is flat with no renal pelvis. B, Every renal pyramid results in a “primary” ureter and these 5 “primary” ureters come together to form a very short main ureter. C, Main artery has a branch that crosses kidney and enters on the opposite part of the dorsal side.

to start renal perfusion. After the kidney was delivered to the organ procurement organization’s organ perfusion laboratory, the kidney anatomy was reevaluated. Because of the surgical damage of the 2 small arteries during organ recovery, the lower lobe of the kidney was hypoperfused, and the kidney was not acceptable for transplantation. The length of the main artery coming into the kidney was 5 cm and the diameter was 6 mm. Instead of forming the vascular pedicle of the kidney, the main artery and vein came to the kidney from opposite sides of the kidney. The main artery had a branch that crossed the kidney and entered on the opposite part of the dorsal side (Figure, C). A wedge biopsy of the 2 kidneys yielded normal findings.

Evaluation of the fresh frozen biopsy specimen of the kidney showed zero obsolete glomeruli out of 30 in the sample. No tubular interstitial scarring or intimal fibrous narrowing was found.

Discussion

According to published reports, the main characteristics of the congenital anomaly of an ectopic kidney are as follows: (1) Blood vessels are derived from the distal aorta and iliac artery, with the venous anatomy also varying. (2) The kidney is usually smaller, flattened, and incompletely rotated. (3) The kidney often has a short ureter and defective ureteral drainage.^{1,4} Renal ectopy has a reported frequency of between 1 in 500 and 1 in 1200 cases, and 1 normal and 1 pelvic kidney has a reported frequency of 1 in 3000 cases.⁴ However, in a recent epidemiological study,⁵ researchers described a higher frequency of renal ectopy in Kenya, where an ultrasound survey of 3118 people showed renal ectopy in 11 cases (0.35%). A retrospective study⁶ of 1650 aortic procedures showed 8 pelvic kidneys found during aortic surgeries (0.48%).

Because of the incomplete rotation of the ectopic kidney, the renal pelvis usually is not fully developed. However, we were unable to find any reports of a case similar to ours, with the complete absence of the renal pelvis and the presence of 5 “primary” ureters, each originating from a separate calyx and then forming the short “common” ureter below the kidney. Normally, the renal calices are oriented toward the renal pelvis. In our case, the orientation of the renal calices was chaotic, with the only similarity being that all 5 calices were drained by 5 “primary” ureters coming out on the same side of the kidney (Figure, B). It is also very unusual for the main artery and main vein to enter the kidney on opposite sides, instead of forming the kidney’s vascular pedicle (Figure, A and C).

Several published cases^{2,3,7,8} describe use of an ectopic kidney in living related kidney transplantation and in deceased donor transplantation. In our case, the ectopic kidney’s biopsy did not reveal any morphological changes. If the presence of the ectopic kidney

with its specifics of vascular anatomy had been diagnosed before organ perfusion, the left iliac artery could have been catheterized to flush the left kidney completely.

Because of the presence of a hypoperfused area in the lower pole of the kidney, this organ was not used for transplantation. The hypoperfusion was the result of standard aortic organ perfusion without recognition of the specifics of the vascular anatomy of the ectopic kidney, as well as damage of 2 lower pole arteries derived from the left iliac artery. As a result, the backtable flushing of the left (ectopic) kidney was not effective. Had the arteries of the kidney been identified during recovery, it is possible the ectopic kidney might have been usable as a transplant graft.

Summary

The recovering surgeon should evaluate the kidneys' position and shape before inserting the aortic cannula. If renal abnormalities such as an ectopic kidney or a horseshoe kidney are found, renal arteries might be ascending from iliac arteries and should not be perfused with a cannula inserted in the distal part of the abdominal aorta. The surgeon may cannulate the femoral

artery on the appropriate side or, in addition to the aorta, cannulate the iliac artery distal to the ascending renal artery or arteries to perfuse the kidney.

Financial Disclosures

None reported.

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