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Fig. 1a Transverse US scan of the abdomen taken at the right paraumbilical region.



Fig. 2a IVU film taken at 5 minutes.

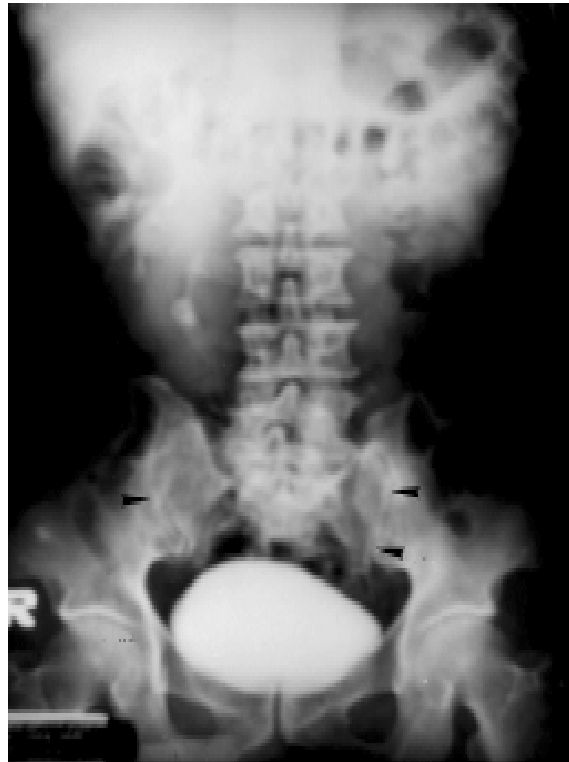


Fig. 2b IVU film taken at 1 hour.

### CASE PRESENTATION

A 62-year-old man presented with haematemesis of 8 hours duration. He also had melena but no abdominal pain. He had a past history of peptic ulcer disease. Physical examination revealed pallor, blood pressure of 130/70 mm Hg and pulse rate of 100/minute. His abdomen was soft and non-tender. There was a 15cm firm, non-tender mass at the right paraumbilical region. His initial haemoglobin was 7.3 g/dL. Gastric lavage showed no active bleeding. Gastroduodenoscopic examination revealed deformity of the duodenal bulb. Ultrasonography (US) was performed to investigate the palpable mass. Intravenous urography (IVU) was subsequently performed to better delineate the mass lesion. What do the US scan (Fig. 1) and IVU (Fig. 2a-b) show? What is the diagnosis?

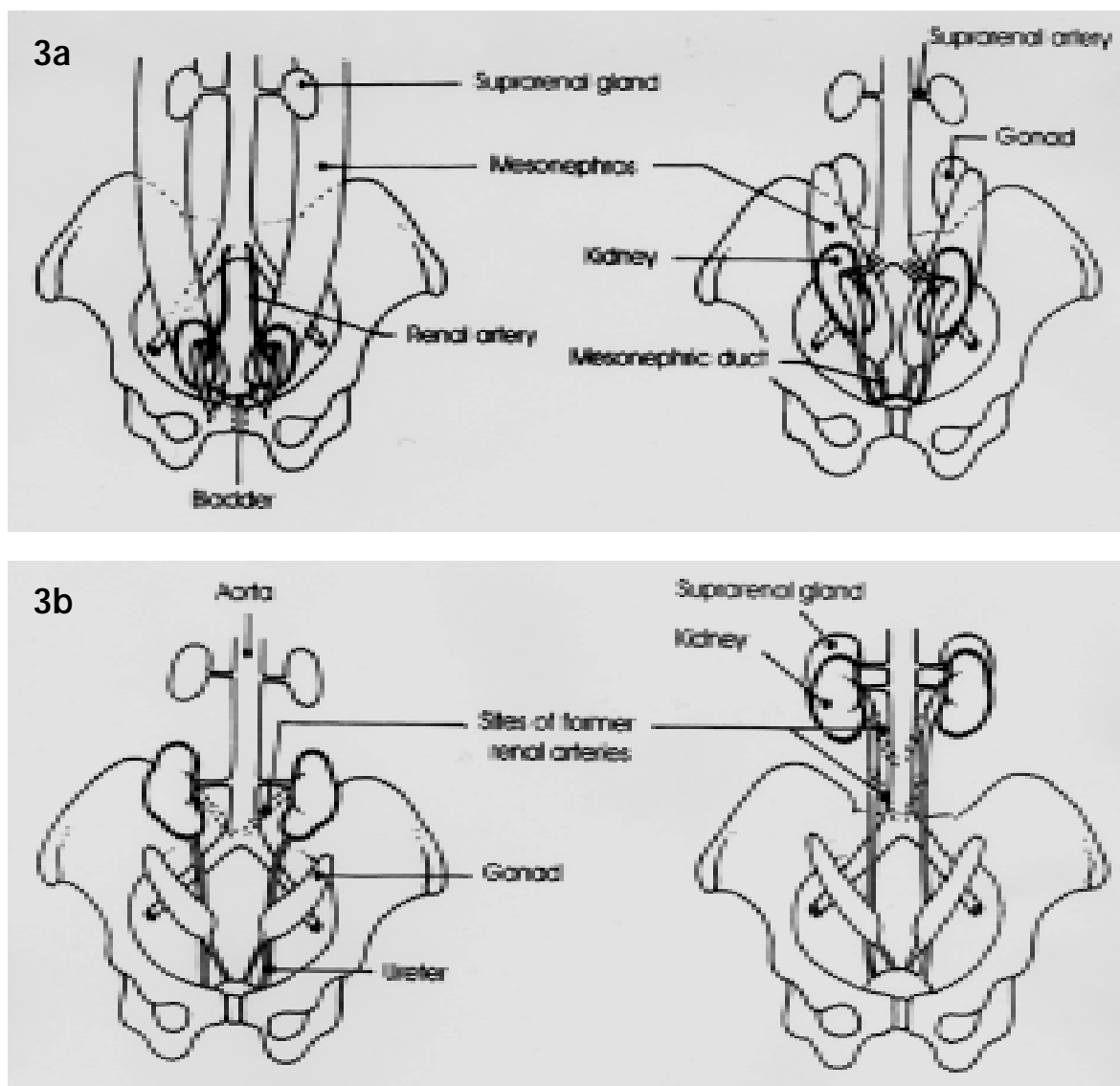
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**Fig. 3a-b** Diagrams showing caudal-to-cranial ascent of the kidneys from the pelvis to the abdomen during the 6th to 9th weeks of development. (a) The kidneys ascent relative to growth of the embryo's body. The mesonephros regresses gradually. (b) During ascent, the kidneys are supplied by successively-cranial arterial branches. By the 9th week, the renal hila have rotated anteromedially.

#### IMAGE INTERPRETATION

US scan (Fig. 1) shows an oval hypoechoic mass with central hyperechogenicity, typical of a kidney. IVU demonstrates that the left kidney is ectopic. It is located in the lower abdomen, crosses the midline at the lower lumbar level, and fuses with the lower pole of the right kidney (Fig. 2a). The right renal pelvis is ventrolateral in position, reflecting failure of medial rotation. Both lower ureters (arrowheads) enter the bladder in their normal position (Fig. 2b).

#### DIAGNOSIS

Crossed-fused renal ectopia.

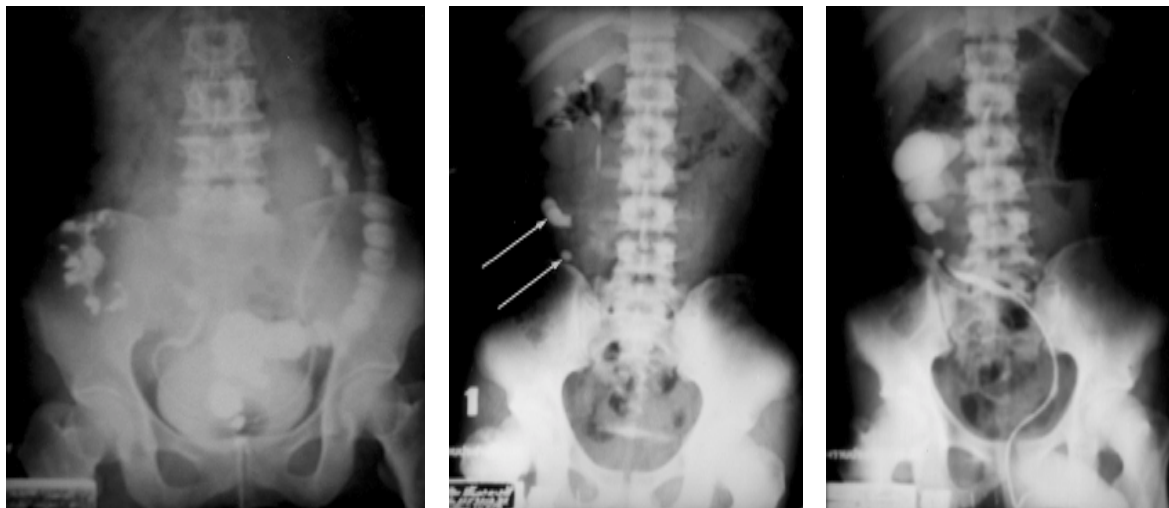
#### CLINICAL COURSE

The patient's bleeding settled with symptomatic treatment. Urine analysis and blood creatinine were normal. The patient was informed that he had a renal

anomaly with normal renal function. No further treatment was required.

#### DISCUSSION

Abnormalities of the kidney and /or urinary tract are more common in male than female patients. The autopsy incidence of renal ectopia is 5.9%<sup>(1)</sup>. In renal ectopia, the affected kidney is abnormal in position, either lower or higher than the normal site. The anomaly results from abnormal caudal-to-cranial ascent of the kidney. Initially, the kidneys lie close together in the pelvis, anterior to the sacrum and with the hila directed anteriorly. With growth, the kidneys gradually ascend to lie in the abdomen and separate away from the midline. They attain their adult position adjacent to the adrenal gland by the ninth week. As the kidneys ascend, they rotate almost 90 degrees so that the hila are eventually directed anteromedially (Fig. 3a-b). Underascend is more



**Fig. 4** Patient with bilateral underascended kidneys. Bilateral retrograde pyelograms show a right pelvic kidney and a left lower abdominal kidney. The length of both ureters is appropriate to their renal positions. There is residual barium in the colon from a previous barium enema.

**Fig. 5** Patient with stone formation complicating an ectopic left kidney. (a) IVU shows contrast excretion by the right kidney and no visualisation of the left kidney. There are stones (arrows) located inferior to the right kidney. (b) Left retrograde pyelogram shows the left ureter crossing the midline at the sacral region to the right side. There is hydronephrosis in the malrotated ectopic left kidney, due to stone obstruction, and upper ureteric stones.

common than overascend. Hence, ectopic kidneys are most often found in the pelvis or lower abdomen (Fig. 4). The overascended kidney or intrathoracic kidney lies cranial to its normal expected position. The affected kidney remains subdiaphragmatic in location. However, its high position may lead to focal eventration of the diaphragm overlying the kidney, and may mimic a supradiaphragmatic renal position<sup>(2)</sup>. Pelvic kidneys are usually relatively small and irregular in shape, have a variable degree of rotation, and may fuse to form a discoid or pancake kidney<sup>(3)</sup>. The length of the ureter is appropriate to the position of the kidney, an important point in differentiation between true ectopia and nephrotosis (Figs. 2,4).

During ascent, the ureteric bud may cross the midline and encounter the contralateral kidney. This is known as crossed ectopia. (The renal tissue in crossed ectopia is usually fused, and known as crossed-fused ectopia, similar to the present case). In most cases, the fusion is between the lower pole of the orthotopic kidney and the upper pole of the ectopic kidney. It is more common for the left kidney to cross the midline to lie on the right side. Blood supply to the ectopic kidneys usually arises from the major adjacent blood vessels, and they are often supplied by multiple vessels. As the kidneys ascend from the pelvis to abdomen, they receive blood supply from vessels that are close to them. While in the pelvis, they receive blood supply from the common iliac arteries. When they reach a higher level, they receive new branches from the aorta. The inferior branches undergo evolution and disappear (Fig. 3b).

Many renal anomalies are incidental findings. Ectopia kidneys are prone to trauma, particularly if they

are located anterior to the spine. As in our patient, an ectopic kidney may present as a palpable abdominal or pelvic mass. The patient may present with signs and symptoms of urinary tract obstruction due to passage of the ureter anterior to the lower pole in renal ectopia<sup>(2)</sup>. The ectopic kidney is associated with an increased incidence of stone formation as a result of stasis caused by the altered geometry of urinary drainage. Patients with crossed-fused renal ectopia are usually asymptomatic. However, they may have increased susceptibility to develop complications seen in other forms of ectopic kidneys (Fig. 5). Imaging is useful in the detection of renal ectopia and its complications.

#### REFERENCES

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#### ABSTRACT

**A 62-year-old man was incidentally found to have a palpable right paraumbilical mass. Ultrasonography and intravenous urogram showed cross-fused renal ectopia. The embryology and clinical features of renal ectopia are discussed.**

**Keywords:** congenital renal anomaly, ectopic kidney, intravenous urography.