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Case Report

Blunt trauma of unilateral intraperitoneal kidney: A case report

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ABSTRACT

The kidney is located and fixed with Gerota's fascia in the retroperitoneal space and is surrounded by a fat pad that acts as a shock absorber in the normal anatomy; however, the kidney becomes more vulnerable to external shock when it is located intraperitoneally. Bleeding from an injury may advance to hemoperitoneum and unstable hemodynamics may develop, requiring emergency surgery. Although various anatomical variations of the kidney have been reported, to our knowledge, an intraperitoneal kidney has never been reported previously except for one case in the world literature. This paper describes a successful nephrectomy of a unilateral intraperitoneal kidney in a 69-year-old woman who had grade IV laceration based on the renal injury scale of the American Association for the Surgery of Trauma with unstable hemodynamics after blunt trauma.

Introduction

The kidney is normally located and fixed with Gerota's fascia in the retroperitoneal space and is surrounded by a fat pad that acts as a shock absorber. When the kidney is located intraperitoneally, it becomes more vulnerable to external shock. In such cases, bleeding from the injury may advance to hemoperitoneum, and unstable hemodynamics may develop, requiring emergency surgery. Although anatomical variants, such as vascular variations of renal vessels [1, 2], ectopic pelvic kidney [3], and intrathoracic kidney [4, 5] have been reported, to our knowledge, an intraperitoneal kidney has never been previously reported except for one case [6] in the world literature. Herein, we report a successful nephrectomy of a unilateral intraperitoneal kidney with grade IV laceration based on the renal injury scale of the American Association for the Surgery of Trauma (AAST) after blunt trauma.

Case

A 69-year-old woman sustained blunt trauma from a pedestrian traffic accident. She had no medical history except subtotal gastrectomy for gastric cancer six years prior. On arrival, she was alert with a blood pressure of 104/68 mmHg, pulse rate of 95 beats/min, respiratory rate of 23/min, and hemoglobin level of 8.2 g/dL. Physical examination revealed tenderness on the abdomen and abdomen distension. Focused assessment with sonography for trauma showed intraabdominal fluid in the Morison pouch and splenorenal recess. Abdominal computed tomography (CT) scan revealed laceration of the right kidney, involving the calyx in the lower pole in accordance to grade IV of the AAST renal injury scale, and a surrounding perirenal hematoma similar to intraperitoneal bleeding, not retroperitoneal hematoma (Fig. 1A, B). The injury severity score was 26 with multiple rib fractures, pneumothorax requiring thoracostomy, grade I liver laceration, and skin laceration of the eyebrow.

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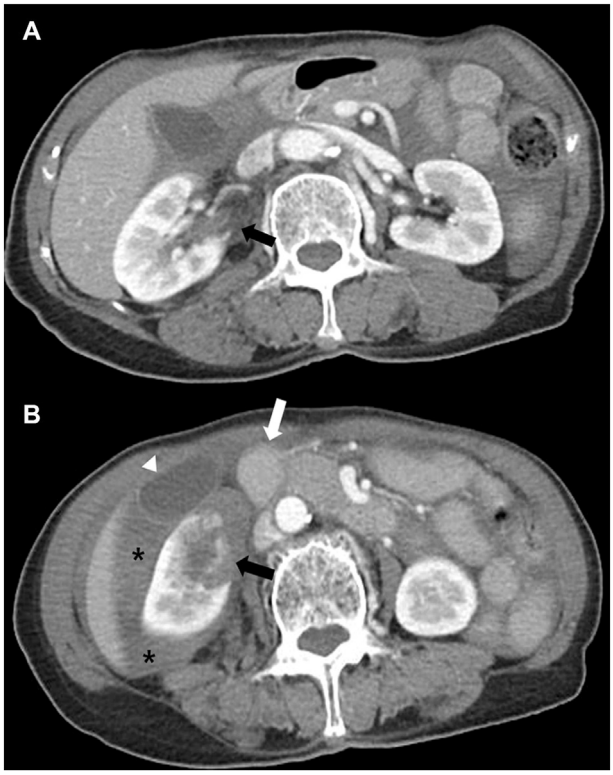

Fig. 1. Abdominal CT scan. (A) Right renal vein injury and laceration of the right were noted (black arrow). (B) Scan shows laceration of the right kidney, involving the calyx in the lower pole (black arrow) and perirenal hematoma boundless with hemoperitoneum (asterisks) (white arrow, duodenum; white arrow head, gallbladder).

She underwent emergency laparotomy because of aggravating abdomen distension and unstable hemodynamics. During the surgery, the right kidney was found to be an intraperitoneal organ that was lying free at the right of the duodenum and above the mesocolon of the transverse colon without perirenal fat tissues and Gerota's fascia (Fig. 2A). Furthermore, it had a laceration in the lower pole and renal vein injury with active bleeding into the intraperitoneal space. Right nephrectomy was completed only with ligation of hilar vessels and ureter, and without dissection of any underlying tissues or right-sided medial visceral rotation (Fig. 2B). The intraperitoneal kidney had anatomically normal renal vessels, renal pelvis, and ureter, but was shorter (8.5 cm). Laceration in the lower pole had involved the calyx (Fig. 3). The patient was discharged on postoperative day 23 without any complications.

Discussion

To our knowledge, an intraperitoneal kidney, an anatomical variant, has never been reported except for one case report [6]. The previously reported variation was discovered in a female Caucasian cadaver (deceased at 89 years from respiratory insufficiency), during routine educational dissection at the Medical School of the University of Athens. The left kidney was not covered by the parietal peritoneum in the front, which implied that the kidney was located in the intraperitoneal space.

During development, some organs are suspended initially in the abdominal cavity by a peritoneal fold and become secondarily retroperitoneal by fusing with the abdominal wall. In our case, the right kidney did not fuse but remained in the intraperitoneal space without a supporting fold, and was therefore completely mobile as Panagouli et al. described [6].

Increased mobility of the intraperitoneal position of the kidney may compromise its blood supply because the artery would “fold” in some position. In such circumstances, the growth of the kidney may be insufficient, and an additional polar renal artery might not degenerate [6]. Each kidney is typically 11 cm in length, whereas the left may be 1.5 cm longer than the right [7]. The kidney of the cadaver in Panagouli et al.'s study was 9.3 cm in length, with an additional left renal artery [6], whereas the length was 8.5 cm, 4 cm shorter than the normal, with normal vascular anatomy in our case.

An intraperitoneal kidney has several clinical implications. Because it is completely mobile, temporary hydronephrosis due to urinary flow obstruction may occur [6]. The approach to diagnostic or interventional procedures of the variant kidney may be different from that of the normal kidney, but the presence of a variant kidney is difficult to predict and can be overlooked. CT scan of the injury of the normal kidney shows crescent-shaped or retroperitoneum-confined perirenal hematoma, different from intraperitoneal hematoma [8], whereas the intraperitoneal kidney shows wide, ill-defined and totally encircling perirenal hematoma. The kidney is located and fixed with Gerota's fascia in the retroperitoneal space and is surrounded by a fat pad that acts as a shock

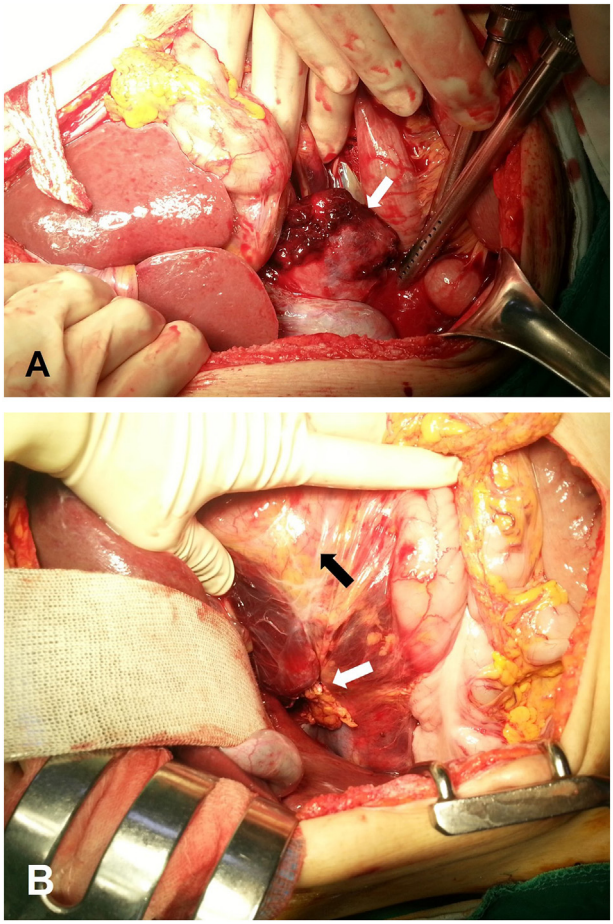

Fig. 2. Operative field shows that (A) the right kidney is lying free in the intraperitoneal space, and injury the lower pole is observed with active bleeding (white arrow), and (B) after right nephrectomy, ligation of the renal hilum is performed (white arrow) without dissection of any surrounding tissues (black arrow, duodenum).

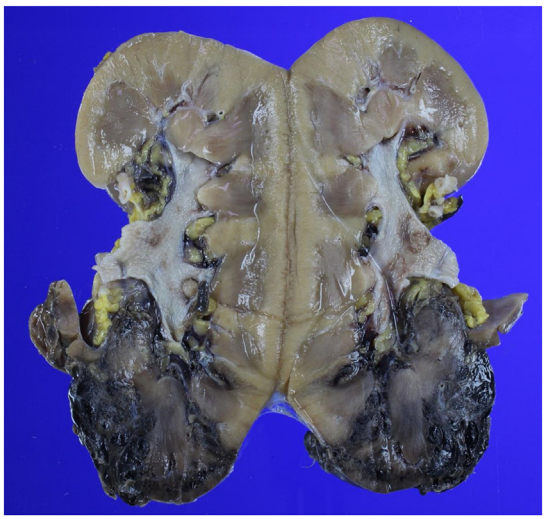

Fig. 3. Specimen of the intraperitoneal kidney shows parenchymal hematoma and laceration involving the calyx in the lower pole.

absorber in normal anatomy; however, an intraperitoneal kidney is more vulnerable to external shock. In such cases, bleeding from the injury may advance to hemoperitoneum, and unstable hemodynamics may develop, requiring emergency surgery. Renal vessels can be also prone to injury due to the increased mobility of the intraperitoneal kidney; therefore, performing nephrectomy was inevitable because of hemodynamically unstable status. If the location of the kidney was anatomically normal, the extent of the injury might not have caused hemoperitoneum with unstable hemodynamics and might have been managed with angiographic intervention or self-limited course because of mass effect of the retroperitoneal perirenal hematoma, as current standard care of AAST renal injury grade IV [9, 10]. The clinical features and treatment of traumatic injury to an intraperitoneal kidney were different compared with the injury to kidney with normal anatomy.

Although an intraperitoneal kidney is extremely rare, it should be considered if unstable hemodynamics and suspected imaging findings are present, as it requires aggressive surgical management.

Conflicts of interest statement

None of authors have a conflict of interest.

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