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Challenging case of horseshoe kidney double fracture

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ABSTRACT

INTRODUCTION: Renal injuries occur in 10% of blunt abdominal traumas, 7% of these occur in kidneys with congenital or acquired disorders. Trauma of horseshoe kidney is an uncommon finding.
PRESENTATION OF A CASE: We present the case of 31 year-old caucasian man with no remarkable personal records, who was brought to our Trauma Unit soon after being involved in a motorcycle collision. A Contrast Enhanced – Multi Detector Computed Tomography (ce-MDCT) revealed a double disconnection of a horseshoe kidney. The patient was not aware of bearing such abnormality.
DISCUSSION: Trauma of horseshoe kidney is an uncommon finding. The abdominal ce-MDCT scan is the diagnostic tool of choice since the renal anatomy, injury grading and vascular or urinary tract abnormalities are well depicted and easily identified. The conservative management of these injuries is associated with a lower rate of nephrectomies and kidney failure while selective *trans*-catheter renal embolization is a challenging treatment option. However surgery can be a treatment of choice and should be aimed to preserve renal function. Conclusion: the interest in our case lies in the rarity and particular anatomical aspect of such injuries and the implication related to its management in an emergency setting.

1. Introduction

Renal trauma is a well-known accepted cause of significant morbidity and mortality at trauma centers across the globe, despite kidneys are located in a relatively protected retroperitoneal position. Renal injuries occur in 10% of blunt abdominal traumas, 7% of these occurring in kidneys with congenital or acquired disorders. Horseshoe kidney is a congenital disorder of the kidney characterized by the fusion of both kidney lower poles arising at the time of renal spin rotation around the main axis, typically appearing between week 4 and 6 of pregnancy. The two kidneys are often joined by a fibrous or parenchymatous isthmus connecting the two renal poles. These anomalous kidneys may have normal function although they show important anatomical changes in their vascular network and sometimes serious urinary tract abnormalities. Horseshoe kidneys occur in 1 out of 400 people, it is more common in males (ratio 2:1) and it is sometimes associated with other different congenital disorders. Approximately 60% of the horseshoe kidney patients are asymptomatic and diagnosis is obtained as an incidental finding. In other cases, the most common symptom is related to recurring renal stones, UTI or hydronephrosis due to urinary tract obstruction. The increase of motor vehicle accidents and high speed collisions during the last 10 years, as well as the industrial and sport collisions and the soar of street violence and aggressiveness, increased renal trauma incidence in severe abdominal traumas. The particular anatomical aspect of the horseshoe kidney leads to an extreme vulnerability of such congenital condition in case of abdominal trauma; therefore, the correct and quick detection of this abnormality is needed in order to carry out a prompt and adequate treatment.

2. Case report

A white, 31 Y old male with no remarkable personal records, was brought to our Trauma Unit soon after he was involved in a motorcycle collision. His conditions were critical with hypovolemic shock due to haemorrage. Blood pressure was 80 over 50 mmHg, heart rate was 140 bpm with a GCS being 13. Lab tests revealed hemoglobin value of 14,5 g/dl, hematocrit of 42,3%, WBC count 9.700/mm^3, platelets count of 200.000/mm^3, creatinine of 1,2 mg/dl, urea of 25 mg/dl and prothrombin of 82%. He also presented with left humeral and peroneal fracture. Primary survey was carried out according to ATLS® approach with good response and he was then rushed to undergo total body CT scan. A Contrast

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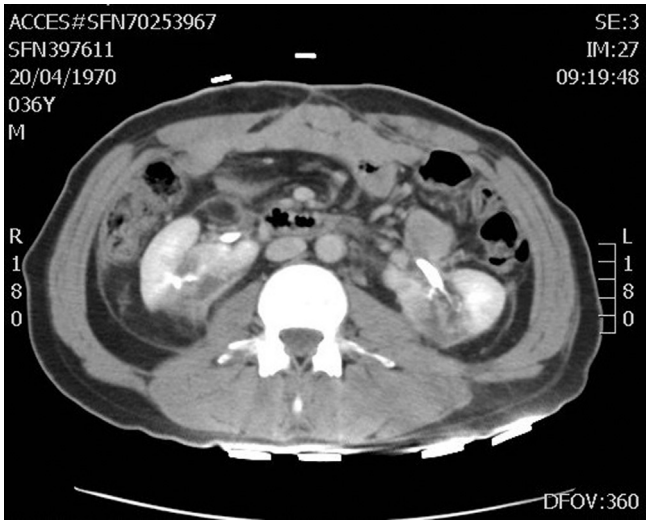

Fig. 1. Ce-MDCT of abdomen showing large left perirenal hematoma and active extravasation of contrast media consistent with active bleeding.

Enhanced – Multi Detector Computed Tomography (ce- MDCT) revealed a double disconnection of a horseshoe kidney with a massive retroperitoneal haematoma. The patient was not aware of bearing such abnormality. Trauma injuries were considered of grade IV according to the American Association for the Surgery with an ISS 16 of Trauma classification (Fig. 1). No other abdominal injuries were detected. In order to attend a conservative treatment the patient was sent to the Interventional Radiology Unit (IRU). The angiography performed confirmed a bilateral kidney transection with a retroperitoneal haematoma suspected evolving, with a selective peripheral/distal embolization resulting impossible due to either the anatomical abnormality, either the kidney malpositioning as compressed by the hematoma. A bilateral embolization of both renal arteries had to be carried out as a selective treatment was not possible. A *trans*-catheter embolization was not indicated because of the high risk chronic kidney failure. Also, a new CT scan revealed an increate in the hematoma volume indicating a high risk of imminent rupture (Fig. 2). Hemoglobin level dropped to 7, therefore the patient was taken immediately to the OR to undergo surgical laparotomy. The intraoperative findings included a quote of free abdominal fluid (400cc) and injury-free intraperitoneal organs. Nevertheless, the presence of a large fissuring retroperitoneal hematoma was confirmed. To achieve a successful retroperitoneal space exposure synchronous Cattel-Mattox (Left-to-right medial visceral rotation) and Cattel-Braasch (Right-to-left medial visceral rotation) maneuvers were performed. A complete bilateral disconnection of the middle segment of the horseshoe kidney was observed. Sutures of the injured renal segments were achieved without the need of a ureteral stenting deployment (Fig. 3). Three abdominal drainages were then placed, two perinephric and one in the pelvis. Two unit of packed red blood cell (PRC) were transfused. A temporary abdominal wall closure was carried out in order to prevent the onset of an abdominal compartment syndrome. Bone injuries were treated conservatively at the end of the abdominal surgery. Post – operative renal function was normal. On post-op day 14 the patient was discharged from hospital

Fig. 2. Abdominal aorta angiography and right and left renal artery selective angiography. Horseshoe kidney tear and discontinuation is very well depicted. Extravasation of contrast media on rupture sites is also shown.

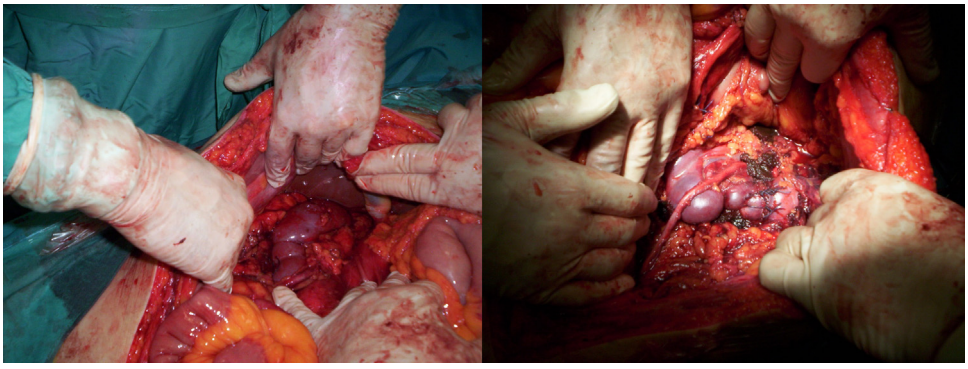

Fig. 3. Intraoperative findings. Right and left horseshoes kidney upper poles sutured. Note the left ureter well depicted in the middle of the figure.

and a definitive abdominal closure was scheduled to be performed three months later. No delayed complications were observed. U.S. and ce-MDCT follow-up were performed at 6 and 12 months both revealing normal anatomical findings. Abdominal MRI performed at a 3 year follow-up showed normal appearance of the horseshoe kidney.

3. Discussion

Patients with traumatic injuries of unsuspected horseshoe kidney are rarely observed [1]. Early recognition of such condition is crucial but sometimes could be very difficult. Motorcycle or car accidents, sports injuries, falls, and assaults are the main causes of blunt renal traumas [2]. Revised renal injury classification was described by the American Association for the Surgery of Trauma: grade 1, subcapsular hematoma; grade 2, laceration <1 cm in depth into cortex; grade 3, laceration >1 cm in depth into medulla; grade 4, laceration through the corticomedullary junction into the renal collecting system or segmental renal vascular injury with haematoma; grade 5, shattered kidney [3]. A Contrast Enhanced – Multi Detector Computed Tomography (ce-MDCT) scan is the technique of choice for the diagnosis of renal trauma, which allows to detect the grade of renal injury, the presence of associated anomalies, vascular tears, urinary extravasation or theinvolvement of other abdominal organs [4–8]. The treatment of renal trauma follows one or a combination of the following pathways: observation only, minimally invasive intervention, or open operative intervention [9]. If observation fails, patients commonly proceed to minimally invasive or open surgical intervention. Options for minimally invasive therapy are driven by the nature of injury. For example, *trans*-catheter embolization is a minimally invasive approach for persistent injured kidney arterial bleeding. Ureteral stent placement, perinephric drain placement, or percutaneous nephrostomy tube placement can be applied for collecting system injuries (i.e., urinoma). Open operative interventions include nephrectomy, partial nephrectomy, or nephrorrhaphy [10,11]. The horseshoe kidney is the most common congenital abnormality of the urinary tract. In most of the cases, it is revealed incidentally at imaging, as it can be asymptomatic. In the event of a closed abdominal traumatism, as a consequence of the lower anatomic location of the kidney which is not protected by the floating ribs and located before the lumbar vertebrae, there is an increased risk of rupture by compression of the isthmus against the spine [12,13]. Currently, there is a general tendency among urologists to be as conservative as possible in the treatment of renal trauma, including high-grade trauma with hemodynamic stability, which can be managed conservatively in 90% of cases with a nephrectomy rate of 4.6% [14–18]. Angiography and selective embolization is an alternative option for active bleeding cases with a response rate of 98% and a low rate of complications, including high grade trauma or previous kidney disease. In cases of horseshoe kidneys, the complex and abnormal vascularization in this condition is an additional difficulty for renal trauma endovascular management. In our case the appearance of such large traumatic injuries, we opted for operative management of the patient in order to avoid the high risk of chronic kidney failure.

4. Conclusion

Trauma of horseshoe kidney is an uncommon finding. The specific anatomical changes increase the risk of renal injury even in low-speed traumas and low rate of associated injuries with other abdominal organs. Abdominal ce-MDCT scan is the diagnostic tool of choice since the renal anatomy, injury grading and vascular or urinary tract abnormalities are well depicted and easily identified. The conservative management of these injuries is associated with a lower rate of nephrectomies and kidney failure while selective *trans*-catheter renal 5 embolization is a challenging treatment option. However surgery can be a treatment of choice with the aim to preserve renal function. The case presented confirms how trauma surgery should be necessarily flexible. The injuries presented did not guarantee a certain functional recovery in any way. The bilateral polar resection alternative could have its reasoning but was not taken into account at all. The need to preserve anatomy with such an important variant dictated the type of intervention. The long-term result has given us reason.

Conflicts of interest

The authors declare no potential financial conflict of interest related to this manuscript.

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