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PARTIAL NEPHRECTOMY IN RENAL TRAUMA WITH GRADE IV INJURY: DESCRIPTION OF A CASE AND REVIEW OF THE LITERATURE.

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ABSTRACT Renal trauma is present in 5% of polytrauma cases, which is more frequent in young males. The management of severe renal trauma is a diagnostic and therapeutic challenge that requires the participation of multidisciplinary Urology and Radiology teams. We present the case of a 19-year-old male, with polytrauma secondary to an electric skateboard accident at a speed of 30 km/hour, with direct trauma against a bollard in the right lumbar region. In the chest-abdominal-pelvic CT, right renal lacerations are identified, the largest in the upper pole, without signs of vascular avulsion or active bleeding and retroperitoneal collection suggestive of perirenal hematoma with high-attenuation content surrounding it, compatible with urinary extravasation. Given the hemodynamic stability of the patient and the fact that there was significant urine extravasation, a double J catheter was inserted. The CT performed at 48 hours shows hypoperfusion of the upper pole and peripheral vascular injury, compatible with several pseudoaneurysms, the largest of which was approximately 14 mm, and small peripheral anomalous vessels with arteriovenous fistulas. Given the radiological findings, selective catheterization of arteriovenous fistula afferents and embolization of pseudoaneurysms with microcoils and with cyanoacrylate-lipiodol were performed. Due to the absence of vascularization of the upper renal pole and the persistence of the perirenal collection of blood and urine, it was decided to perform an open lumbar heminephrectomy of the upper pole of the right kidney. The evolution of the patient was satisfactory without hemodynamic or infection problems. One month after surgery, the double J catheter was removed. Six months after the heminephrectomy, the patient is asymptomatic with the disappearance of the perirenal collection and good morphology of the lower right hemi-kidney. Preservation of nephrons after major renal trauma in young patients is a therapeutic approach to be taken into account, despite the technical difficulties that may exist.

KEYWORDS : Renal trauma, embolization, heminephrectomy.

INTRODUCTION

Renal trauma is present in up to 5% of all cases of polytrauma[1], being more frequent in the young male population and with an incidence in the general population of 4.9 per 100,000[2]. A large part of these types of injuries can be managed conservatively.

The American Association for the Surgery of Trauma (AAST) renal injury scale is the most widely used grading system for renal trauma[3], validated internationally and predictor of morbidity and need for intervention.

The management of this type of injury is a diagnostic and therapeutic challenge for multidisciplinary teams of Urology, Radiology, Vascular Radiology and Intensive Care Medicine.

CLINICAL CASE

A 19-year-old male patient with no medical-surgical history. He is brought by the emergency services to the emergency room due to polytrauma secondary to an electric skateboard accident at a speed of approximately 30 km / hour, with direct trauma against a sidewalk bollard in the right lumbar region.

Upon arrival at the emergency room, the patient was hemodynamically stable and had macroscopic hematuria. On physical examination, he presented a soft and depressible abdomen, not painful on deep palpation, without signs of peritoneal irritation and without visible bruising.

In an urgent study using contrast-enhanced abdominal-pelvic computed tomography (CT), multiple right renal lacerations were identified, the largest of which was located in the upper renal pole (Figure 1) and running through the entire transverse thickness of the parenchyma, with no signs of avulsion of the main renal artery and vein and without signs of active bleeding. There was also evidence of a right retroperitoneal collection suggestive of perirenal hematoma and high-attenuation content surrounding the collection, compatible with urinary extravasation (Figure 1) secondary to laceration of the collecting system, in addition to a large intravesical clot. These findings were compatible with grade IV renal trauma according to the AAST[3] classification.

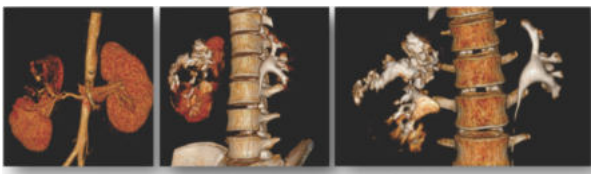

Figure 1: Computed tomography images showing multiple right renal lacerations and urinary extravasation.

The patient was hemodynamically stable so bladder catheterization was performed and bladder clots were evacuated with manual bladder lavage. Close monitoring of constants and hemoglobin and hematocrit levels started with broad-spectrum intravenous antibiotic therapy. The PCR test for Covid-19 is positive, so the appropriate isolation measures are taken.

In the first 48 hours the patient did not present significant anemization and maintained hemodynamic stability without requiring vasoactive drugs.

A control image test was performed 48 hours after the trauma by CT identifying persistence of an extensive laceration in the upper third and right meso-kidney with various trajectories, with hypoperfusion of the upper renal pole. In the arterial phase, a peripheral vascular lesion was seen, dependent on a segmental anterior branch that irrigates the upper third of the kidney, compatible with a pseudoaneurysm of approximately 14 mm. Another image suggestive of a 0.9 cm pseudoaneurysm dependent on a posterior branch of the meso-kidney and other small anomalous peripheral vessels with arteriovenous fistula phenomena was identified (Figure 2) and also persistent urinoma with extravasation of contrast from calyces of the upper right group.

Given the CT findings, the urgent urinary diversion was decided through a right JJ catheter. In addition, selective catheterization of multiple arteriovenous fistula afferents and embolization with microcoils and with cyanoacrylate + lipiodol was performed (Figure 2)

using a radiovascular procedure. In the angiographic control there was no filling of the main pseudoaneurysms or of the arteriovenous fistula.

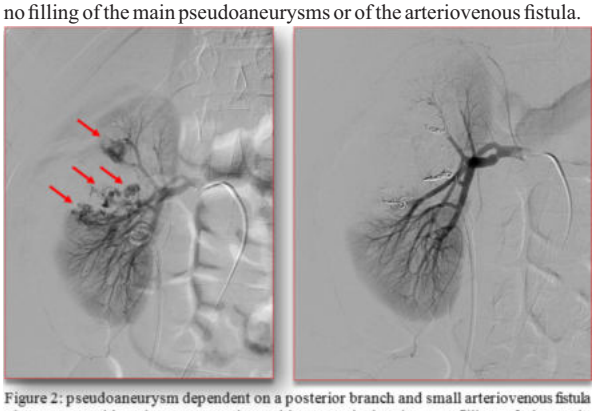

Figure 2: pseudoaneurysm dependent on a posterior branch and small arteriovenous fistula phenomena with subsequent angiographic control showing no filling of the main pseudoaneurysms or of the arteriovenous fistula.

Subsequently, and given the absence of vascularization of the upper right renal pole, an open partial nephrectomy of the right upper pole was performed without intraoperative incidents.

In the postoperative period, the patient remained hemodynamically stable but required a transfusion of two packed red blood cells due to progressive anemization. The antibiotic cycle was completed and given the absence of significant anemia after the previous transfusion and the patient's good general condition, he was discharged from the hospital 14 days after the trauma.

Fifteen days after hospital discharge, a radiologic control was performed with CT identifying embolization material in the right kidney and a collection in the surgical bed of 15 x 7 x 6 cm, with a normally positioned JJ catheter.

In ultrasound control one month after the previous study, a notable decrease in residual collection was observed with dimensions of 4 x 2.4 cm. The JJ catheter was removed.

In a CT study performed 6 months after the renal trauma, the postsurgical changes after heminephrectomy and the embolization material with practical disappearance of the collection and without dilation of the urinary tract are evident (Figure 3).

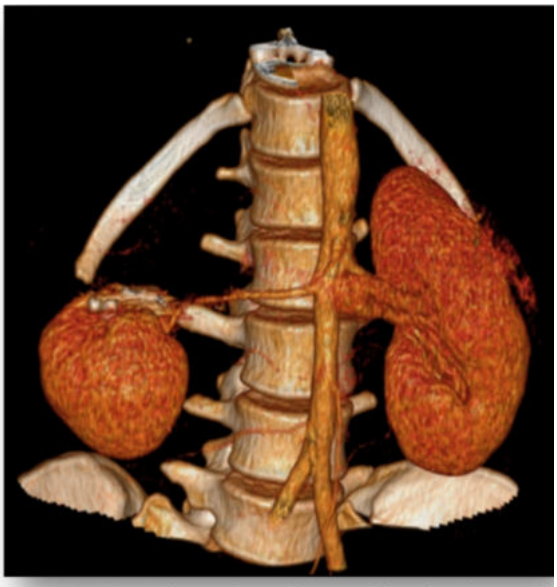

Figure 3: CT study performed 6 months after the renal trauma with postsurgical changes after heminephrectomy and the embolization material.

The patient's kidney function is maintained in successive tests with creatinine levels below 0.6mg/dl and glomerular filtration rate above 90ml/min/1.73m2.

DISCUSSION

Renal trauma is present in up to 5% of all cases of polytrauma[1], being more frequent in the young male population and with an incidence in the general population of 4.9 per 100,000[2].

The American Association for the Surgery of Trauma (AAST) renal injury scale is the most widely used grading system for renal trauma[3], validated internationally and predictor of morbidity and need for intervention. This classification was created in 1989 by Moore et al.[4] and its last update carried out in 2018[3] incorporates vascular lesions diagnosed by CT, described as pseudoaneurysms or arteriovenous fistula.

The case we present was classified as a grade IV injury due to laceration of the parenchyma with extension to the collecting system; however, it could also be reclassified as grade IV due to the presence of a disfigured portion of the kidney (shattered kidney).

Shariat et al.[5] validated the predictive value of this classification in 2007, confirming its usefulness as a predictive tool for the clinical evolution of patients with renal trauma. The AAST scale was shown to be the strongest independent factor for the need for renal exploration and nephrectomy. In their review, 24.7% of patients with grade IV injuries required nephrectomy.

After receiving this type of patient in the emergency room, monitoring of vital signs must be close and physical examination may sometimes show lumbar hematoma, incised wounds or abdominal distension. Microscopic or macroscopic hematuria is the most significant finding, although in some serious cases such as rupture of the ureteropelvic junction, renal pedicle lesions, thrombosis of segmental arteries or stab wounds, there may not be hematuria[6].

There is no established direct relationship between the degree of hematuria and the severity of kidney injury. In patients with grade IV and IV injuries, macrohematuria is absent in up to 18% and microhematuria in 27%[7,8].

In the latest update of the European Guidelines[9], the use of CT for the hemodynamically stable patient is recommended for the initial evaluation, insisting on the importance of the nephrographic and late phases to identify renal lacerations and collector system and ureters injuries. The CT study adequately identified vascular injuries, parenchymal lacerations, urinary extravasation and perirenal hematoma[10]. The involvement of the collecting system may not be detected in the early phases, so it is important to perform a late phase 10-20 minutes after the contrast injection[11].

Grade I-III kidney injuries are managed conservatively. Recently, in 2006, Alsifaki et al.[12] retrospectively analyzed all the patients treated at their center with renal trauma and urinary extravasation, concluding that conservative management of such patients without vascular or abdominal injury was safe and had success rates above 90%.

Grade IV injuries are mostly treated conservatively but the need for intervention is greater. Buckley et al.[13] retrospectively analyzed a series of patients with grade IV injuries, differentiating between those with kidney injuries exclusively or those with other associated abdominal injuries. Of the 43 patients with exclusively renal lesions, 18 (42%) required surgical exploration, 2 of them requiring radical nephrectomy, and 25 patients (58%) were managed conservatively. In this same article, Buckley[13] refers that the presence of associated non-renal lesions is a predictive factor for the decision of surgical exploration. 87 patients with grade IV injuries were analyzed: 26% of those with no other associated injuries underwent surgical exploration, while 74% of those with concomitant injuries underwent surgery.

Grade V injuries usually present with hemodynamic instability and other serious associated injuries, so the rate of surgical intervention is higher. The rate of total nephrectomy according to the degree of kidney injury was 0.4%, 15% and 62% for grades III, IV and IV, respectively[14].

In the multidisciplinary management of this type of case, the use of selective angioembolization is becoming increasingly important, although the type of patients that would benefit from this endovascular treatment has not yet been standardized. Findings that indicate the need for embolization are contrast extravasation and the presence of an arteriovenous fistula or pseudoaneurysms[15].

Hotaling et al.[16] analyzed all kidney injuries treated between 2002 and

2007, collected in the National Trauma Data Bank, analyzing a total of 9002 cases. Of the 77 patients (78% with grade III-IV injuries) in whom embolization was performed first, 68 required a second intervention, the second embolization being the most frequent, resulting in success in 35 of 36 patients. A second procedure after the first embolization was necessary for all patients with IV-V injuries. Of the patients who underwent open surgery after embolization, 88% ended in nephrectomy.

In the case that we present, the first embolization solved the arteriovenous fistula and a second endovascular intervention was not necessary. However, given the loss of vascularization of the upper renal pole, it was decided to perform surgery. The difficulty at this time is given by the high probability that the surgery will end with a total nephrectomy (88% of patients requiring surgery after embolization resulted in total nephrectomy[16]). These data coincide with those of another study carried out in the USA by Keihani[14], which found that of the 84 patients who required open surgery, 55 (65.4%) ended up in total nephrectomy, 23 (27.5%) in partial nephrectomy or renorrhaphy and 10 (7.1%) in packing to control bleeding.

The European guidelines[9] indicate that partial nephrectomy must be performed when non-viable renal parenchyma is identified and point out the usefulness of hemostatic agents and sealants[17] as used in our procedure.

Postoperative complications in the medium and long term will be detected with imaging tests (ultrasound / CT). Physical examination, urinalysis, control with imaging tests, blood pressure measurement, and serum creatinine value are recommended in the follow-up of these patients[18].

CONCLUSION

Renal trauma is a rare pathology in our setting whose management has tended in recent years to be more conservative with the ultimate goal of preserving as much renal parenchyma as possible.

The AAST[3] classification allows us to establish the severity of kidney injury in degrees and help us in the decision of surgical, endovascular, or conservative management of acute trauma. The surgical review decision will be conditioned by the hemodynamic stability of the patient, the degree of anemization, and the association with other abdominal injuries.

Selective embolization is becoming increasingly important in the management of renal trauma. Open surgery, if it has to be performed, must try to preserve the highest percentage of the viable renal parenchyma.

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