Post-traumatic renal arteriovenous fistula

Neave-Sánchez EA,1 Castellanos-Hernández H,2 Hernández-Fraga H,1 Bernal-García R,2 Xochipiltecatl-Muñoz DJ,1 Castillo-de Lira HH2

ABSTRACT

Renal arteriovenous fistula (RAVF) is a rare pathology in urological practice. It is classified by origin as acquired and non-acquired. Acquired RAVF is the most frequent. Acquired fistula etiology may be traumatic, iatrogenic, spontaneous or inflammatory. Clinically it is manifested by intra-abdominal murmur, heart failure, kidney failure and hematuria.

Diagnosis is suspected based on both urological and cardiovascular symptoms as well as on medical history and findings during physical examination. Diagnosis is confirmed through imaging studies.

Key words: arteriovenous fistula, traumatic fistula, Mexico.

RESUMEN

Las fístulas arterio-venosas renales (FAVR) constituyen una patología poco frecuente en la práctica urológica. Pueden clasificarse, según su origen, en adquiridas y no adquiridas, siendo las primeras la variedad más frecuente.

La etiología de las fístulas adquiridas pueden ser traumática, iatrogénica, espontánea e inflamatoria. Clínicamente se manifiestan por un soplo intraabdominal, insuficiencia cardíaca, insuficiencia renal y hematuria.

El diagnóstico se sospecha con base en los síntomas, tanto urológicos como cardiovasculares, así como en los antecedentes y hallazgos de la exploración física. Su diagnóstico se confirma con estudios de imagen.

Palabras clave: Fistula- arteriovenosa, fistula traumática, México.

INTRODUCTION

Arteriovenous fistula (AVF) is a communication anomaly between an artery and a vein that does not pass through the capillary bed. Varela (1923) was the first to describe a case of renal arteriovenous fistula (RAVF) in a man with heart failure and high blood pressure.1-3

The kidney is a richly vascularized organ full of small arteries and veins that run into each other. When arteriovenous perforations are produced they heal adequately. However, if there is high blood pressure, sclerosis or interstitial fibrosis that makes immediate closure more difficult. In addition, intrarenal

1Staff Urologist of the Urology Service at the Hospital Central Sur de Alta Especialidad PEMEX, Mexico City 2Urology Resident at the Hospital Regional Licenciado Adolfo López Mateos of the ISSSTE, Mexico City 3Staff Radiologist of the Radiology Service at the Hospital Central Sur de Alta Especialidad PEMEX, Mexico City

Corresponding author: Dr. Hibert Castellanos Hernández Av. Universidad No. 1321 Col. Florida, Delegación Álvaro Obregón, Distrito Federal
Telephone: 044 55 29019733 Email: hibertfuzz@hotmail.com
hematoma can create an arteriovenous channel by a “pressure” mechanism. This may eventually lead to arteriovenous fistula. AVF may form immediately or take several days or weeks. It is a liquefaction of the angle between the lacerated artery and vein that produces a communicating opening.²

### CLINICAL CASE

The patient is a 41-year-old male worker from the state of Veracruz, Mexico. Patient began smoking 6 cigarettes per month at the age of 20 years and continues this habit to the present. He reported a probable left ureteropelvic junction plasty at the age of 14 years. In January 2009 patient suffered trauma in a car accident. His present disease began 7 days after that accident. He presented with left flank pain and persisting total hematuria with amorphous coagulates. He had no other symptoms.

At physical examination patient had good color and presented with normal cardiopulmonary data, soft non-painful, palpable abdomen, peristalsis and surgical scar on the left flank. Penis presented with hypochromic changes on the glans, redundant prepuce, transurethral catheter that drained hematuric urine. Shape, size and location of testes were normal. Rectal examination revealed smooth, euthermic, adenomatous, non-painful prostate of approximately 50 g. Simple abdominal X-ray showed left side radiopaque image suggestive of pyelic calculus.

Patient continued to have macroscopic hematuria with coagulates. Simple and computerized tomography (CT) corroborated presence of a hyperdense image at the level of the left renal pelvis compatible with calculus. In the contrasted phase, heterogeneous zones with attenuation values going from 40 HU to 126 HU were observed in the renal parenchyma (Image 1). CT showed no abnormalities at the bladder level.

Kidney scintigram was done to evaluate function. It showed adequate filtration and perfusion with no data suggestive of obstruction. Hematuria persisted and hemoglobin dropped 3 g/dL in two days, from 10.2 g/dL upon admittance to 7.2 g/dL. Cystoscope as part of hematuria protocol showed hematic material expulsion with pressure at left ureteral meatus.

The cystoscopic finding and secondary anemia led to post-traumatic RAVF suspicion caused by a combination of the sudden braking in the car accident, presence of a calculus and previous surgery.

Color Doppler study was done suggesting fistula. Left renal arteriography was carried out that showed aneurysmatic dilatation at the arcuate artery midsection (Image 2). Microcoil embolization was done (Image 3) and hematuria was resolved 2 days after procedure.

---

Image 1. Abdominal CT with contrast medium showing heterogeneous left kidney with attenuation values going from 40 HU to 126 HU.

Image 2. Selective angiogram of left kidney showing a rounded image, dependent on arcuate arteries, that is filled with contrast medium.
Patient was kept under surveillance for one week. Hematuria did not recur and patient was hemodynamically stable with hemoglobin of 10.8 g/dL. He was released and scheduled for future calculus treatment.

**DISCUSSION**

RAVF constitutes a rare pathology in urological practice.\(^1\) It can be classified according to origin as acquired or non-acquired.\(^1,3\) Acquired is the most frequent type and represents 70–75% of cases. Depending on etiological factors, acquired fistula can be traumatic, iatrogenic, spontaneous or inflammatory.

Closed trauma as well as penetrating knife or gunshot wounds involving the kidney, can be causes of RAVF. Their incidence is 10–15% in relation to RAVF and those secondary to penetrating wounds are more frequent.\(^1,3\)

RAVF clinical characteristics depend on its size (the magnitude of the communication), location (proximity to the urinary tract), length of time of progression and etiology. It can manifest with intra-abdominal murmur, heart failure, kidney failure and hematuria.\(^1,3\) RAVF can appear from 3 weeks up to 26 years from its onset, in the case of acquired fistula.\(^4\) Hematuria presents in approximately one third of cases, sometimes resulting in anemia.

Massive hematuria episodes can cause symptoms of colic-type pain that are the consequence of the passing and attaching of clots in the ureter and can be the cause of bladder obstruction.\(^1\)

Diagnosis is suspected based on urological as well as cardiovascular symptoms along with medical history and physical examination findings. Diagnosis is confirmed with imaging studies.\(^1,3\)

Dynamic CT with bolus contrast medium injection enables clear outline of the principal arteries and their branches as well as changes in blood flow that can suggest diagnosis. Scintigraphy studies with glucoheptonate-Tc\(^{99}\) have identified areas of ischemia that surround the fistula. In other words, there is a relay and reduction of flow in the kidney area. Duplex as well as color Doppler ultrasound are very useful studies in RAVF diagnosis because they provide information as to localization and dimension as well as local hemodynamic changes. Selective renal arteriography is an excellent RAVF diagnostic method, superior to all others. Besides confirming the presence of fistula its volume, localization in relation to the afferent artery and state of the venous or efferent system can be determined.\(^1\) Criteria for arteriography with embolization include persistent bleeding of a segmental artery with or without laceration of the parenchyma, hemodynamically unstable, grade III or IV kidney lesion, AVF or pseudoaneurysm and hematuria resulting in rapid drop in hematocrit requiring transfusion of two globular concentrations.\(^5\)

RAVF treatment modality depends on the severity of symptoms and their etiology. In cases of short duration and small size, asymptomatic or oligosymptomatic, the best initial treatment is conservative, employing surveillance with periodic controls. This type of fistula is most frequent after percutaneous kidney biopsy, can be the result of trauma or may be congenital and discovered incidentally. Watchful attitude is the consequence of existing clinical experience. Approximately 90% of these fistulas are spontaneously resolved within 2–24 months. Follow-up can be carried out with Doppler ultrasound.\(^1,3,4,6\)

Therapeutic intervention is indicated in those fistulas that cause cardiac imbalance, progressive kidney failure, intense pain, high blood pressure (especially when uncontrollable) and refractory hematuria. There is also clear intervention indication when fistulas are secondary to tumor or when, after initial watchful approach, they become larger or begin to manifest symptoms. The two treatment options are surgical (partial or total nephrectomy) and minimally
invasive fistula embolization by means of arterial catheterization.1

The first report of arterial embolization for controlling hemorrhage was by Bookstein and Ernst in 1973. Interventional radiology techniques such as angiography and more recently superselective embolization have become an efficacious resource for kidney lesion treatment.5,7

Through selective catheterization of the segmental artery that feeds the fistula, agents that permanently occlude the arteriovenous communication are injected.6 These agents include autologous clots, polyvinyl alcohol, spongy gel, coils, subcutaneous cellular tissue, muscle and cyanoacrylates. It is important to mention that the emboligenic material to be used should not be absorbable.4 This technique has the advantages of avoiding the aggressive aspect of surgery, minimizing kidney damage and of having low complication risk.1 Endovascular treatment success depends on the catheterization technique and material employed. Emboligenic material selection is important for achieving good results and that choice will depend on each pathological condition.8

Arterial embolization is directed towards the treatment of AVF that are not excessively large, that is to say with moderate output, that affect small vessels of medium caliber. Therefore, it is the treatment of choice in fistulas occurring after percutaneous kidney biopsy, after trauma and in some congenital fistulas.1,6

Embolization complications include: 1) high blood pressure that is usually transitory, 2) pulmonary embolism if AVF are large, 3) kidney infarct as a consequence of arterial wall injury or emboligenic material shift and 4) postembolization syndrome, consisting of lumbar pain, transitory high blood pressure and sepsis. Sepsis risk is low and is directly related to the size of the embolized area.1,4-5

CONCLUSIONS

Post-traumatic arteriovenous fistula is a rare entity. In the present case, it was diagnosed after ruling out kidney or bladder tumor and by taking into account the fact that there had been previous surgery, a trauma and the presence of a calculus. All of these factors led to diagnosis.

Adequate diagnostic approach is important so that the patient does not undergo unnecessary procedures or surgeries that can negatively affect kidney function.

With the advent of minimally invasive procedures and, as in this case, supported by interventional radiography, management does not cause functional tissue damage and its effectiveness is very high.

BIBLIOGRAPHY