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Best strategy in managing the association of Horse-shoe-Kidney and Abdominal Aortic Aneurysm: Case report

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ABSTRACT

INTRODUCTION: Horseshoe Kidney (HSK) is probably the most common of all renal fusion abnormalities. However the association of Abdominal aortic aneurism (AAA) and HSK is rare, and occurred in 0,12% of patient affected by AAA.

PRESENTATION OF CASE: We present a patient with the concomitant presence of AAA and HSK treated by open surgical repair with a transperitoneal approach without section of the isthmus with great outcomes after surgery.

DISCUSSION: The management of AAA associated with HSK presents a special challenge during vascular surgery, given the close spatial relationship and the frequent renal arterial variations that accompanies HSK.

CONCLUSION: Diagnosis and a well designed surgical strategy are required to avoid surgical post operative complications.

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1. Introduction

Horseshoe Kidney (HSK) is probably the most common of all renal fusion abnormalities [1]. However, the association with abdominal aortic aneurysm (AAA) is rare, and occurred in 0,12% of patient affected by AAA [2].

The management of AAA associated with HSK presents a special challenge during vascular surgery, given the close spatial relationship and the frequent renal arterial variation that accompanies HSK.

Diagnosis and a well designed surgical strategy are required to avoid surgical post operative complications.

We present a patient with the concomitant presence of AAA and HSK, treated by open surgical repair with a transperitoneal approach without section of the isthmus with great outcomes after surgery.

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2. Presentation of case

A 66-year-old man with a history of hypertension under Angiotensin-converting enzyme (ACE), coronary angioplasty and transurethral resection of bladder tumor in complete remission, was referred to our department for an asymptomatic AAA. The patient had no family history of aneurysm or renal malformations. Computed tomography (CT) revealed a 11.2 cm infrarenal AAA associated to a HSK with a wide parenchymatous isthmus lying anterior to the aneurysm (Fig. 1A, B). Two main renal arteries were detected, without accessory artery for the kidney, neither for the isthmus, the proximal neck has a 90° angulation and 18 mm length and has been deflected to left side.

Initially, the patient had normal renal function with a serum creatinine of 1.00 mg/dL.

Given the highly angulated aortic neck we choose open surgery. The operation was performed through a long midline incision by our chief surgeon. The transperitoneal dissection along the Treitz ligament revealed a large aneurysm covered by the isthmus in its upper third. The dissection of the aortic neck and the individualisation of renal arteries was difficult given the deflected angulated neck and the descendant trajectory of the renal arteries.

We couldn't recognise the limits between the isthmus and the renal parenchyma so we decided to avoid isthmus section and its related complications (Fig. 2). Common iliac arteries were desiccated.

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After systemic heparinisation and clamping, the aneurismal sac was longitudinally opened; thrombus was removed and lumbar arteries were sutured, then a Y-shaped Dacron graft (16–8 mm) was placed under the isthmus for the reconstruction (Fig. 3). Both common iliac arteries were free from aneurysm and calcifications, so distal anastomoses were performed. The aneurismal wall was closed covering the implanted prosthesis, then an epiploasty was performed by placing the great epiploon between the closed aneurismal wall and the posterior side of the isthmus, finally the abdominal wall was closed.

The procedure was well tolerated by the patient, with an uncomplicated postoperative course and no deterioration of renal function.

3. Discussion

HSK, thought to occur in 0.25% of the population, is probably the most common of all renal fusion abnormalities and is twice as common in men as it is in women [1]. However, the association of AAA and HSK is rare and occurred in 0.12% of patients affected by AAA [2].

HSK is occurred between the fourth and sixth weeks of embryogenesis, during the metanephric phase [3] as a result of the proximity of the two kidneys that may lead to an abnormal metanephric cell migration and therefore the formation of a connective isthmus between the inferior renal poles in 95% and superior poles in 5% [4]. Most commonly the isthmus is located anterior to the aorta, beneath the inferior mesenteric artery. It may contain functional parenchymal (85%) or fibrous tissue (15%) [5].

Vascularisation abnormalities are present in two third cases of HSK [4]. Different classification were proposed. Papin proposed a

classification based on the number of renal arteries, while Crawford et al. [6] classification was based on the origin of the renal arteries, then a classification was introduced by Boatman et al. [7] consisting of six types of vascularisation. Currently, the classification proposed by Einseidrath [8] in 1925 is the most used, in patients suffering an AAA with the concomitant presence of HSK, because of its greater surgical significance. It includes five types, with the first two representing approximately 50% of the cases. Type I refers to the presence of one renal artery on each side of the HSK, whereas type II demonstrates an auxiliary aortic branch to the renal isthmus in addition to type I. Type III inserts to type II one more renal artery to each side; type IV refers to the presence of two renal arteries on each side with one or more originating from iliac arteries or the isthmus branch. Finally, type V refers to the presence of multiple renal arteries arising from the aorta, the mesenteric arteries, and the iliac arteries (Fig. 4).

Our patient’s HSK corresponds to Einseidrath II [8].

Classifying a HSK is very important to establish the best therapeutic strategy using a three-dimensional CT angiography that provides detailed informations about the vascularisation of the HSK [8,9]. However, it is important to identify how much each branch contributes to the HSK perfusion.

The technical difficulties in managing AAA associated with HSK, is mainly caused by their close spatial relationships and the frequent arterial variations that accompanies HSK.

The best strategy to approach an those cases remain an issue of continued debate.

Endovascular aortic repair (EVAR) for the management of an AAA associated with HSK is an interesting technique. Several series were published, the largest one in 2019 by Fabiani MA et al. founding that EVAR is a safe and efficient option for the treatment of

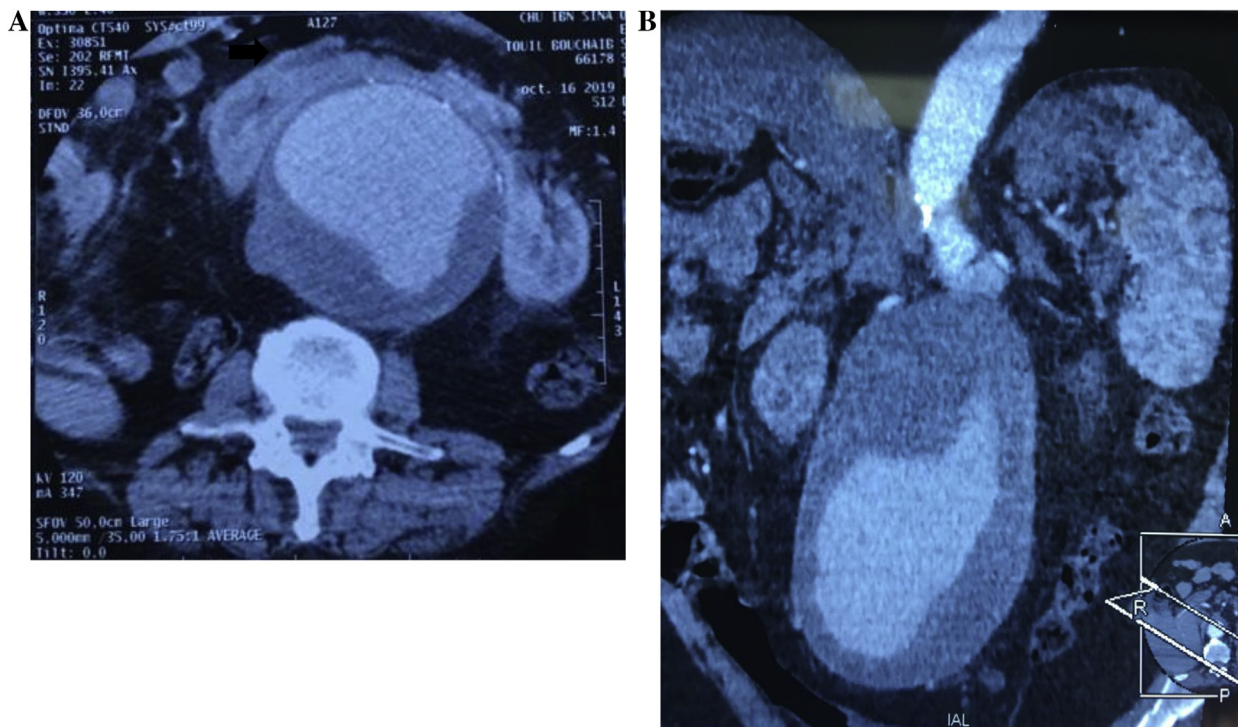


Fig. 1. (A): computed tomography showing the huge aneurysm associated to Horse-Shoe-Kidney. Black arrow: the isthmus. (B): coronal view showing the angulated neck of the inferior renal aorta.

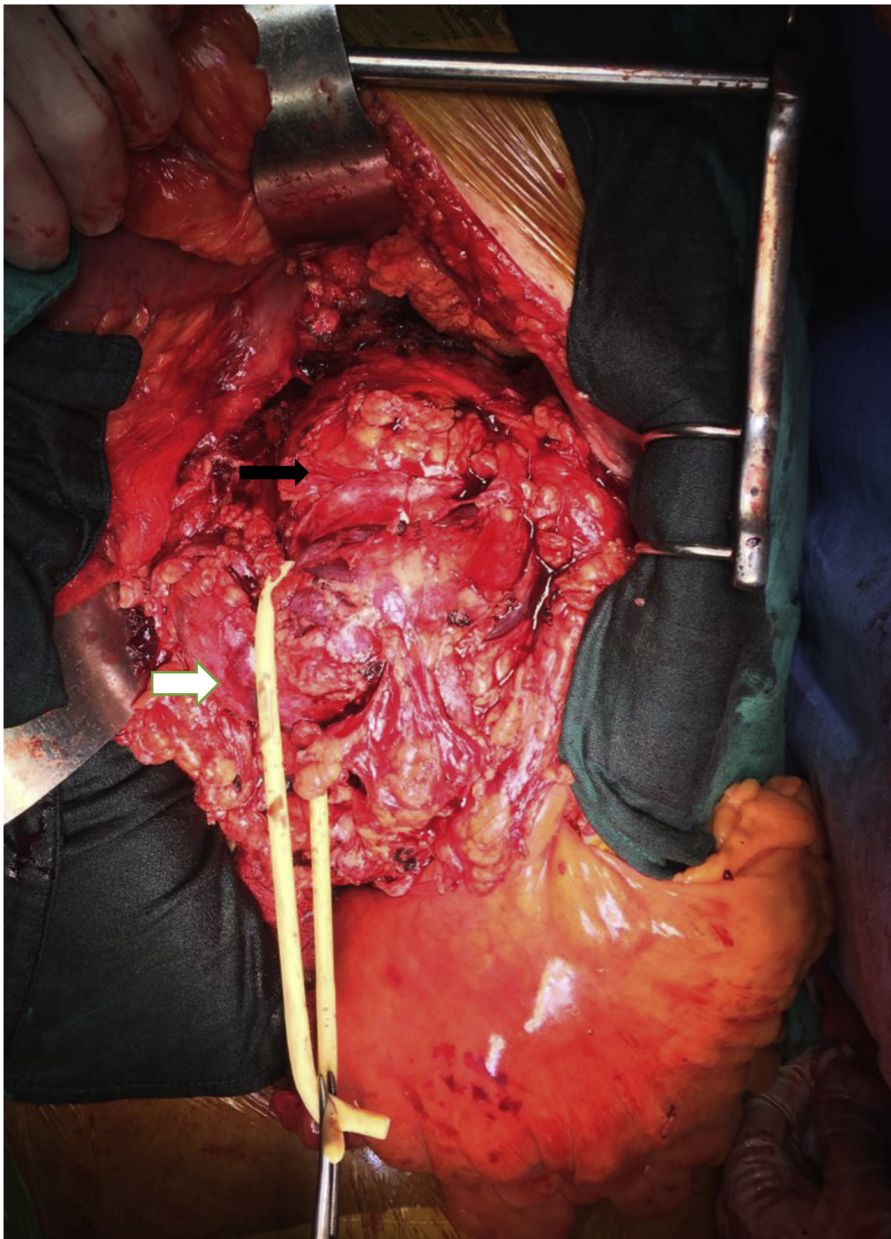


Fig. 2. Per operative view showing the aneurysm with a wide parenchymatous isthmus lying anterior to the aneurysm.

Black arrow: aneurysm.

these patients, with excellent short- and medium-term outcomes even with covering the aberrant renal arteries smaller than 4 mm [10].

The anatomical position of the isthmus in front of the aorta and beneath the inferior mesenteric artery makes that the best surgical option is the retroperitoneal approach because its well tolerated by the patients, reduce risk of ureteral injury and provides good visualization of both the AAA and the aberrant arteries arising from the aneurysm regardless the presence of the isthmus, however the surgical exposure and the control of the right iliac arteries are quite difficult [11].

Historically, the transperitoneal approach has been more commonly used.

Open surgery approach can be made based on the anatomical characteristics of the AAA, such as, the involvement of the iliac arteries and the proximal extent of the aneurysm.

In our case, we choose the transperitoneal technique given the highly angulation of the neck with no renal arteries abnormalities and also because it's the most used technique in our experiences, the outcomes were great and the patient adhere completely to the treatment and is very grateful and satisfied.

4. Conclusion

The concomitant presence of HSK and AAA presents a real challenge for the vascular surgeon imposing the mastery of the different vascular technique both endovascular and open repair to deal correctly with this rare condition.

The choice of the technique still controversial and must take in consideration the degree of urgency and the anatomical abnormalities of the aneurysm and the different renal arteries. However we

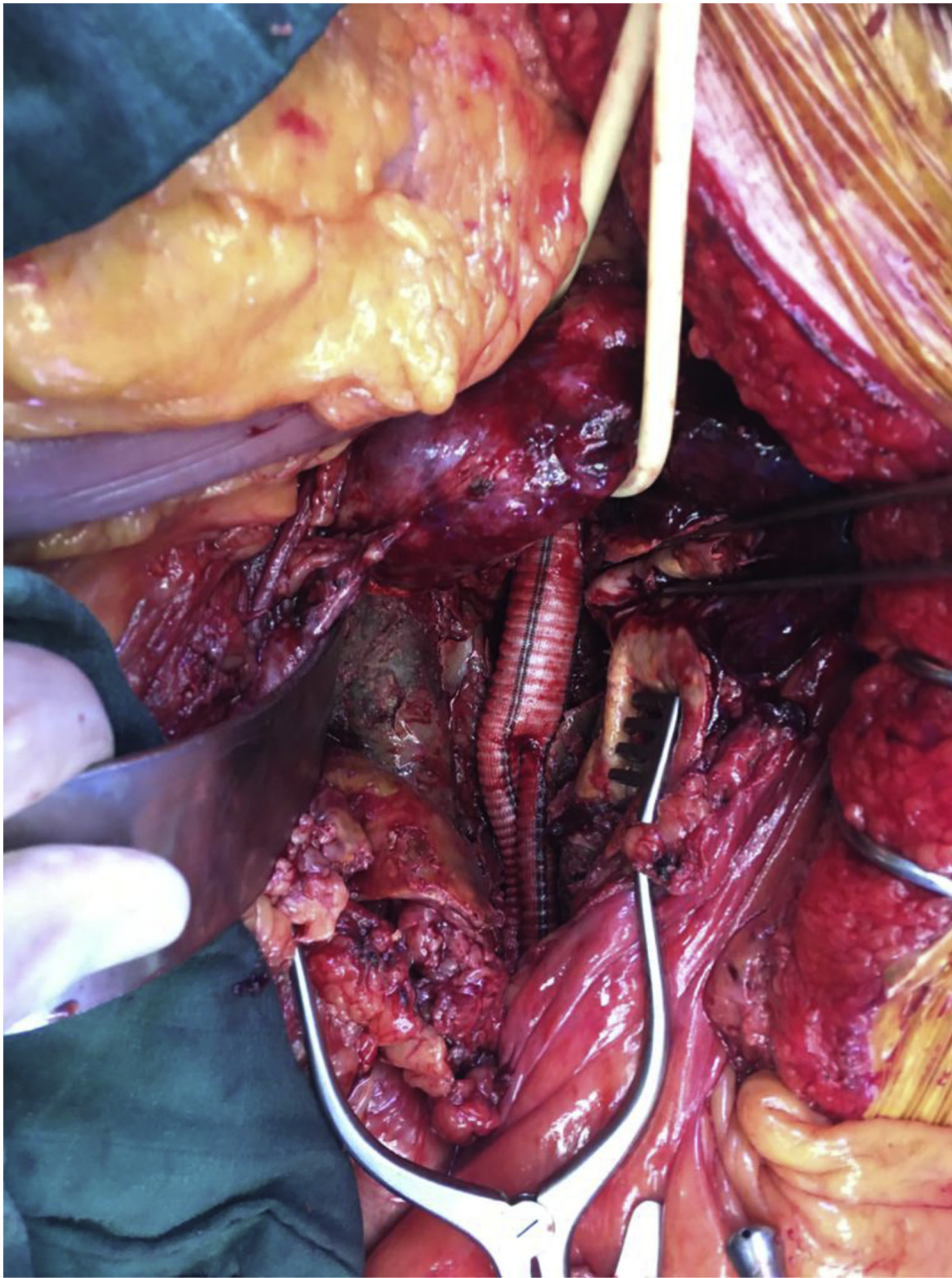


Fig. 3. Y-shaped Dacron graft (16–8 mm) placed under the isthmus.

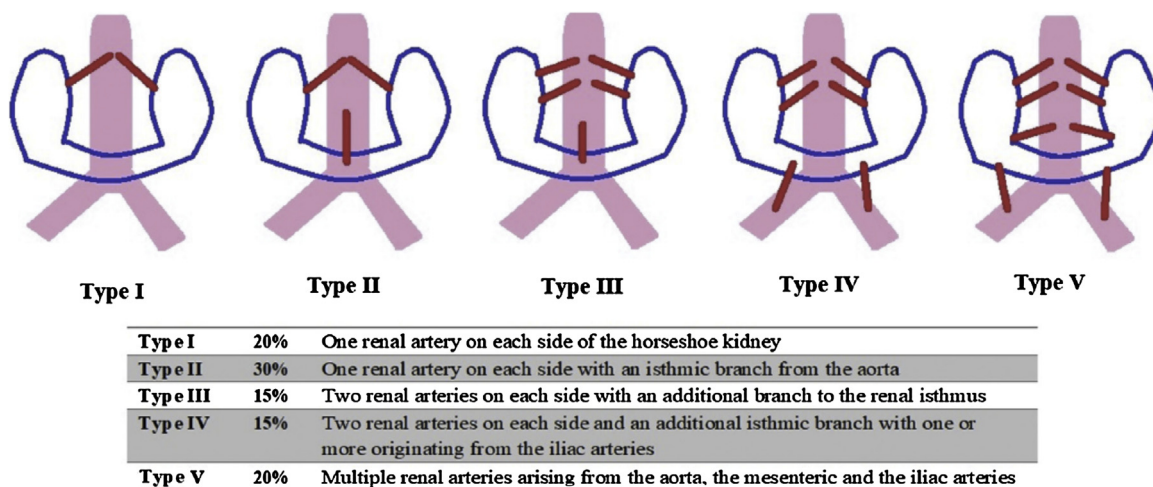


Fig. 4. Horseshoe kidney (HSK) classification according to Eisendrath et al. [8].

believe that avoiding isthmus section is the most important advice if open repair is preferred.

The work has been reported in line with the SCARE 2018 criteria [12].

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

Exempt from ethnical approval in my institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

BOUNSSIR Ayoub: Conception, Methodology, Software, Data curation, Writing- Original draft preparation.

BAKKALI Tarik: Data curation, Analysis.

TAGHI Houda: Writing, Data collection.

SEFIANI Yasser: Critical revision, Approval of the manuscript.

EL KHALOUFI Samir: Critical revision, Approval of the manuscript.

EL MESNAOUI Abbas: Critical revision, Approval of the manuscript.

LEKEHAL Brahim: Critical revision, Approval of the manuscript.

Registration of research studies

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