Surgical Treatment of a Voluminous Infrarenal Abdominal Aortic Aneurysm with Horseshoe Kidney: Tips and Tricks

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Horseshoe kidney is a common urology anomaly, while its association with infrarenal abdominal aortic aneurysm represents a very rare condition. Surgical approach remains controversial however, we believe that the left retroperitoneal approach should be preferred in order to avoid isthmus resection with any subsequent renal infarction, urinary tract damage and to facilitate renal arteries reimplantation, when required.

We present a case of voluminous infrarenal abdominal aortic aneurysm associated with horseshoe kidney, successfully treated through a left retroperitoneal approach on the retro-renal space.

Keywords: horseshoe kidney, infrarenal abdominal aortic aneurysm

Introduction

Horseshoe kidney (HSK) is a common urologic anomaly, occurring approximately in 0.15%–0.33% of the population;¹ the isthmus connecting the lower poles may be a fibrous band or may contain functional parenchymal tissue.

Despite this relatively high incidence, the occurrence of infrarenal abdominal aortic aneurysm (AAA) associated with HSK is very rare. The isthmus of the HSK almost always lies over the aneurysm, so an accurate preoperative diagnosis and a well-designed surgical strategy are required to avoid intraoperative complications.

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In 90% of cases computerized tomography (CT) gives the most detailed information about the morphology of HSK and the anatomic relationships between the kidney, its blood vessels, and the aneurysm.²)

Here we present our operative strategy to treat a patient affected by a voluminous symptomatic AAA associated with HSK, through a left retroperitoneal surgical approach.

Case Report

A 67-year-old man with a history of hypertension, dyslipidemia and diabetes mellitus, reported to the emergency room complaining acute onset of abdominal pain, probably due to a rapid enlargement of the aneurysm diameters. Clinically, a pulsatile abdominal mass was observed. Computed tomography (CT) demonstrated an AAA measuring 6.68 cm × 5.74 cm in diameter, associated with a HSK, with the isthmus lying anterior to the aneurysm, containing functional parenchymal tissue (Fig. 1A). Three main left and one right renal arteries were detected through CT scan. One small accessory renal artery, arising from the aneurismal wall near to the inferior mesenteric artery origin was observed. Also, the presence of one small accessory renal artery arising from the right common iliac artery that presented a diameter of 31 mm and of a large renal accessory artery arising from the left common iliac artery were detected (Fig. 1B). Even if Ruppert and colleagues³ reported that endovascular aneurysm repair with coiling of the renal accessory arteries can be performed safely in presence of HSK, we did not chose this option for our patient, in order to avoid possible complications, such as occlusion of accessory renal arteries with subsequent renal infarction and the development of type 2 endoleaks, that are reported in literature.⁴)

The rapid onset of abdominal pain leads us to opt an emergency operation. With the patient in the right semilateral position, we recurred to a left retroperitoneal approach on the retro-renal space, in order to avoid the kidney isthmus resection and urinary tract damage. The renal isthmus containing functional parenchymal tissue...
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was easily separated from the aneurismal wall. The dissection of the proximal aorta and of the origin of the left common iliac artery was easy. The accessory renal artery arising from the right common iliac artery was not identified because the iliac artery was only partially isolated. The larger accessory renal artery that originated from the left common iliac artery was identified and carefully dissected (Fig. 2). After systemic heparinization, the proximal aorta was clamped under the left and right main renal arteries. The aneurismal wall was longitudinally opened; thrombus was removed and lumbar arteries and the renal accessory artery arising from the aneurismal wall were sutured. The two common iliac arteries were clamped through Foley catheter 16 F from the inner wall. An aorto-aortic bypass in Dacron 16 mm (Gelsoft™, Vascutek) was performed and the proximal anastomosis was reinforced using a banding in polytetrafluoroethylene (PTFE) 6 mm (Fig. 3). The renal accessory artery arising from the left common iliac artery was preserved during surgery.

The right common iliac artery aneurysm was not treated in order to maintain the renal accessory artery arising from it. In addition, it was difficult to treat through the left retroperitoneal approach, chosen to avoid the division of the renal isthmus and the related complications. The aneurismal wall was closed covering the implanted prosthesis and the abdominal wall was traditionally closed. The procedure was well tolerated by the patient, with an uncomplicated postoperative course and no deterioration of renal function was recorded. On 7th postoperative day the patient was discharged on good health.

Discussion

Horseshoe kidney is a common urologic anomaly, occurring approximately in 0.15%–0.33% of the population. Despite this relatively high incidence, HSK occurring at same time with AAA is rare occurring in 0.12% of patients affected by AAA.
The right retroperitoneal approach to the AAA is also possible, through a parietal-cholic incision, and, if necessary, the Kocher maneuver can be performed when the AAA is very close to the kidney. Through the transperitoneal approach the surgeon could explore the peritoneal cavity, with an optimal exposure of the aorta and both iliac common arteries, of the HSK and both ureters; however, the isolation and preparation of the aneurysmal wall for all its length could be difficult, due to the presence of the renal isthmus.

Successful surgical repair of the abdominal aorta, with or without division of the renal isthmus, has been previously reported. The section of the isthmus to obtain a complete isolation and exposure of the aneurysm is not well accepted by all surgeons, because it could be responsible for urinary tract injuries with subsequent retroperitoneal infection, bleeding, and renal ischemia, in particular when the renal isthmus consists of functional tissue.

Connelly et al. proposed the renal isthmus division when it is necessary to treat the AAA, not routinely. They reported the results of symphysiotomy in 24 of the cases reviewed and added their cases, without complications after the renal isthmus division. If the arterial blood supply was preserved, postoperative renal necrosis and urine leaks would not occur.

Also Chihara et al. reported a case of AAA associated with HSK, with division of the kidney isthmus by using a Harmonic Focus, recurring to a transperitoneal approach. They reconstructed the renal accessory artery and no postoperative renal dysfunction was observed. Noguchi et al. reported the successful repair of an AAA in the presence of HSK and a coagulopathy, via division of the renal isthmus using a harmonic scalpel and additional suturing in 2004.

On the other hand, Canova et al. reported three cases treated through a median xiphopubic laparotomy, with mobilization of the renal isthmus as much as necessary, without isthmectomy.

A straight or bifurcated Dacron tube graft was inserted. The postoperative course of all three patients was uneventful, with temporary renal dysfunction only in one patient. These authors reported that anomalous renal arteries with a diameter >2 mm should be preserved in order to avoid renal ischemia, while smaller arteries could be sacrificed without a real risk of renal necrosis.

Technical opportunities to save or restore vascular perfusion are various. Revascularization of anomalous branches can be obtained by reimplanting an aortic patch that includes the origins of the vessels, by reimplanting the arteries directly into the prosthesis in accordance with the usual methods (after having performed thromboendarterectomy of the ostia), or by interposing a graft.
More recently, Ikeda et al.\textsuperscript{11} reported a particular case of ruptured AAA with HSK. They performed a transperitoneal approach in order to clamp immediately the aorta, that is difficult to obtain through the left retroperitoneal approach, recurring to renal isthmus division, without renal complications.

In our patient, one right and three left main renal arteries were recorded. In addition, renal accessory arteries originated from both common iliac arteries and one minor vessel arose from the aneurismal wall. To avoid isthmus resection that consisted of functional tissue and urinary tract injury, we chose a left retroperitoneal surgical approach on the retro-renal space, without exposure of the right common iliac artery from which a small accessory renal artery originated. We exposed the left common iliac artery and we carefully dissected and preserved a large renal accessory artery arising from this vessel. Only the accessory renal artery arising from the aneurismal wall was sacrificed but no renal dysfunction was recorded during the postoperative period.

**Conclusions**

Horseshoe kidney associated with AAA is a very rare condition. Even if until today the best surgical approach is controversial, we believe that the left retroperitoneal approach through the retro-renal space should be preferred because it offers an improved vision, a reduced risk of ureteral injury without need to resect the renal isthmus, and a reduced difficulty to reimplant anomalous renal arteries, when required.

**Disclosure Statement**

The authors declare no conflict of interest.

**Author Contributions**

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