CASE REPORT

Problems of Abdominal Aortic Aneurysm Associated with Horseshoe Kidney

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Introduction

Horseshoe kidney (HSK) is an unusual abnormality occurring in 0.15–0.25% of the population.1 In its most common form fusion is between the lower poles, creating an isthmus of variable size and shape anterior to the aorta and inferior vena cava. This may consist of a simple fibrous band or may contain a significant amount of functioning renal parenchyma and part of the collecting system. In up to three-quarters of cases it is associated with abnormalities of the renal vasculature.

The coexistence of abdominal aortic aneurysm (AAA) with HSK is rare, being present in only 0.12% of patients undergoing aneurysm replacement.3 Technical problems related to exposure, vascular access and preservation of renal tissue may trap the unwary.

We report two cases of successful reconstruction of the aorta in patients with AAA and HSK and review the literature to date.

Case 1

A 71-year-old lady was investigated for loin pain and recurrent urinary tract infections by intravenous urography, which revealed a functioning HSK with a calculus in the left lower calyx. Extracorporeal shock wave lithotripsy was planned and subsequently abandoned after an AAA was discovered on ultrasound scan (USS). A spiral computed tomography (CT) arteriogram (Fig. 1) confirmed a 6.5 cm aneurysm with the main renal arteries arising above the aneurysm neck. No accessory renal arteries were identified. The isthmus of the HSK was shown to have functioning parenchyma and the collecting system and ureters were anteriorly placed.

At elective resection of the aneurysm via a midline
incision and transperitoneal exposure of the aorta, the aneurysm was found to be inflammatory with the duodenojejunal flexure and left renal vein densely applied to its anterior surface. The thick isthmus of the HSK was also densely adherent to the aneurysm sac below the inferior mesenteric artery (IMA) origin. The bifurcation of the aorta lay behind the renal isthmus.

In order to gain proximal control the left renal vein was divided and oversewn, and the aorta cross-clamped above the right but below the left renal artery. Distal control was obtained by clamping the left common iliac and the right external iliac arteries after ligation of the right internal iliac artery. The sac was opened longitudinally and a bifurcated graft anastomosed to the neck. The graft was tunnelled, with difficulty, beneath the isthmus and the distal end-to-end anastomoses were constructed to the external iliac arteries in a standard fashion. Throughout the procedure troublesome bleeding was encountered from the aortic lumen behind the isthmus, arising from the median sacral artery. This was eventually controlled by oversewing both common iliac arteries, packing the distal aorta with haemostatic sponge and oversewing the stump. Postoperatively, the patient’s renal function remained normal and she was allowed home, without complications, on the ninth day.

Case 2

A 74-year-old gentleman, followed-up for carcinoma of the bladder, was found to have an asymptomatic AAA measuring 8 cm in its maximum diameter on USS. The kidneys and bladder were reported as ultrasonically normal and elective surgery for AAA was arranged.

A transverse supraumbilical laparotomy was performed and exposure of the infrarenal aorta revealed an unsuspected HSK with a substantial isthmus lying below the IMA. Dissection of the aortic neck below the renal arteries was performed and an infrarenal clamp was applied which caused immediate devascularisation of approximately two-thirds of the renal tissue. Renal perfusion was restored after prompt clamp removal. The procedure was abandoned and the patient underwent arteriography a few days later to clarify the renal arterial anatomy. This demonstrated apparently normally sited main renal arteries which fed the upper poles of the HSK. A large aberrant artery was seen arising from the anterior wall of the aorta (below the IMA) and feeding the isthmus and a large part of the kidney moieties (Fig. 2).

Re-exploration was performed 2 weeks later and the neck was clamped as before. The common iliac arteries were controlled with balloon occlusion catheters and the IMA was oversewn. The aberrant renal artery was perfused with Ringer lactate and the proximal anastomosis was constructed. A tube graft was tunnelled below the renal isthmus and the distal anastomosis was completed. The lower limbs were reperfused and the aberrant renal artery was then anastomosed to the anterior surface of the graft. Renal function remained normal postoperatively and the patient made an uneventful recovery, going home on the tenth day.

Discussion

Since the first operation performed by Phelan and colleagues in 1956⁴ over 100 cases of abdominal aortic reconstruction in the presence of HSK have been reported. The major challenges during surgery are posed firstly by the isthmus of the HSK lying anterior to the great vessels, and secondly by associated renovascular
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abnormalities. Up to 25% of cases of HSK are not diagnosed preoperatively, and this adds significantly to the difficulties encountered, especially in the emergency setting. At present, CT scanning is the most accurate imaging modality for the diagnosis of HSK and also provides important information about the AAA itself, thus obviating the need for any other imaging. USS alone is disappointing and frequently underdiagnoses HSK, as illustrated by our second case. Intravenous urography is reliable in 88% of cases and is extremely helpful in the delineation of the renal collecting system. It is not routinely used in aneurysmal disease. Arteriography has an accuracy varying from 25% to 67%, but is the principal tool for assessing the renal arterial pattern. We report the use of spiral CT arteriography as an additional modality, which in our first case gave accurate data regarding renal vasculature and isthmus.

The surgical exposure for aortic reconstruction remains controversial. The optimal approach should provide access to the aortic neck, bifurcation and iliac arteries, and allow reimplantation of aberrant renal vessels. It should also minimise the risk of injury to the renal collecting system.

The midline laparotomy is the most widely used and its proponents feel that it meets these criteria. In the majority of reported cases the isthmus of the HSK was left intact and the graft was simply tunnelled behind it. Our experience with the first case, however, illustrates that a bulky isthmus, if undivided, may make the distal aorta inaccessible and the control of lower lumbar or median sacral arteries difficult. The isthmus has, therefore, been divided by some to improve exposure and to gain control in cases of rupture. Opponents of midline laparotomy suggest that division of the isthmus increases the risks of urinary fistula and, since infection is common in HSK, graft sepsis is a potential risk. Severe complications, however, are exceptional and division of the isthmus is not necessarily associated with increased morbidity and mortality.

Midline incision may be combined with a right retroperitoneal dissection to facilitate visualisation and reimplantation of aberrant renal arteries. Preservation of these vessels is essential and, as the patterns of supply are highly variable, it is of paramount importance to anticipate the likely reconstructive procedure, otherwise renal failure may ensue following simple arterial ligation.

A left thoracoabdominal retroperitoneal approach is preferred by some because it avoids the collecting system and is useful in patients who have had previous surgery for congenital renal abnormalities. Its main disadvantage is the restriction of access to the right external iliac artery requiring sometimes an additional extraperitoneal incision a few centimetres above the right inguinal ligament.

Case 1 required a bifurcated graft because of an inaccessible distal aorta, although a tube graft would have been performed. Current advances in technology have now made endovascular stenting of aortic aneurysms a reality, which would have been a viable option for this case. However, in most other cases the use of endovascular stenting will be limited by the need to protect renal function by preserving aberrant renal arteries.

We report two cases of successful repair of AAA associated with HSK. In one case the aneurysm was inflammatory and that has not been previously reported. The HSK may be missed by USS and therefore CT scan, as the most reliable diagnostic modality, is necessary. Our current practice is to perform spiral CT arteriography for assessment of all aneurysms. This technique may prove useful in delineating renal arterial anatomy and, as further experience is accumulated, may replace conventional arteriography.

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References


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