Chronic type B dissecting aortoiliac aneurysm repair complicated by congenital pelvic kidney

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Although the association between abdominal aortic aneurysm and pelvic kidney is rare, previous reports have described various methods of repair with successful preservation of pelvic kidney function. We describe a unique case complicated by aortic dissection. Successful intra-operative perfusion of the kidney was maintained via a temporary axillorenal shunt. (J Vasc Surg 2008;48:727-9.)

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CASE REPORT

A seventy-year-old man presented with an asymptomatic abdominal aortic aneurysm found on an ultrasound scan performed for persistent pyuria. His past medical history included two coronary artery bypass procedures, the second complicated by a cerebrovascular accident and an atrial septal defect. Computed tomography (CT) scanning showed a type B thoracoabdominal aortic dissection. The maximum diameters of the aortic segments were 37 mm (descending thoracic), 35 mm (suprarenal abdominal), and 65 mm (infrarenal). The dissection extended into a left common iliac aneurysm (maximum diameter 30 mm) and a nonaneurysmal left external iliac artery, where it terminated. The left internal iliac artery was of normal appearance and the inferior mesenteric artery patent.

The left pelvic kidney lay medial to a sacular, nondissecting right common iliac aneurysm (maximum diameter 83 mm): the right internal iliac artery was also aneurysmal (maximum diameter 30 mm). Two pelvic renal arteries were noted to arise from the aortic bifurcation and proximal right common iliac aneurysm (Fig 1). Preoperative serum urea and creatinine were 16.5 mg/dL and 0.97 mg/dL respectively, while intravenous urography confirmed a left pelvic kidney with a single, short ureter. The right kidney and collecting system were normal. Isotope renal scintigraphy showed that the pelvic kidney contributed 36% of total renal function.

After cardiothoracic consultation, the suprarenal aortic dissection was left intact and elective infrarenal aortoiliac replacement was performed using a temporary right axilloleft renal artery shunt to maintain pelvic kidney perfusion. Although endovascular repair was considered, the authors were dubious of a successful outcome in view of the complex anatomy.

Midline laparotomy confirmed the aforementioned arterial pathology and revealed the left renal vein to cross the proximal aspect of the right common iliac aneurysm to drain into the inferior vena cava (Fig 2).

The infrarenal aorta, inferior mesenteric artery, external and internal iliac arteries bilaterally, and both left renal arteries were isolated. The right, but not the left, ureter was taped. A 6 mm bifurcated polytetrafluoroethylene (PTFE) prosthesis anastomosed end to side to the right axillary artery was infused with heparin-saline (1000 u/h). Carotid shunts (Burbank; Bard Norden AB, Kelsingborg, Sweden) were ligated to each limb of the prosthesis. Following systemic heparinization and placement of clamps, the aortoiliac systems were opened and the Burbank shunts inserted into each left renal artery orifice to preserve pelvic kidney perfusion.

The infrarenal aortoiliac aneurysms were replaced by a 24 mm by 12 mm Dacron prosthesis anastomosed end to end to the infrarenal aorta, with fenestration of the false aortic channel into the stem of the graft. The two left renal arteries were anastomosed as an aortoiliac patch to a window in the proximal segment of the right limb of the graft. The latter was anastomosed to the origin of the right external iliac artery and the origin of the right internal iliac aneurysm oversewn. The Burbank shunts were removed and the patch and external iliac anastomosis completed to establish pelvic kidney and right leg perfusion. Intraoperative doppler confirmed flow in both pelvic renal arteries throughout reconstruction and on completion of the anastomosis. Overall aortic clamp time was 3 hours. However, renal ischaemic time incurred to complete the pelvic renal artery anastomosis was 11 minutes.

The left limb of the graft was anastomosed to the left external iliac artery at the distal extent of the dissection. A 'jump graft' was taken from the left limb of the graft to the left internal iliac artery to maintain pelvic perfusion. The inferior mesenteric artery was oversewn. On completion of the intra-abdominal reconstruction, the PTFE graft was transected and oversewn to leave a short stump attached to the axillary artery.

The patient was extubated on the day of the procedure and made an uncomplicated recovery, being discharged on the tenth postoperative day. Serum urea and creatinine on discharge was 16.8 mg/dL and 0.89 mg/dL respectively.

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Competition of interest: none.

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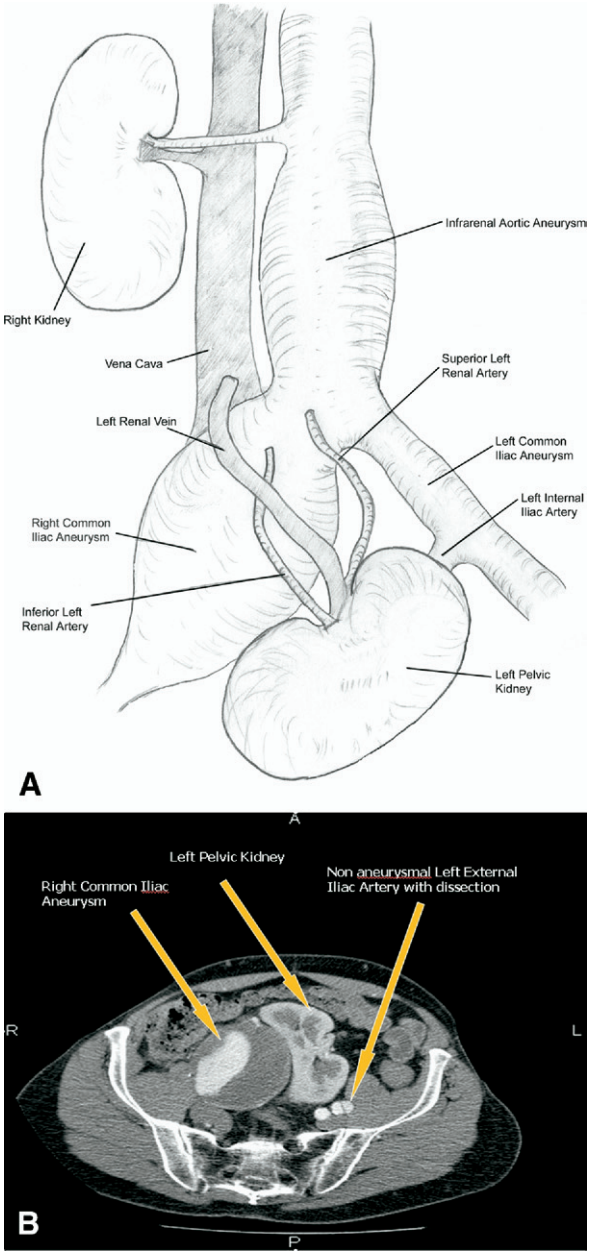

Fig 1. Diagrammatic representation (A) and computed tomography scan (B) of preoperative arterial pathology in relation to left pelvic kidney.

He was readmitted after three weeks with anaemia secondary to a chronic duodenal ulcer which healed with conservative treatment. Contrast enhanced CT scan at this time revealed satisfactory perfusion of the entire pelvic kidney, although only one pelvic renal artery was shown to be patent. The oversewn right internal iliac aneurysm did not enhance with contrast and hence deemed to have thrombosed (Fig 3).

DISCUSSION

Congenital pelvic kidney is rare, occurring in approximately one in 1000 live births[1] and results from failure of

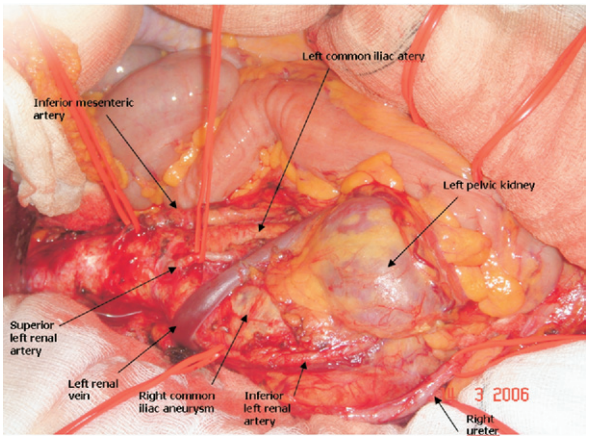

Fig 2. Preliminary dissection revealing the arterial and venous anatomy of the left pelvic kidney.

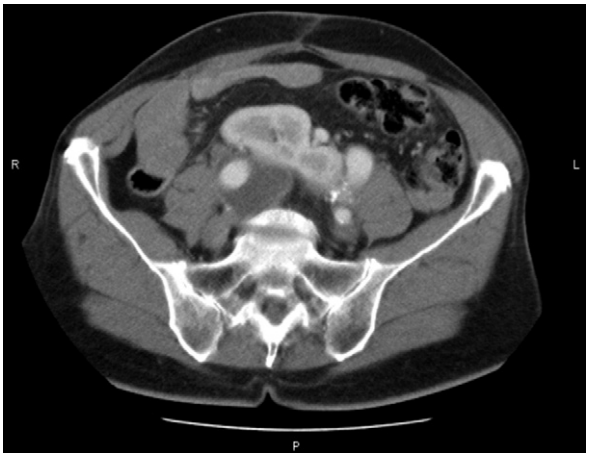

Fig 3. Contrast CT at three weeks postoperatively demonstrating satisfactory perfusion of the pelvic kidney.

the developing kidney to ascend during the fourth to the eighth week of gestation.[2] The arterial supply is often multiple, with renal arteries arising from various sites, most commonly between the distal aorta and the iliac bifurcation. A radiological study has shown that 0.18% of patients undergoing major aortic procedures have pelvic renal kidneys.[3] Our literature search has identified a total of nine cases of aortic aneurysm replacement in the presence of a congenital pelvic kidney.[4-10] However, there have been no previous reports of repair of a dissecting aortic aneurysm in the presence of a pelvic kidney. We believe this case to be unique.

Standard surgical techniques without renal protection have been successful in maintaining pelvic kidney function during uncomplicated aortic reconstruction.[2] The procedure relies upon expeditious proximal anastomosis to allow early implantation of the pelvic renal arteries into the aortic graft, before the distal anastomosis is undertaken.

Hypothermic renal ischaemia produced by perfusion with Ringer's lactate solution has also been successful,[4] but ischemic damage to the kidney is likely to occur after 45 to 60 minutes.

Proximal double clamping of the aneurysm neck[4] allows the proximal anastomosis to be performed, with perfusion of the pelvic kidney maintained by retrograde flow in the lumbar and iliac arteries. The procedure requires a suitable length of infrarenal aorta to permit placement of two clamps, while the adequacy of retrograde artery perfusion may be problematic. Patients with aneurysmal involvement of the origin of the pelvic renal arteries require extended clamping times to allow separate anastomoses for these vessels: the ischemia time has been reduced in such cases by the combined use of proximal double aortic clamping with temporary shunt from the aortic graft to the pelvic renal artery, after the proximal anastomosis is complete.[5] Distal aortic double clamping proximal to the origin of the pelvic arteries may be feasible where the latter arise from nonaneurysmal iliac arteries.[6] Again the adequacy of retrograde iliac perfusion of the kidney may be unpredictable.

The limitations of these techniques curtail their use during more complex aortic reconstructions that involve anastomosis of pelvic renal arteries to the graft, while preservation of precious solitary renal transplants is mandatory. Hence, autoperfusion techniques that minimize pelvic renal transplant ischaemia have included temporary aortoiliac[11] or axillofemoral[12] shunts, while Campbell et al reported the use of a pump oxygenator with femoral artery and vein cannulation:[13] the latter two techniques require a groin incision and introduce the risk of graft infection.

In our patient, the unpredictable duration of aortic reconstruction combined with the presence of aortoiliac dissection and two pelvic renal arteries arising from the aneurysm necessitated reliable renal autoperfusion without time constraint, achieved by the use of an axillorenal shunt. A similar method of preservation of a congenital pelvic kidney with a single artery during repair of a nondissecting aortoiliac aneurysm was reported by Hanif et al.[10]

It is evident that the surgical approach will be determined by the arterial and renal anatomy of individual patients. However, the decision to preserve function in a congenital pelvic kidney during aortic reconstruction should not be based upon renal scintigraphy alone as the results of the investigations are difficult to interpret in the presence of renal ectopia.

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