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SHORT COMMUNICATION

Supra-Celiac Aorto-Bifemoral and Left Renal Artery Bypass

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ABSTRACT

We report a 49-year-old hypertensive female smoker presenting with stroke and juxtarenal aortoiliac occlusive disease, who underwent supra-celiac aorto-bifemoral (SCAB) and left renal artery (LRA) bypass. Failure of femoral artery access during planned carotid stenting led to diagnosis of extensive occlusion of abdominal aorta and atrophic right kidney. Surgical technique, renal protection strategy involving cold perfusion with mannitol, methylprednisolone, and papaverine, and post-operative recovery are discussed.

KEYWORDS

• Supra Celiac Aorta • Aorto-Bifemoral Bypass • Renal Artery Bypass • Aortoiliac Occlusive Disease Introduction

INTRODUCTION

Aortoiliac occlusive disease (AIOD) affecting the juxta renal aorta presents technical challenges for revascularization, especially when standard infrarenal clamping is precluded by calcification or anatomy. Supra-celiac aorto-bifemoral bypass combined with renal artery reconstruction offers durable revascularization but demands advanced surgical expertise and renal protection measures to prevent ischemic injury.[1-4]

CASE REPORT

A 49-year-old postmenopausal woman presented to the neurology department with a history of recent ischemic stroke and documented stenosis of the internal carotid artery. She was planned for internal carotid artery (ICA) stenting by the interventional neurosurgical team, but the procedure failed due to inability to gain femoral access. Subsequent imaging revealed juxta renal aortoiliac occlusive disease associated with an

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atrophic right kidney and precarious perfusion of the left kidney.

On further interrogation, the patient reported intermittent claudication persisting over the past four years. She was known to have long-standing hypertension, with poor compliance to antihypertensive treatment. She denied history of diabetes, asthma, chronic obstructive pulmonary disease, or tuberculosis. There was no significant past surgical history. The patient reported disturbed sleep and reduced appetite but had normal bowel and bladder habits. She adhered to a vegetarian diet. Her smoking history included three to four beedis per day for many years, which she discontinued in April 2025 after her stroke. No known drug or food allergies were reported.

On general physical examination, the patient was conscious, oriented, and cooperative. She weighed 45.8 kg and was 154 cm tall, with a body mass index of 19.3 kg/m². Her vital parameters included blood pressure of 114/63 mmHg, pulse rate of 81 beats per minute, respiratory rate of 20 breaths per minute, and afebrile status. No pallor, icterus, cyanosis, pedal edema, or lymphadenopathy was noted.

Abdominal examination showed a flat, soft, and non-tender abdomen with normal respiratory excursions. There was no organomegaly, and the bowel sounds were normal. Cardiovascular examination revealed apical impulse in the fifth intercostal space at the midclavicular line, without thrills, parasternal heave, or new murmurs. Respiratory examination was unremarkable. Neurological examination revealed power 3/5 on the affected side.

Echocardiography revealed left ventricular ejection fraction of about 45% with borderline disease in the left circumflex artery in coronary angiography but there was no history of angina pectoris.

At this stage, the patient was referred to vascular surgery where the decision for supra celiac aorto-bifemoral and left renal artery bypass was made, considering the extensive occlusive disease and jeopardized renal perfusion.

IMAGING FINDINGS

Preoperative CT angiography (Figure 1) demonstrated complete occlusion of the abdominal aorta just distal to the origin of the renal arteries, near-total occlusion of right renal artery, and an atrophic right kidney. There was tight stenosis at the origin of left renal artery with post-stenotic dilatation. Multiple pelvic and abdominal collaterals were visualized reforming bilateral common femoral arteries.

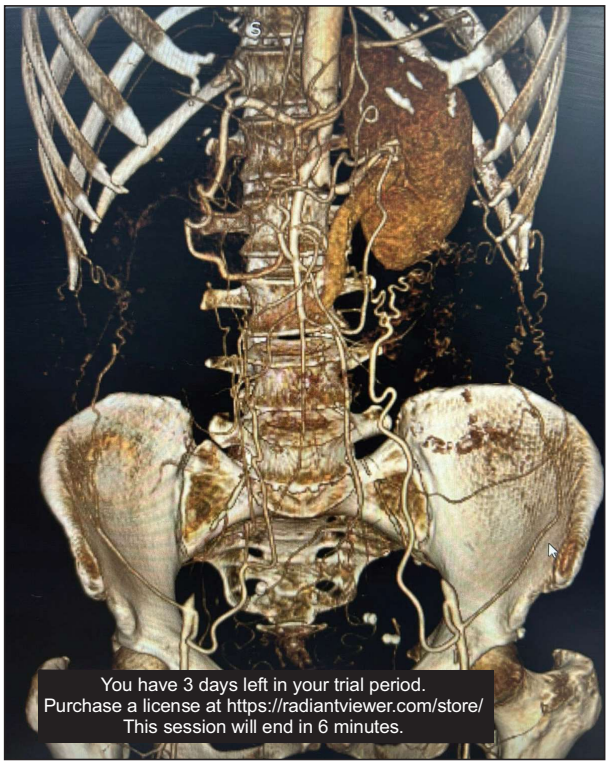

Figure 1: 3-D CT angiography showing occluded infra renal abdominal aorta and right renal artery with non opacified right kidney and ostial stenosis of left renal artery

OPERATIVE DETAILS AND TECHNICAL NUANCES

A multidisciplinary decision (including cardiovascular surgeon, gastrointestinal surgeon and urologist) was made for a supraceliac aortobifemoral bypass using a polyester (Dacron) bifurcated graft (Figure 2), with a separate bypass to the left renal artery from the proximal graft limb (Figure 3). Under general anesthesia, a midline laparotomy was performed, and self-retaining abdominal wall retractor (Thompson) is used. The left medial visceral rotation (Mattox maneuver) was performed by fully mobilizing the left colon, spleen, and pancreas to access the supraceliac aorta and retroperitoneal structures, providing direct exposure while minimizing visceral injury risk. We followed kidney down approach initially as it gives better lie of the left renal artery during grafting. Later it was taken partially up to place the graft in retro renal position.

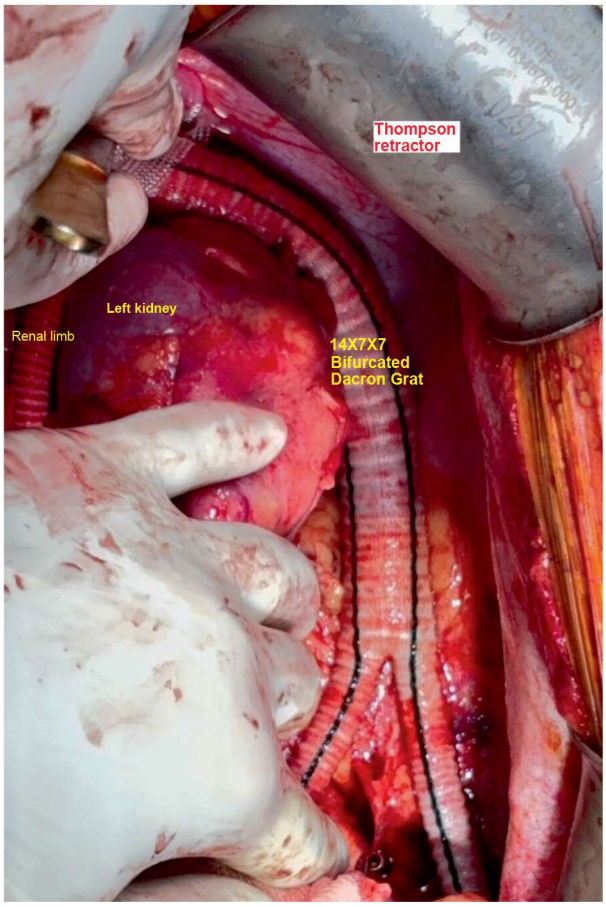

Figure 2: Aortobifemoral Dacron Y graft with renal limb

Both femoral arteries were dissected bilaterally. The left renal artery was isolated beyond the stenosed segment. After systemic heparinization, the supraceliac aorta was partially clamped (thereby maintaining the blood supply of left renal artery), and a longitudinal aortotomy created. Proximal anastomosis of the Dacron graft, sized 14 × 7 × 7 mm, was performed to the supraceliac aorta in end to side fashion. One limb was tunneled retroperitoneally to each femoral artery and anastomosed end-to-side on common femoral arteries. A 6-mm polyester graft from the proximal trunk was used for left renal artery bypass, as the left kidney was the sole functioning renal unit.

Renal protection was meticulously achieved using an evidence-based cold crystalloid perfusion protocol. A solution was prepared by mixing 500 mL Plasmalyte at 4°C with 12.5 g mannitol, 125 mg methylprednisolone, 25 mg sodium bicarbonate, 30 mg papaverine, and 1000 units of heparin. Following arteriotomy, 300 mL of this solution was infused into the left kidney via a 16G grey cannula at a rate of 30 mL/min, with the dose repeated after 20 minutes. Concurrently, topical ice packs were applied around the kidney to further minimize warm ischemic injury.[5-8]

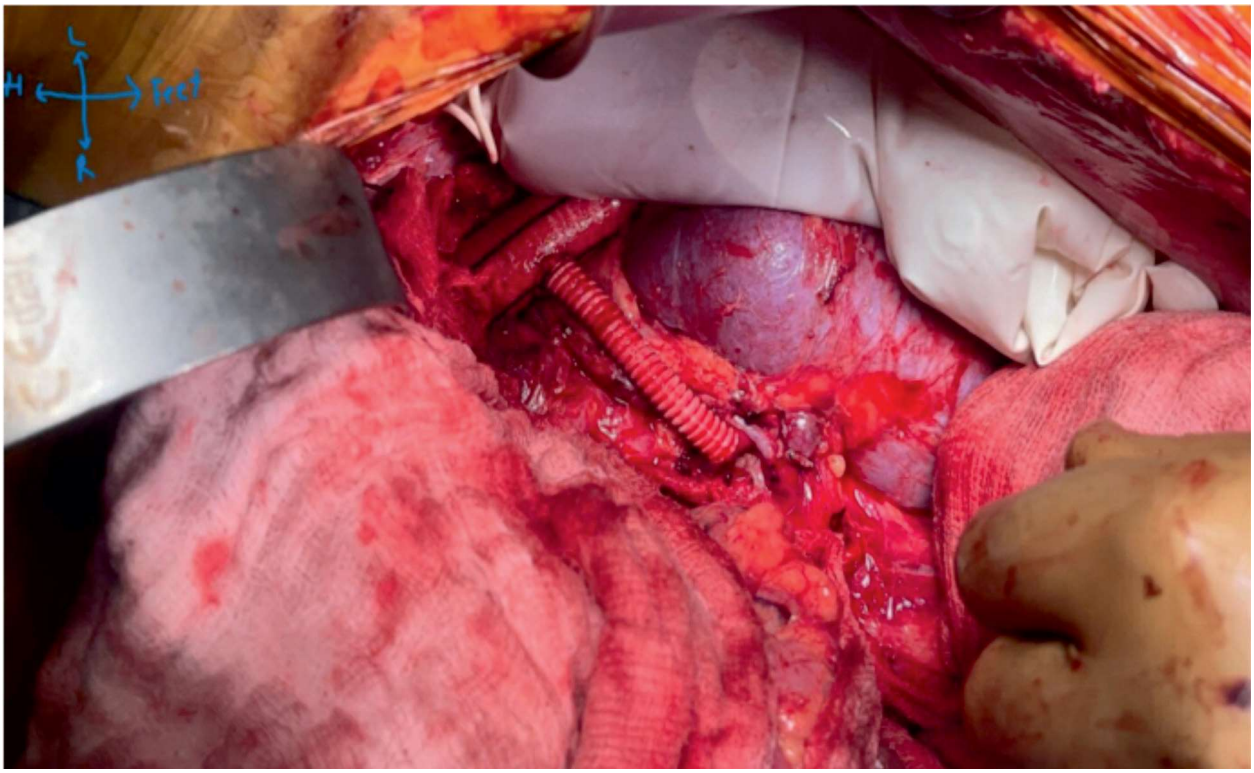

Figure 3: Renal limb of graft anastomosing with left renal artery

This protocol aligns with contemporary renal protection strategies during suprarenal cross-clamping and complex aortic reconstruction, aiming to reduce the risk of postoperative acute kidney injury especially crucial in those with solitary kidney perfusion or prolonged ischemic intervals. Hemostasis was confirmed, clamps were sequentially released, and satisfactory distal pulses were documented. The aortic clamp time was kept minimal (12 minutes in our case) to reduce renal ischemia.

POSTOPERATIVE OUTCOME

The patient did not require dialysis. Ileus developed for 3 days, likely secondary to bowel handling and retroperitoneal exposure, and resolved uneventfully. Serous wound discharge (~300 mL/day) lasted one week. She was discharged on postoperative day 10 in stable condition with palpable distal pulses and normalized renal function. Follow-up at 3 months showed sustained clinical improvement.

DISCUSSION

Supra-celiac aorto-bifemoral bypass is reserved for complex AIOD with juxta-renal extension where infrarenal aortic clamping is unfeasible due to extensive calcification, relevant anatomy or prior failed reconstructions. The supraceliac aorta provides a robust inflow but requires careful exposure, hemodynamic monitoring, and minimization of ischemic injury to visceral organs.

Renal artery reconstruction may be necessary when renal perfusion is at risk, as in solitary kidney or critical bilateral stenosis. Combining cold perfusion with mannitol, steroids, bicarbonate, papaverine, and heparin reduces ischemic renal injury during suprarenal cross-clamping and bypass.[6-9] Several extra-anatomical bypass options exist axillofemoral, descending thoracic aortofemoral, or hybrid endovascular approaches but they may offer inferior patency in young or low-risk patients.

This case illustrates successful use of a supraceliac inflow source and concomitant renal bypass, highlighting the importance of meticulous surgical planning, multidisciplinary collaboration, and individualized approach to complex aortic occlusive disease.

CONCLUSION

This case illustrates successful use of supra-celiac aorto-bifemoral and left renal artery bypass with advanced renal protection, achieving restored perfusion and functional recovery without dialysis. Such individualized, multidisciplinary approaches are essential for complex juxta-renal AIOD.

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Conflicts of Interest: None

Ethical Declaration: Not applicable as this is a case report.

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