Case Report

# Anaesthesia for autotransplantation after extracorporeal nephron sparing surgery for bilateral giant renal angiomyolipoma

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## ABSTRACT

Extracorporeal 'work bench surgery' with subsequent autotransplantation is a challenge from both anaesthetic and surgical point of view when performed bilaterally or in a solitary kidney. A 28-year-old female with bilateral giant angiomyolipoma of kidneys was taken up for renal autotransplantation. Patient had a huge tumour, which was the largest reported exophytic tumour to be excised by this technique. Both kidneys were operated at an interval of 1 month, under combined general and epidural anaesthesia. Anaesthetic challenges faced during the procedure were maintenance of adequate perfusion of the grafted kidneys, containment of massive blood loss and coagulopathy during the perioperative period. Patient recovered in due course with functioning autotransplanted kidney. A careful pre-operative preparation with intraoperative maintenance of adequate blood volume and blood pressure is the key for graft survival.

**Key words:** Angiomyolipoma, autotransplant, coagulopathy, graft, nephron sparing surgery

## INTRODUCTION

Renal autotransplantation is a method of removing kidney from its place of origin, repairing it and transplanting it in another location of the body (most commonly, the iliac fossa) of the same patient. This procedure was first performed by Hardy in 1963.[1] Since Hardy's landmark surgery for management of a high ureteral injury, renal autotransplantation has been described in the treatment of renal arterial disease, renal cell carcinoma, nephrolithiasis etc.[2] Renal autotransplantation still remains a last resort procedure for these complex urological conditions.

Angiomyolipomas are benign lesions that are frequently asymptomatic. Indications for surgery include suspicion of malignancy, haematuria, renal failure and rupture. It has been demonstrated that tumour size (>4 cm) identified on computerised tomography (CT) scan, is the most reliable predictor of rupture.

Extracorporeal 'workbench surgery' with subsequent autotransplantation is an underutilised technique. Here we describe the anaesthetic challenges in a bilateral *ex-vivo* nephron sparing surgery with autotransplantation for giant angiomyolipoma.

## CASE REPORT

A 28-year-old unmarried female weighing 55 kg presented with lower abdominal discomfort and vague lump in the abdomen of 5 years duration. She was diagnosed to have giant tumour in both kidneys. She sought medical advice at different hospitals and the tumour was deemed inoperable. Examination showed huge flank masses. Blood investigations were normal and contrast enhanced abdominal CT with angiogram showed bilateral highly vascular huge renal masses suggestive of angiomyolipoma [Figure 1]. She was taken up for right radical nephrectomy, bench surgery and autotransplantation after adequate pre-operative preparation.

We instituted general anaesthesia supplemented with low thoracic epidural at T11-12 interspace and epidural analgesia was maintained with 0.2% ropivacaine and

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fentanyl 2 mcg/ml at the rate of 4-6 ml/h. Anaesthesia was induced with glycopyrrolate 0.2 mg, midazolam 1mg, ramosetron 0.3 mg, fentanyl 100 mcg and propofol 100 mg. Intubation was facilitated with 100 mg succinylcholine and anaesthesia was maintained with $N_2O$, $O_2$, isoflurane and atracurium.

Electrocardiogram, pulse oximetry, invasive blood pressure, end-tidal carbon dioxide, central venous pressure (CVP), core temperature and hourly urine output were monitored. Abdomen was entered through a right thoracoabdominal incision [Figure 2], excising the tenth rib and splitting the diaphragm. Right kidney with the mass (30 cm × 15 cm) was removed and cannulated for cooling with the histidine tryptophan ketoglutarate solution. The warm ischemia time was 1 min and 45 s. Bench dissection was carried out and kidney was autotransplanted. Cold ischemia time was 4 h. During this period, the anaesthetic goal was to maintain mild hypertension. Mannitol was given for renoprotection (0.5 g/kg). Patient had massive blood loss approximately 5 l, which was corrected with five units of packed cells, four units of fresh frozen plasma, 9 l of crystalloids and 1 l of colloid. Dopamine and subsequently dobutamine infusion were administered to maintain her haemodynamic parameters. Urine output was sluggish after the release of cross clamps. Patient was electively ventilated. She had continuous oozing from the wound site suggestive of coagulopathy due to massive blood loss and transfusion which was corrected with further transfusion of blood components (two units of packed cells, three units of fresh frozen plasma, four units of platelets and four units of cryoprecipitate). She was haemodynamically stable and coagulopathy was corrected by the second post-operative day and she was weaned off inotropic and ventilatory support.

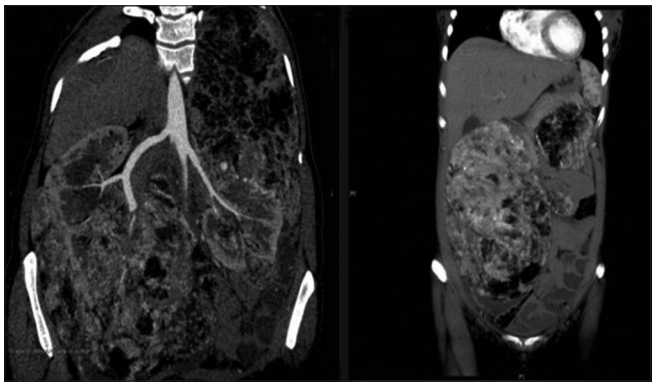

**Figure 1:** Pre-operative computed tomography angiogram-highly vascular angiomyolipoma

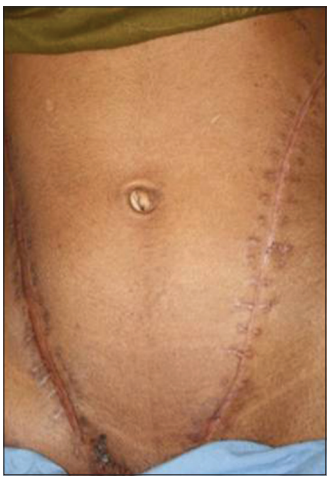

**Figure 2:** Flower vase incision

After 4 weeks, she was posted for the left nephrectomy with bench surgery and autotransplantation as she had a large tumour (26 cm × 18 cm) in the left kidney with high risk of bleeding. Renal Doppler showed suboptimal function of right transplanted kidney. Only a single arcuate artery in the lower pole cortex picked up Doppler flow with increased resistance index. Anaesthetic plan was to restrict fluids intraoperatively and to maintain haemodynamic status. The surgical technique and induction of anaesthesia were similar to what was used for the right nephrectomy. Patient was adequately hydrated before nephrectomy with 3 l of crystalloids to maintain adequate urine output. Warm ischemia time was 2 min 13 s. Cold ischaemia time was 2 h 48 min. After the nephrectomy, fluids were restricted with a goal to maintain CVP of 6-7 cm of water. Before the release of the cross clamp after transplantation, CVP was increased to 16-18 cm of $H_2O$. The target blood pressures were systolic more than 140 mm Hg, mean arterial pressures more than 95 mm Hg and the diastolic pressure more than 85 mm Hg as was practiced in renal allotransplantation. Frusemide 200 mg and sodium bicarbonate 25 ml were administered and urine output was adequate after reperfusion. Blood loss was around 1.5-2 l. She was infused nine litres of crystalloids, 500 ml colloid and two units of packed cells. The surgery lasted for 6 h. She was ventilated overnight and extubated next day. The urine output was 3.6 l. At the time of discharge her creatinine was 1.4 mg/dl and it was 1.5 mg/dl on day 30. The follow-up angiogram after 1 month showed a well-perfused kidney on the left side.

## DISCUSSION

*Ex-vivo* excision of the tumour and autotransplantation is a feasible option for bilateral giant renal lesions in

select cases, thus avoiding the morbidity associated with bilateral nephrectomy and renal replacement therapy.[2] It is a technically demanding procedure and is contraindicated in severe occlusive atherosclerosis of the iliac arteries. Renal autotransplant is a two-step procedure; first the kidney is removed, dissected extracorporeally and then transplanted. Surgical approach in removing the kidney is similar to that of living donor nephrectomy.

Angiomyolipomas are the commonest benign neoplasms of the kidney. A tumour size greater than 4 cm increases the risk of bleeding.[3] The problems that we had during the right nephrectomy were massive blood loss due to the highly vascular large tumour and maintenance of adequate renal perfusion. Once the autotransplantation was completed it was important to maintain adequate intravascular volume with colloids or blood to ensure well-perfused kidney. CVP was maintained at 16-18 cm of water and the mean arterial, systolic and diastolic pressures were maintained above 95 mm Hg, 140 mm Hg and 85 mm Hg respectively, with risk of increased blood loss.[4] We had to start the patient on dopamine and dobutamine to maintain the blood pressures. Brisk diuresis should be maintained with intravenous hydration for graft survival. Intravenous frusemide helps in urine production. Intravenous mannitol minimises ischemic injury to the kidney and hasten the restoration of renal function.[5] Post-operatively fluid management was dictated by the hourly urine output.

For the second autotransplant the problems we anticipated were a large angiomyolipoma which could bleed profusely making maintenance of CVP and blood pressures difficult. Also, the operated kidney had suboptimal function complicating fluid management.

After discussion with the surgeon, we decided to manage the patient as a donor before the nephrectomy and administered fluids as for a donor for allotransplant. Fluid loading and intravenous mannitol was given as per the protocol. After the nephrectomy, as the patient was anepheric we decided to treat the patient as an allotransplant recipient. A targeted approach, with restriction of fluids and replacement of blood loss was practiced to maintain the CVP at 6-7 cm $H_2O$ during bench dissection.[5] During the final stages of bench dissection, CVP was raised to 16-18 cm of H2O, thus enabling the patient to be adequately filled up during reperfusion with achievement of the target mean arterial, systolic and diastolic pressures. Intravenous frusemide administered would increase graft viability, turgidity and assure good urine output. It also decreases tubular $O_2$ consumption, protecting from ischemic injury.[5] A 'flower vase' thoracoabdominal incision was used [Figure 2] and analgesia was maintained with a low thoracic epidural, intravenous fentanyl, tramadol and paracetamol.

## CONCLUSION

Renal bilateral *ex-vivo* nephron sparing surgery with autotransplantation is a highly invasive surgery, which demands proper intraoperative fluid management and maintenance of adequate urine output.[6] Invasive monitoring is preferred to achieve this goal and enable smooth patient recovery and preservation of renal function.

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