Cardiac surgery in renal transplanted patient : A case report

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Cardiac surgery causes high mortality among post-renal-transplant patients. These patients are on steroids, which can accelerate atherosclerosis, and on immunosuppressive drugs, which expose the patient to infection. Here we report a case of a post-renal-transplant patient who underwent off-pump coronary artery bypass graft surgery with favorable outcome. In the present case, perioperative renal dysfunction was prevented by maintaining strict asepsis and adequate renal perfusion, by titrating the fluid based on pulmonary artery pressures, by maintaining urine output greater than 1 ml/kg/h, by avoiding cardiopulmonary bypass, and by titrating drugs according to the bispectral index, which resulted in early extubation and better outcome of the patient.

Keywords:
bispectral index, renal transplant, steroids

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Introduction

Cardiac disease accounts for ~38% of all the causes of mortality among post-renal-transplant patients [1]. These patients are at an increased risk of mortality when subjected to cardiovascular surgery. Renal transplant patients are usually on steroids, which can accelerate atherosclerosis and worsen coronary artery disease; they are also prone to infection because of immunosuppression and have narrow threshold for electrolyte and fluid balance [2]. Although special attention must be paid to infection and fluid balance, surgical intervention should always be considered, as it can improve the patient's quality of life and long-term survival.

Anesthetic management in a renal transplant recipient coming for a major cardiovascular surgery is a challenging task. A case of coronary artery bypass grafting in a renal transplant patient is described.

Case report

A 52-year-old man who underwent renal transplantation 18 months back for chronic glomerulonephritis was being maintained with tab mycophenolate mofetil 250 mg twice daily, tab cyclosporine 100 mg twice daily, and tab prednisolone 10 mg once daily. He was admitted to a tertiary care hospital with chest pain Canadian Cardiovascular Society (CCS) angina class 3, which was radiating to the left arm. He was a known diabetic, and has been on regular oral hypoglycemic drugs since 8 years. On ECG, inferior wall myocardial ischemia was diagnosed. Echocardiography revealed mid and inferolateral segmental hypokinesia with ejection fraction of 40%. Coronary angiography showed mid left anterior descending artery 70%, first diagonal (D1) ostial 80%, and right coronary artery proximal 80% occlusion. Left circumflex was normal. His preoperative blood urea was 34 mg/dl, serum creatinine was 1.1 mg/dl, and serum potassium was 3.8 mEq/dl. Other blood investigations were within normal limits.

This patient was scheduled for elective off-pump coronary artery bypass grafting. All the immunosuppressants, steroids, and cardiac medication were continued until the morning of the surgery. As there was a functioning arteriovenous fistula on the left upper limb, radial artery and intravenous access was secured in the right upper limb. Prophylactic antibiotic (ceftriaxone 1 g) and hydrocortisone 100 mg were administered. General anesthesia was induced with 5 μg/kg fentanyl citrate, 0.05 mg/kg midazolam, and a titrating dose of propofol intravenously. Trachea was intubated with a cuffed oral endotracheal tube of size 9.0 after adequate relaxation with 1 mg/kg atracurium intravenously.

Left femoral artery was catheterized for continuous arterial blood pressure monitoring. Right internal jugular vein was cannulated for central venous pressure, and Swan Ganz catheter was floated for monitoring filling pressures and fluid management. Nasopharyngeal temperature, SpO_2, $EtCO_2$, hourly urine output, arterial blood gas (ABG), and activated clotting time (ACT) were monitored. Bispectral index (BIS) was monitored for maintaining the depth of anesthesia, for titrating the drugs, and for fast-tracking.

BIS was maintained between 50 and 60. After induction, infusion of atracurium at 10 μg/kg/min was started with fentanyl and isoflurane titrated to BIS values.

Mean arterial pressure was maintained between 70 and 90 mmHg throughout the procedure. Left internal mammary artery was anastamosed to left anterior descending artery, and saphenous venous graft was used to anastamose D1 and right coronary artery. Dopamine 5 μg/kg/min was started during D1 anastamosis. Intraoperative fluid administration was guided by pulmonary artery pressure to maintain a urine output above 1 ml/kg/h. Only one dose of furosemide 20 mg was required in the present case. The total duration of surgery was 260 min, and the total urine output was 530 ml, with 1200 ml of fluid administered intraoperatively.

The patient was shifted to the surgical ICU (SICU) for postoperative management. Immunosuppressants and steroids were started intravenously as soon as the patient was shifted to the SICU. These intravenous medications were switched to oral medication in the first postoperative day (POD). The patient was extubated after 3 h. Dopamine and nitroglycerine were discontinued on the second POD. Intravenous piperacillin and tazobactam 2.2 g was administered for 6 days.

Renal parameters and any intervention carried out from first POD to fifth POD are enumerated in Table 1. All the invasive monitors were removed on the fourth POD. On the fifth POD, the patient was transferred from the SICU to the postoperative ward. The patient was discharged from the hospital after 4 days with blood urea of 38 mg/dl, serum creatinine of 1.1 mg/dl, and ejection fraction of 44%.

Discussion

The mortality rate is four times more in renal transplant patients as compared with the general population [3]. With improved survival of renal transplant recipients, the need for cardiac interventions is also on the rise [4]. The success and survival of renal transplant recipients have been improved; however, there are increased complications because of chronic immunosuppression and steroid therapy [2]. Chronic steroid use accelerates atherosclerosis, and hence there is an increased incidence of coronary artery disease. Consequently, revascularization in these patients must be performed with utmost care because of advanced atherosclerosis and the fact that perioperative myocardial infarction or graft compromise is not uncommon.

However, the renal transplant patients have normal creatinine levels, the glomerular filtration rate and effective plasma flow are likely to be significantly lower than those of healthy subjects, and the activity of drugs excreted by way of the kidney may be prolonged [5]. Therefore, it seems prudent to choose anesthetic drugs that do not rely on the kidney for excretion. Diuretics should be given only after careful evaluation of the patient's volume status, which was best guided by Swan Ganz catheter in the present case.

Chronic rejection of the allograft may be indicated by azotemia, proteinuria, and hypertension. Renal transplant patients are immunosuppressed and are at a significantly increased risk of infection. As these patients do not present with the typical signs and symptoms of infection, a high index of suspicion is required. The presence of an infection should also always be ruled out preoperatively, as it is a significant cause of morbidity and mortality after transplantation [5].

Cyclosporine and tacrolimus are metabolized by cytochrome P-450 in the liver. Therefore, drugs administered preoperatively or during anesthesia may effect cyclosporine and tacrolimus blood levels, which should be borne in mind.

Perioperative renal dysfunction was prevented in this patient by maintaining strict asepsis, adequate renal perfusion, urine output, and good postoperative management, thus maintaining the functioning of the renal allograft. Cardiopulmonary bypass (CPB) increases the incidence of renal dysfunction and inflammation and decreases the renal blood flow in an already renal compromised patient [6]. Hence, it was decided to perform the surgery by avoiding CPB.

Table 1 Renal parameters and intervention in the postoperative period

	Blood urea (mg/dl)	Serum creatinine (mg/dl)	Urine output (ml)	Interventions
1st POD	18	0.8	2020	–
2nd POD	82	2.5	1450 (positive balance 630 ml)	Inj. furosemide 10 mg, TID
3rd POD	89	2.4	2100 (negative balance 150 ml)	Inj. furosemide 10 mg, TID
4th POD	70	1.7		
5th POD	44	1.3		

POD, postoperative day.

Both increased thromboxane A2 and perhaps endothelin production are responsible for renal dysfunction, especially in renal transplant patients [7].

In the present case, fast-tracking was done and the patient was extubated at the third hour, which decreased the sedatives and relaxants; otherwise, it would have contributed to renal dysfunction. BIS played a pivotal role in titrating the drug dose to effect and fast-tracking.

Conclusion

A clear understanding of physiology in transplanted kidney, effects of CPB on renal allograft, pharmacodynamics, and pharmacokinetics of the immunosuppressive drugs are mandatory before anesthetizing a renal transplant patient undergoing major cardiovascular surgery. Preoperative left ventricular dysfunction with increased risk of renal allograft failure would result in high morbidity and mortality. By avoiding CPB, maintaining optimum intravascular volume, maintaining urine output above 1 ml/kg/h, and titrating drug dose to effect using BIS resulted in better outcome of this patient.

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Conflicts of interest
There are no conflicts of interest.

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