

# Revascularization in renal transplant patients-why and when: Our experience

Rupinder kaur Kaiche<sup>1\*</sup>, Rahul Kaiche<sup>2</sup>, Nagesh Aghor<sup>3</sup>

<sup>1</sup>Department of Cardiac Anaesthesia, Ashoka Medcover University, Nashik, India

<sup>2</sup>Department of Cardio-vascular and thoracic surgery, Ashoka Medcover University, Nashik, India

<sup>3</sup>Department of Nephrology, Ashoka Medcover University, Nashik, India.

## Abstract

**Background:** Ample documentation suggesting Renal Transplant patients undergoing CABG exists, few proved the benefits of revascularization prior to transplantation.

**Aim:** We performed revascularization before transplantation.

**Methods:** Presenting two patients for live donor transplantation, with echocardiographic findings prompting angiography. CABG was planned followed 6 months later by transplantation allowing physical, psychological, emotional recovery.

**CABG**

- Strict B.P and sugar control with Inotropes and insulin.
- Fluid management using TEE.
- BIS between 45-60
- Off-pump surgery.
- Fast-tracking-extubated within 2 hours.
- Prompt acidosis, potassium and hypothermia correction.
- Dialysis day1 postop.

**Transplant**

- Good hemodynamic stability intra and post-op
- Generous intravenous fluids.
- Good urine output, no major cardiovascular events intra,postop,2 years follow-up.

**Result:** Meticulously given anaesthesia, diligent postop management and fine surgical skills helped decrease morbidity and mortality. Renal transplantation offers best outcome for ESRD 37-53% asymptomatic ESRD patients have significant stenosis. 10% have CCF due to dilated cardiomyopathy, hypertrophic hyperkinetic disease, anemia, hyperparathyroidism, diastolic dysfunction. This prompted pre-transplant angiography. Revascularisation followed by transplantation had 98% and 88.4% cardiac event free survival at 1 and 3 years. 3. Optimal medical management, in a meta-analysis shows no difference in post-transplant cardiovascular outcomes. 5. Revascularization entails dual anti-platelet therapy with bleeding risks. With newer drug-eluting stents dual anti-platelets can be stopped after 3-6 months. During transplantation there were 36 events in revascularization group and 57 in Medical management group. 5. The severity of these events were not specified hence needs more analysis.

**Conclusion:** With advanced anesthetic and surgical techniques, it is safe to undertake revascularization pre-transplant. Further research is required to formulate guidelines to categorize patients into medical and interventional groups.

**Keywords:** ESRD, Renal transplant, Revascularization.

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## Introduction

The prevalence of End stage renal disease (ESRD) defined as renal dysfunction requiring chronic renal replacement therapy is increasing. Renal transplantation is the best option as renal replacement therapy as far as quality of life and life expectancy are concerned. However the population with ESRD far

outnumbers the renal donors, both live and cadaveric, hence most of the patients undergo dialysis [1]. Among dialysis patients only 23% have normal echocardiogram, about 10% have recurrent or chronic congestive heart failure and 17% have asymptomatic ischaemic heart disease. The predisposing factors for congestive heart failure are dilated cardiomyopathy, hypertrophic hyperkinetic disease and ischemic heart disease.

6. Dilated cardiomyopathy, a disorder of systolic function, includes age, hyperparathyroidism and smoking as risk factors. Hypertrophic disease, causing diastolic dysfunction, includes age, hypertension, anemia and hyperparathyroidism as risk factors [2]. Ischemic heart disease is due to the presence of coronary artery disease and also nonatherosclerotic disease caused by reduction in coronary vasodilator reserve and altered myocardial oxygen delivery and use.

Most patients with renal insufficiency demonstrate left ventricular hypertrophy and subsequent subendocardial ischemia secondary to arterial hypertension even prior to ESRD requiring dialysis. In addition, ESRD can cause LV dysfunction through toxic effects [3]. Uraemic environment is cardiotoxic. Another important factor is hyperparathyroidism secondary to renal failure, which has been shown to be associated with accelerated atherosclerosis and calcification of cardiac structures including valves and conduction tissue.

First case where CABG was done in post kidney transplant patient was in 1974 by Menzoin and colleagues. This was followed by many case reports and studies. However very little literature is available on cardiac surgery done prior to kidney transplant [4]. We present two case series where patients were admitted for kidney transplant but revascularization was done prior to transplant surgery.

## Methods

Presenting two patients for live donor transplantation with echocardiographic findings prompting angiography. CABG was planned followed 6 months later by transplantation allowing time for physical, psychological and emotional recovery.

### CABG

Both the patients were hemodialysed for 3 consecutive days pre-operatively to optimize intravascular volume, serum potassium and serum creatine [5].

On day of surgery, right IJV and right femoral artery were cannulated. Fistula on left radial hand was protected. Patients were induced with midazolam-fentanyl-propofol-atracurium, intubated and maintained with oxygen-air-sevoflurane. TEE probe was introduced and regular monitoring done to titrate fluid requirement. After heparinization to maintain ACT at 250-300s, LIMA-LAD, Ascending aorta-SVG-OM and ascending aorta-SVG-PDA grafting was done using Octopus tissue Stabilizer, Medtronic, US. Noradrenaline and dobutamine were titrated to maintain adequate perfusion pressures between 70-80mmhg mean. Insulin infusion was started for sugar control. Intraop sedation was titrated to maintain BIS between 45-60 [6].

Post-op patients were shifted to ICU, stabilized and extubated after two hours. Inotropes were titrated and weaned off. Transthoracic echo was used intermittently to guide fluid therapy. Serum potassium was monitored 4hrly and repeated keeping a watch on heart rate and ECG. Glucose-insulin drip was started to maintain potassium <5meq/lit. Calcium

gluconate and sodium bicarbonate was started 12hrly to correct acidosis. Normothermia was strictly maintained.

Day 1 of surgery, hemodialysis was done, on advice of nephrologist, repeated on alternate days till discharge on day. Both patients were on regular follow-up and posted for kidney transplant 6 months later.

### Renal transplantation

Pre-operative all investigations were within acceptable limits for kidney transplant surgery. Patients were dialysed night before surgery, put on triple immunosuppressants. Inj. simulect and solumedrol given prior to induction. Right IJV cannulated. Induced with midazolam-fentanyl-propofol-atracurium, maintained with oxygen-air-sevoflurane. Generous intravenous fluids were given guided by central venous pressure. Good haemodynamic stability was maintained. Urine started forming after renal vessels were anastomosed [7]. With ureteric implantation done by G.L. technique, incision was closed and after confirming good urine output patient was reversed and shifted to transplant ICU. No major cardio-vascular events were observed intra and post operatively.

Post-op patients were managed with NIV support, antibiotics and diuretics. Patients were discharged with good urine output, normal creatinine and good cardiac function and advised regular follow-ups.

## Result

Meticulously given anaesthesia, diligent postop management and fine surgical skills helped decrease morbidity and mortality [8].

## Discussion

Information regarding patient outcome after myocardial revascularization and renal transplantation is limited, even though there have been several case reports and few case series describing CABG or PTCA performed in patients with renal disease. In 1975, Nakhjavan et al reported a successful CABG in a patient with functioning renal allograft. 11. Many followed later Li Zhang analysed patients of kidney transplant undergoing cardiac surgery from 1987-2004. 10. In hospital mortality was 5.3%, all deaths being cardiac related [9]. The median interval from kidney transplant to cardiac surgery was 60 months. Infectious complications were 17.5% and allograft failure requiring hemodialysis was 28.6%. Their predictors of in-hospital adverse events like death, infection and renal failure were

- Pre-operative renal insufficiency
- Mitral valve disease
- Left ventricular dysfunction

A retrospective analysis was done for a period of 25 years (Jan 1, 1968-Jan 1, 1994) by Edward Ferguson et al, 16, which included 2989 patients of renal transplant of which 83 patients had myocardial revascularization consisting of at least 1 PTCA procedure or CABG. One patient had renal transplant and

CABG during one operation and underwent both procedures within 180 days. The mode of death in patients undergoing renal transplantation and revascularisation was most commonly cardiac disease. This observation was identical to experience of Diethelm et al and Bolman et al. The relatively high frequency of patient death from cardiovascular disease emphasises the importance of careful screening for ischemic cardiac disease in potential renal transplant recipients, particularly those with risk factors for coronary atherosclerosis such as diabetes, hypertension [3]. The improvement in renal allograft survival along with patient survival has been attributed to use of cyclosporine as an immunosuppressant. CABG was not associated with allograft loss or injury.

The question of when to perform cardiac operations relative to renal transplantation remains open. It has been observed that peri-operative bleeding increases in patients who are maintained on dialysis when they have a CABG; however the incidence of infectious complications increases in patients who had CABG after renal transplantation. Doing a CABG before transplantation may be preferable as it may diminish the incidence of myocardial infarction and thereby optimize patient survival for receiving renal allograft as we observed in our patients.

Conventional techniques for CABG are safe for patients with functioning renal allograft. However efforts to slow the progress of coronary atherosclerosis in patients of ESRD, their early diagnosis and treatment before complications like MI set in is warranted. In patients with clinically important coronary artery disease, myocardial revascularisation should be performed before renal transplantation, since cardiac disease is a common mode of death when renal failure and ischemic heart disease coexist. Revascularisation followed by transplantation had 98% and 88.4% cardiac event free survival at 1 and 3 years [10].

Optimal medical management, in a meta-analysis shows no difference in post-transplant cardiovascular outcomes. Revascularization entails dual anti-platelet therapy with bleeding risks. With newer drug-eluting stents dual anti-platelets can be stopped after 3-6 months. During transplantation there were 36 events in revascularization group and 57 in Medical management group. The severity of these events were not specified hence needs more analysis

## Conclusion

Since the prevalence of IHD is high in patients with ESRD and cardiac disease is the common mode of death when the two coexist, it is warranted to diagnose early and treat before complications like MI and death occur. With advanced

anesthetic and surgical techniques, it is safe to undertake revascularization pre-transplant. Further research is required to formulate guidelines to categorize patients into medical and interventional groups.

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## \*Correspondence to

Dr. Rupinder kaur Kaiche  
Department of Cardiac Anaesthesia,  
Ashoka Medicover University,  
Nashik, India  
E-mail: rrkaur8@gmail.com