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journal homepage: <http://www.elsevier.com/locate/crvasa>Original research article – Special issue: *Cardiovascular Surgery*

## Five-year experience with cardiac surgery procedures in dialysis-dependent patients



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### ARTICLE INFO

#### Article history:

Received 14 January 2015

Received in revised form

27 February 2015

Accepted 4 March 2015

Available online 29 March 2015

#### Keywords:

Heart surgery

Renal failure

Dialysis

### ABSTRACT

The purpose of this study was to review the outcome of dialysis-dependent patients undergoing cardiac surgery. We retrospectively reviewed 36 dialysis-dependent patients with a mean age of  $63 \pm 9.4$  years who underwent cardiac operations. Surgery included coronary artery bypass grafting (CABG) in 27 patients (75%), valve surgery in 2 (5.5%), combined CABG plus valve surgery in 5 (13.8%), combined valve surgery and MAZE procedure in 1 patient, combined valve surgery, CABG and MAZE procedure in 1 patient, major aortic surgery in 1 patient, suture of injured right ventricle in 1 patient and extirpation of infected right atrial thrombus in 1 patient. In-hospital mortality rate was 11.1%. All the deaths occurred in patients who underwent urgent procedure. Two of the deaths occurred in patients who underwent cardiac surgery procedure on pump (ascending aorta replacement and infected thrombus removing), one death occurred in a patient who underwent suture of injured right ventricle and another one death occurred in patient who underwent the conventional myocardial revascularization. The survival was 77.8% at 1 year. Generally suggested predictors of increased late mortality are heart failure, urgent/emergent surgery, the complexity of the surgical procedures (valve surgery, combined CABG, valve and major aortic surgery) and postoperative low cardiac output syndrome. In dialysis-dependent patients, CABG has an acceptable risk. Results in patients affected by valve lesions associated or not with coronary artery disease are improved by an early referral to surgery, before the onset of symptoms of heart failure.

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### Introduction

Patients with end-stage renal disease (ESRD) are at high risk of cardiovascular disease and cardiac complications, resulting in higher rates of mortality than in the general population [1].

Advancements in dialysis treatments have resulted in a progressive increase in the prevalence of people living with ESRD. The 5-year survival rate for patients with ESRD has increased and the mean age has increased also [2].

Cardiovascular diseases and cardiac complications are the major causes of death in patients with ESRD [3]. Patients with

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<http://dx.doi.org/10.1016/j.crvasa.2015.03.004>

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ESRD have a greater risk of suffering from coronary artery disease [4], because they have a greater incidence of systemic hypertension, diabetes mellitus and dyslipidemia. Patients with ESRD have an acceptable prognosis after open heart surgery procedures. In the literature, the reported hospital mortality for these patients has ranged between 0% and 36% [5–11].

Although there has been tremendous advancement in the use of percutaneous transluminal coronary angioplasty (PTCA) for the treatment of coronary artery disease, coronary artery bypass grafting (CABG) remains the gold standard for revascularization [12]. There is a question if off-pump coronary artery bypass (OPCAB) surgery is potentially attractive for patients likely to have severe vasculopathy, such as patients with ERDS. Its principal physiologic advantages over on-pump CABG surgery include the ability to avoid the deleterious consequences of systemic inflammatory response initiated by the cardiopulmonary bypass [13] and thromboembolism caused by aortic cannulation and crossclamping [14]. In our institution we usually perform the OPCAB procedure depending on patient's hemodynamic stability. This is usually problem in patients who are undergoing the urgent or emergent procedure.

The meta-analysis focused on valve replacement in patients with ESRD on dialysis has shown that there no difference was observed in survival between the valve types (bioprostheses versus mechanical prostheses) [15]. But bioprostheses valve replacement is associated with fewer valve-related complications. The choice of valve in the patients with ESRD should be determined by age, level of activity and patient choice. There is no sufficient evidence to recommend mechanical or tissue valves. Due to the limited life expectancy of these patients, bioprosthetic valves should be considered especially since there is no evidence of early degeneration of tissue valves in this subgroup of patients [16].

The goal of this study was to evaluate perioperative and mid-term results of cardiac surgery procedures in patients with ESRD.

## Materials and methods

We retrospectively reviewed the data of 36 dialysis-dependent patients (14 women and 22 men) who underwent heart surgery between 2008 and 2013 at our institution. Mean patient age at the time of surgery was  $63 \pm 9.4$  years (range 44–80). Mean preoperative duration of dialysis was  $4.8 \pm 6.3$  years (range 0.5–12 years). Preoperative mean creatinine level was  $58.8 \pm 275$   $\mu\text{mol/l}$  (range 200–1019  $\mu\text{mol/l}$ ). And preoperative mean potassium level was  $4.9 \pm 1.6$   $\text{mmol/l}$  (range 3.12–6.88  $\text{mmol/l}$ ).

All the patients underwent dialysis on the day prior to surgery and on the first postoperative day after hemodynamic stabilization.

Emergent operation was defined as in the case of an operation performed within the same working day of the consultation or within 24 h after consultation. Urgent operation was defined as an unscheduled operation performed within 72 h after consultation.

Heart surgery was performed using cardio-pulmonary bypass (CPB) in 16 patients (44%), while the others 20 patients were operated off-pump. On-pump operations were supported

**Table 1 – Demographic and pre-operative clinical characteristics.**

Variables	Number of patients
Gender	
Male	22
Female	14
Hypertension	27
Diabetes	17
History of smoking	15
COPD	4
Hypercholesterolemia	12
Peripheral arterial vascular disease	9
Vascular neurologic disease	6
Previous AMI	2
HF history	7
Previous PTCA	2
AF	5
Anemia	30
CCS class III	9
CCS class IV	4
NYHA class III	10
NYHA class IV	7
LVEF (%) $\pm$ SD	$50\% \pm 14.2$
LVEF $\leq 35\%$	8
Urgent operation	9
Emergent operation	4

COPD, chronic obstructive pulmonary disease; AMI, acute myocardial infarction; HF, heart failure; AF, atrial fibrillation; LVEF, left ventricular ejection fraction.

with intraoperative hemofiltration during CPB time if it was necessary. Antegrade cold blood or cold crystalloid intermittent cardioplegia was used at the discretion of the operating surgeon. Off-pump beating heart revascularization was performed always if it was possible depending on patient's hemodynamic stability.

CABG-related myocardial infarction was defined as the evidence of cardiac biomarker values more than five times the 99th percentile of the normal reference range during the first 72 h following CABG, when associated with appearance of new pathological Q-waves or new left-bundle branch block, or angiographically documented new graft or native coronary artery occlusion, or imaging evidence of new loss of viable myocardium.

Cerebrovascular accident was defined as any neurological deficit longer than 24 h confirmed by clinical findings or computed tomographic scan.

Bleeding was determined as a re-exploration owing to excessive mediastinal bleeding or cardiac tamponade.

Respiratory failure was determined as a requirement for mechanical ventilatory support for more than 2 days after surgery in the ICU.

In-hospital mortality was considered to be any death occurring within 30 days after surgery (Table 1).

## Results

We identified 36 patients on hemodialysis who underwent the cardiac surgery during the 5-year period 2008–2013.

Twenty-one (58.3%) patients underwent isolated CABG surgery, eight (22.2%) underwent combined CABG plus valve

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