

# Can Preoperative Serum Level of Creatinine Predict New-Onset Atrial Fibrillation in Non-diabetic Male Patients Undergoing Open Heart Surgery? A Retrograde View

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**Abstract-** Renal dysfunction is a risk marker in patients who candidate for coronary artery bypass graft (CABG). Renal disorder is associated with prolonged stays in intensive care unit and hospital, morbidity and mortality. Aim of this study is specific evaluation of association between preoperative creatinine (Cr) with atrial fibrillation (AF) after elective off-pump CABG in non-diabetic male patients with normal ejection fraction. Two hundred non-diabetic male patients with normal ejection fraction undergoing elective off pump CABG surgery enrolled in this cross-sectional study and were stratified by present or absence of postoperative atrial fibrillation: patients with postoperative new-onset atrial fibrillation (n=100) as group 1 and patients without new-onset postoperative atrial fibrillation as group 2 (n=100). Preoperative serological test of the participants, such as serum creatinine, were recorded in their medical dossiers. Data were analyzed in SPSS-16 software and tested for association between atrial fibrillation with creatinine level by using student t test, chi-square test or logistic regression. Cr level in patients with and without AF three days before surgery were  $1.8\pm 0.3$  and  $1.0\pm 0.4$  respectively (*P* value for *Cr*=0.00). On surgical day, mean Cr level in patients with and without AF were  $1.6\pm 0.2$  and  $1.1\pm 0.5$  respectively (*P* value for *Cr* = 0.00). Of the 100, male patients with postoperative AF, duration and frequency of recurrence of AF were not associated with Cr at three days before surgery and on surgical days (*P*>0.05). Patients with postoperative AF had unsuitable status of renal function compare to patients without AF; however, preoperative serum creatinine cannot associate with duration and frequency of recurrence of AF.

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**Keywords:** Renal function; Atrial fibrillation; Elective off-pump CABG; Serum creatinine level

## Introduction

Renal dysfunction is a risk marker in patients who candidate for coronary artery bypass graft (CABG). Chronic kidney disease is associated with prolonged stays in intensive care unit and hospital, early morbidity and mortality and increase the cost of therapy. (1) Previous evidences indicated that elevated creatinine (Cr) level predispose patients to mortality after open heart surgery. (1,2) Atrial fibrillation (AF) is one of the most common arrhythmias in hospitalization stay that occurs in 30% patients on the first, second or third day after CABG. (3) Old age, male sex, preoperative leukocytosis, preoperative pericarditis and increase in inflammatory marker may contribute to presenting of

AF after heart surgery. (4) Early incidence, duration, and recurrence of AF after elective off-pump CABG, which are associated with preoperative levels of serum Cr are not clearly and specifically known. This study was designed to evaluate the association between preoperative creatinine with AF after elective off-pump CABG in non-diabetic male patients with normal ejection fraction. Advantages of this study are including a specific evaluation for this problem in cardiac surgery, selection of patients are according to matching bases for exact detection of relationship.

## Materials and Methods

This cross-sectional study was approved by the ethical

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## Association between preoperative serum level of creatinine and postoperative AF

committee in our hospital. Written consent was received from all patients (n=200) who voluntarily underwent elective off-pump coronary artery bypass graft (CABG) at the Afshar Cardiovascular Hospital of Yazd-Iran from May 2011 to April 2012. All the operations were performed by certain surgical team. Two hundred non-diabetic male patients with normal ejection fraction undergoing elective off pump CABG surgery enrolled in this investigation and were stratified by present or absence of postoperative atrial fibrillation: patients with postoperative new-onset atrial fibrillation (n=100) as group 1 and patients without new-onset postoperative atrial fibrillation as group 2 (n=100). According to international instruction indexed in Kirklin/Barratt-Boyes Cardiac Surgery textbook, 3rd edition (two-volume set), postoperative renal insufficiency was defined creatinine level more than 2.2 mg/dl, therefore, changes in renal serum markers may predispose to morbidity and mortality after open heart surgery. All the patients were operated using standard median sternotomy and monitored for five days after surgery. Preoperative serological test of the participants, such as serum creatinine, were recorded in their medical dossiers. Matching was based on age and confounding variables in our study in both groups. All patients underwent Holter monitoring in intensive care unit and hospital stays. Demographic variables that compared between both groups were according to New York Heart Association classification, occurrence, duration and frequency of recurrence of AF and serum creatinine of all patients were saved. Data were analyzed in SPSS-16 software and tested for association between atrial fibrillation with creatinine levels by using student t test, chi-square test or logistic regression.

## Results

One hundred non-diabetic male patients suffering from

AF after off-pump CABG (group 1) and 100 non-diabetic male patients without postoperative AF five days after surgery (group 2) were monitored during the hospital stay. The average age of the patients was  $64.3 \pm 14.6$  years. The prevalence of risk factors in both groups was hypertension (n=114, 57%), HLP (n=89, 44.5%), cerebrovascular accident (n=5, 2.5%), and cigarette smoking (n=77, 38.5%). Demographic variables have been presented in Table 1. There were not significant differences between two groups for demographic variables. In the AF group, overall duration and frequency of recurrence of AF were  $1228 \pm 860$  minutes and  $2.7 \pm 1.1$  respectively. In the control group, there were one case (1%) with one-vessel, 8 cases (8%) with two-vessel, and 73 cases (73%) with three-vessel, and 18 cases (18%) suffering from left main artery disease. In patients with postoperative AF, there were four cases (4%) with two-vessel, and 84 cases (84%) with three-vessel disease, and 12 cases (12%) suffering from left main artery disease. Distribution of type of involved vessels had not statistically differences between both groups. ( $P > 0.5$ ) Mean Cr level in patients with and without AF three days before surgery were  $1.8 \pm 0.3$  and  $1.0 \pm 0.4$  respectively. ( $P$  value for Cr=0.00). (Table 2) On surgical day, mean Cr level in patients with and without AF were  $1.6 \pm 0.2$  and  $1.1 \pm 0.5$  respectively. ( $P$  value for Cr=0.00). (Table 2) Of the 100 male patients with postoperative AF, duration and frequency of recurrence of AF were not associated with levels of Cr at three days before surgery and on surgical days ( $P > 0.05$ ). These findings show that three days before surgery and on the surgical day, there were differences in the serum Cr between the two groups. So, preoperative elevated creatinine may predispose patients to AF after open heart surgery; however, elevation of this serum marker cannot associate with duration and frequency of recurrence of AF.

**Table 1.** Demographic variable in both groups.

Variables	AF group (n=100)	Control group (n=100)	P. value
Age (year)	$62.8 \pm 9.5$	$65.6 \pm 11.3$	0.8
HTN [n (%)]	63 (63%)	51 (51%)	0.85
HLP [n (%)]	40 (40%)	49 (49%)	0.9
CVA [n (%)]	2 (2%)	3 (3%)	0.8
Cigarette smoking [n (%)]	45 (45%)	32 (32%)	0.65

**Table 2.** Preoperative serum creatinine levels in both groups.

Variables	AF group	Control group	P value
Serum Cr (3 days before surgery)	$1.8 \pm 0.3$	$1.0 \pm 0.4$	0.00
Serum Cr (surgical day)	$1.6 \pm 0.2$	$1.1 \pm 0.5$	0.00

## Discussion

AF is one of the most prevalent arrhythmias after open heart surgery that can be an important cause of early and late morbidity and mortality among patients. Occurrence of postoperative AF is related to the type of surgical operation as well as the procedure and duration of postoperative management and monitoring. One of the most problems in preventing of postoperative AF is attention to changes in serological markers. (3-5) Our study focused on evaluation of association between preoperative creatinine and postoperative incidence, duration and frequency of recurrence of AF in same gender patients with normal ejection fraction. In a study conducted by Jyrala *et al.* reported that mild increase in serum creatinine may be a marker for poor outcomes after cardiac surgery. (6) Regarding that atrial fibrillation is a risk factor for early and late morbidity after open heart surgery, our study indicate that serum Cr can be a predictor for and postoperative arrhythmia and poor outcomes.

In a study carried out by Radmehr *et al.* indicated that patients with mild increased level of serum Cr (1.3-2.2 mg/dl) had more chance for postoperative atrial fibrillation in intensive care unit and hospital stays, therefore, prolonged ICU stay resulted from early atrial fibrillation can provide background for poor outcomes after coronary artery bypass surgery. (7) This study is in line with our study, although our study focused on the relationship between serum Cr and atrial fibrillation specifically in a retrograde evaluation. Another similar study about renal dysfunction and arrhythmia after CABG conducted by Zakeri *et al.* suggested that mild renal dysfunction can an important predictor of common arrhythmias in terms of in-hospital. (8) In a study carried out by Takahashi *et al.* suggested that Treatment of AF by catheter ablation may associate with improvement of status of kidney function over one year follow-up in patients with mild to moderate kidney dysfunction. This study has importance for approving of our study. Takahashi *et al.* indicated that treatment of AF may provide suitable background for improvement of renal function; therefore, renal dysfunction had a relationship with atrial fibrillation directly. (9) Finally, we conclude that Patients with postoperative AF had unsuitable status

of renal function compare to patients without AF; however, preoperative serum creatinine cannot associate with duration and frequency of recurrence of AF.

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