



Original article

Perioperative glycemic control in diabetic patients undergoing coronary artery bypass graft surgery

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Abstract

Background: The concept of perioperative glycemic control in cardiac surgery patients was conducted in many studies, however, it remains unclear how tight the glycemic control should be. Our aim is to study the effect of perioperative tight glycemic control versus moderate glycemic control on the outcome of diabetic patients undergoing coronary artery bypass graft (CABG) surgery.

Methods: This study is a randomized prospective study conducted on 135 diabetic patients planned for CABG surgery. Patients were divided into 2 groups: group A subjected to tight glycemic control during operation to maintain blood glucose level between 110 and 149 mg/dl and group B subjected to conventional moderate glycemic control to achieve blood glucose level between 150 and 180 mg/dl using continuous insulin infusion started before anesthesia induction and continued till the patient is extubated in ICU. Both groups were followed up till 1 month after operation regarding operative mortality and postoperative outcome.

Results: No significant difference between both groups in mortality, however there was statistical significant relationship between tight glycemic control group and lowered incidence of postoperative atrial fibrillation, sternal wound infection, need for inotropic support and reduced time spent on mechanical ventilation. We noticed reduction in incidence of acute renal failure in tight glycemic control with no difference between both groups in neurological insults, renal dysfunction and perioperative myocardial infarction.

Conclusion: Tight glycemic control improved perioperative outcome in diabetic CABG patients. Maintaining perioperative blood glucose level between 110 and 149 mg/dl is safe and should be recommended as a routine practice in diabetic patients undergoing CABG surgery.

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1. Introduction

Approximately half of patients candidate for coronary artery bypass graft surgery (CABG surgery) have diabetes mellitus or metabolic syndrome [1]. Diabetic patients are characterized by more diffuse coronary artery disease, abnormal fibrinolysis, impaired platelet function, abnormal endothelial function with more expectation of lower graft patency and increased perioperative mortality [2,3]. Postoperative hyperglycemia was considered as a predictor of poor outcome post CABG surgery [4]. Uncontrolled hyperglycemia can predispose to increased incidence of ischemic brain injury, arrhythmia and sternal wound infection due to impaired phagocytosis and neutrophilic function in diabetic patients [5,6].

The concept of perioperative glycemic control in cardiac surgery patients was conducted in many studies. The Society of Thoracic Surgeons published guidelines regarding blood glucose management during cardiac surgery, recommending maintenance of blood glucose <180 mg/dl utilizing an insulin infusion and maintaining the level to less than 150 mg/dl in high risk cases [7]. While there is consensus that hyperglycemia should be avoided in the perioperative period in patients undergoing open-heart surgery, it remains unclear how tight the glycemic control should be.

In this study we aimed to detect the effect of perioperative tight glycemic control versus moderate glycemic control on the outcome of diabetic patients undergoing CABG surgery.

2. Patients and methods

This study is a randomized prospective study conducted on 135 diabetic patients planned for CABG surgery during the period from January 2013 till January 2015 in Tanta University Hospital and National Heart Institute. We excluded from the study emergency CABG, off pump surgery and combined valve and CABG surgery. Patients were randomly assigned into 2 groups according to computer allocated generation table (graph pad software). Informed consent was taken from all patients involved in the study. Group A including 67 patients who were subjected to tight glycemic control during operation to maintain blood glucose level between 110 and 149 mg/dl and group B including 68 patients who were subjected to conventional moderate glycemic control to achieve blood glucose level between 150 and 180 mg/dl during operation. Perioperative tight glycemic control was achieved by continuous insulin infusion using insulin actrapid HM Novonordisk 50 unit in 500 ml saline 0.9% by syringe pump started before anesthesia induction and continued till patient weaned from mechanical ventilation. The blood glucose was checked hourly by blood glucose meter.

All patients involved in the study were subjected to complete history taking including age, sex, hypertension, preoperative blood glucose level, COPD, history of myocardial infarction, renal dysfunction and cerebrovascular accident. Preoperative echocardiography was done to detect ejection fraction, wall motion abnormality (hypokinesia, dyskinesia or akinesia) and associated valve lesion. Preoperative coronary angiography was examined regarding number of vessels to be grafted and degree of stenosis of each vessel. All patients in the study were operated on cardiopulmonary bypass and cold blood cardioplegia were administered to all patients. LIMA were harvested in all patients and anastomosed to LAD. Saphenous vein grafts were harvested and grafted to other vessels. Cardiopulmonary bypass time and aortic cross clamp time were recorded in all cases.

Patients in both groups were followed up for operative mortality (defined as mortality within 30 days of operation or during hospitalization due to cause related to operation), renal dysfunction (elevated serum creatinine above 2 mg/dl postoperative or more than 25% of preoperative level), acute renal failure required postoperative dialysis, postoperative permanent neurological deficit, sternal wound infection, leg infection and need for postoperative inotropic support that was defined as the use of dopamine ≥ 5 $\mu\text{g}/\text{kg}/\text{min}$; any dose of epinephrine, norepinephrine, dobutamine, or milrinone. All patients were followed up regarding duration of mechanical ventilation postoperatively. Prolonged mechanical ventilation was defined as cumulative duration of 24 h or more of endotracheal intubation starting from transfer of the patient to cardiac surgery ICU after completion of operation. The occurrence of postoperative atrial fibrillation (AF), and perioperative myocardial infarction were recorded. Perioperative myocardial infarction was defined as any patient having fresh ECG changes including new Q-waves in two precordial leads, new bundle branch block, hemodynamic compromise with new segmental wall motion dysfunction or elevation of CK MB over 100 U/L after undergoing open heart surgery. Patients were discharged from hospital when they had stable cardiac rhythm, temperature less than 37.5 °C, well healed incision,

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