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ORIGINAL ARTICLE

Impact of surgeon experience on the rate of blood transfusion in off-pump coronary artery bypass

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Background/Purpose: Off-pump coronary artery bypass (OPCAB) reduces the rate of blood transfusion. No studies have focused on the effect of surgeon experience on the transfusion rate. We sought to assess the transfusion rate in OPCAB and to evaluate the effect of surgeon experience.
Methods: Retrospective review of 1055 consecutive patients undergoing OPCAB between 2000 and 2012. Patients were divided into tripartites by the year of operation (2000–2004, 2005–2008, and 2009–2012). Surgeon experience was evaluated with revascularization index and conversion rate.
Results: Mode of intervention was elective in 768, urgency in 185, and emergency in 102 patients (10%). Blood transfusion was associated with increased rates of hospital mortality and sternal wound/bloodstream infections. Revascularization index was 1.22 ± 0.29 per patient and increased over time, from 1.05 ± 0.21 in 2000–2004 to 1.39 ± 0.26 in 2009–2012. Conversion rate was 10% and decreased over time, from 17% in 2000–2004 to 6% in 2009–2012. The average rate of blood transfusion was 58% and decreased over time, from 74% in 2000–2004 to 41% in 2009–2012. Rate of red blood cell transfusion was 56% and decreased from 72% in 2000–2004 to 40% in 2009–2012. Rate of platelet transfusion was 21% and decreased from 25% in 2000–2004 to 15% in 2009–2012. The most significant decrease in the transfusion rate was observed in nonemergency cases.
Conclusion: Surgeon experience reduced the need of blood transfusion after OPCAB. Increasing surgeon experience was associated with a 33% reduction in blood transfusion rate.

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

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Introduction

Perioperative blood transfusions are known to increase morbidity and mortality after coronary artery bypass grafting (CABG) surgery. Efforts to avoid unnecessary transfusions and decrease blood transfusion are important.[1–6] CABG has traditionally been performed with the use of cardiopulmonary bypass, which has been suggested to be related to the increased rate of blood transfusion. The technique of operating on a beating heart or off-pump coronary artery bypass (OPCAB) was developed to decrease postoperative complications.[7,8] The use of OPCAB, as compared with on-pump CABG, significantly reduced the rates of blood transfusion.[9–11] Given the technical difficulty of performing OPCAB, it is likely that a strong relationship exists between surgeon experience and the rate of blood transfusion.[12,13] However, none of previous studies have focused on the effect of surgeon experience on the rate of blood transfusion in OPCAB. The purpose of this study was to assess the rate of blood transfusion in OPCAB and to evaluate the effect of surgeon experience.

Methods

Patients

This was a retrospective, observational, cohort study of prospectively collected data. We included all consecutive patients undergoing OPCAB by a single surgeon (R.-B.H.) between December 2000 and September 2012 at the National Taiwan University Hospital, Taipei, Taiwan. No patient was excluded from OPCAB because of pattern of coronary artery disease, cardiogenic shock, or emergency of surgery. Patients who underwent simultaneous valvular or aortic surgery were excluded. Intention-to-treat data were obtained in the current study. OPCAB cases that were converted to on-pump procedures remained in this study.

National Taiwan University Hospital is a 2200-bed tertiary care hospital. It serves an urban population of two million as both first-line and tertiary facilities. It serves also as a referral center for other hospitals in the country with a population of 23 million people. Dr. Hsu is an attending cardiac surgeon since 1996. All data were collected by retrospective chart review. The local Institutional Medical Ethics Committee approved the study and waived the need for informed consent.

Surgery

Beginning from December 2000, we stared to treat all patients with coronary artery disease with CABG without the use of cardiopulmonary bypass or OPCAB. As described previously,[14] surgery was performed through a median sternotomy. We harvest the internal mammary artery using a skeletonized method for clear and precious hemostasis. The heparin dose is two-thirds of the standard dose for cardiopulmonary bypass. The target activated clotting time is >350 seconds. This is partially reversed with one-half the calculated protamine dose after the completion of coronary anastomosis. Cardiopulmonary bypass was on standby without priming the pump. Operation was converted to on-pump beating heart coronary artery bypass if there was hemodynamic compromise during the procedure. The procedure did not change over during the study period.

Definition

Emergency surgery patients were defined as unstable patients with cardiogenic shock or acute coronary syndrome requiring immediate operation. Urgent patients were defined as patients with cardiac conditions who were kept in the hospital before surgery. Elective patients were defined as clinically stable patients who were discharged home while waiting for surgery. Cardiogenic shock was defined as persistent shock even with the use of inotropic infusion and intra-aortic balloon pumping. The completeness of revascularization was identified by comparing the number of distal anastomosis with the number of diseased coronary arteries. Revascularization index was defined as the ratio of the number of distal anastomosis and the number of diseased vessels.[14–17] If the number of distal anastomosis equaled the number of diseased vessels, the revascularization index was 1. The conversion rate means the ratio of operation being converted from OPCAB to on-pump CABG.

Transfusion strategy

Patients undergoing elective OPCAB discontinued antiplatelet therapy (aspirin or clopidogrel) 3–5 days before surgery. Patients requiring urgent or emergent surgery continued their antiplatelet therapy. No preoperative phlebotomy, cell saver blood salvage system, or antifibrinolytic agents were used during the operation. We adopted a liberal blood transfusion strategy.[3] Hemodynamically stable patients who could be estimated to achieve a hemoglobin level of 10.0 g/dL were not transfused. Fresh frozen plasma was administered only for a prolonged prothrombin time. Because of the high incidence of preoperative antiplatelet therapy, platelets were given to all patients with excessive bleeding.

A total of 1055 consecutive patients underwent OPCAB. Surgeon experience and the rates of blood transfusion were determined by summarizing the patient data into tripartite by the year of surgery. Patients were divided into three groups. The first cohort, Group 1, consisted of 353 patients who underwent surgery between the years 2000 and 2004. The second cohort, Group 2, consisted of 316 patients which were operated between the years 2005 and 2008. The third cohort, Group 3, consisted of 386 patients who underwent surgery between the years 2009 and 2012. Surgeon experience was evaluated with a combination of revascularization index and conversion rate. Data on baseline patient characteristics, surgery details, perioperative outcomes, and blood transfusion were compared between groups.