

# Effect of transfusion on dizziness in anemic patients after elective off-pump coronary artery bypass graft surgery

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## Abstract:

**Background:** Neurological disorders are common complications following coronary artery bypass graft (CABG). Dizziness in convalescence period is of high importance because it can prolong patient's stay at the hospital and decrease in sense of rehealing. Transfusion indication is seen in hemoglobin levels  $<7$  g/dl; however, dizziness has been frequently observed in patients with hemoglobin levels 7-10 g/dl and they have dramatic response to transfusion. Therefore, this study was designed to evaluate effect of transfusion on dizziness in hemoglobin levels of 7-10 g/dl to set a more accurate indication for transfusion in anemic patients after elective off-pump CABG. **Materials and Methods:** This clinical trial study was conducted on 90 patients undergoing elective off-pump CABG surgery from January to June 2011, in Afshar cardiovascular center, Yazd, Iran. Patients with hemoglobin levels of 7-10 g/dl measured 48 h after CABG were included in this study and those who stayed in ICU more than 48 h were excluded. The subjects were randomly divided into two groups: the experimental group received packed cell according to study protocol while the control group did not receive packed cell. Hemoglobin concentration was measured at 48 h and 72 h after CABG and discharge time, respectively. Dizziness was evaluated 72 h after surgery. Data were analyzed by ANOVA, Chi-square, and Fisher's exact test for quantitative and qualitative variables. **Results:** The mean age of the patients was  $63.5 \pm 10.67$  years, from all of patients in which 50 cases (55.6%) were males and 40 cases (44.4%) were females. Dizziness after surgery occurred in 35 cases (38.8%), of whom, 27 cases (62.8%) were in the control group and 8 cases (17%) were in the transfusion group. Significantly a difference in the incidence of dizziness was found between two groups ( $P = 0.001$ ). **Conclusion:** Transfusion in hemoglobin levels of 7-10 g/dl can be useful to decrease dizziness in anemic patients after elective off-pump CABG; however, the guidelines in textbooks suggest transfusion after CABG to be in hemoglobin levels  $<7$  g/dl.

## Key words:

Anemia, dizziness, elective off-pump coronary artery bypass graft, transfusion

## Introduction

Coronary artery disease (CAD) is one of the most common causes of morbidity and mortality in developed and developing countries. Coronary artery bypass graft (CABG) is the most common cardiac surgery around the world.<sup>[1]</sup> Neurological complications following CABG are incompetency of motor posture, sensation, reflex, convulsion, and consciousness level during 36 h after open heart surgery. Neurological events including stroke, dizziness, cognitive disorder, central, or peripheral neuropathy can increase morbidity and mortality after cardiac surgery.<sup>[2-4]</sup> Dizziness describes two different symptoms: vertigo and lightheadedness (faintness). Vertigo explains the sense of spinning, whirling, or motion either of yourself and lightheadedness is a sense like you might faint. The common causes of dizziness may include bleeding, stroke, multiple sclerosis, seizures, and brain tumors. The most important reason of dizziness is anemia following internal bleeding or hemorrhage during surgical procedure. The common symptoms in patients that suffer from dizziness are actual fainting, weakness, confusion, headache or head pressure,

imbalance, facial numbness, pain of eye, changes or loss of vision, blind spots, dry mouth, and decreased hearing.<sup>[5,6]</sup> One of the common complications in cardiac surgery is bleeding during surgery, ICU, and hospital stay. Anemic patients need red blood cell (RBC) transfusion in the preoperative phase. Without RBC transfusion, anemic patients suffer from insufficient hemoglobin to withstand hemodilution during off-pump myocardial revascularization bleeding.<sup>[7,8]</sup> The common indications for transfusion include shortness of breath, dizziness, congestive heart failure, and decreased tolerance of exercise and actual blood loss of more than 30% of blood volume.<sup>[9,10]</sup> According to probable complications of anemia in patients undergoing CABG, especially neurological disorders, this study was designed to evaluate the effect of transfusion on dizziness in anemic patients after elective off-pump CABG.

## Materials and Methods

Our prospective randomized clinical trial was approved by the regional committee in our

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university. After receiving the written consent from patients ( $n=90$ ), they participated voluntarily for off-pump CABG surgery in the Afshar Cardiovascular Center of Yazd from January to June 2011. All of the operations were performed by a certain surgical team. The patients that had uttermost 2 days ICU stay and hemoglobin concentration from 7 to 10 g/dl undergoing elective off-pump CABG were enrolled in this study. The patients with more than 2 days ICU stay, death after 72 h from revascularization surgery, need for transfusion of more than two units after 48 h from surgery, emergency surgery, and patients suffered from congenital or acquired coagulation disorders were excluded from the study. 90 patients were enrolled 48 h after surgery and were randomly assigned into two groups: the experimental group ( $n = 47$ ) that received packed red cell 250 ml, according to international instruction indexed in Kirklin/Barratt-Boyes Cardiac Surgery textbook, 3<sup>rd</sup> edition (two-volume set) for transfusion, was transfused two-unit packed cell in patients with Hb = 7-8 g/dl and one-unit packed cell in patients with Hb = 9-10 g/dl and the control group ( $n = 43$ ) did not receive packed cell transfusion. The demographic variables and Hb concentration at 48 h, 72 h, and discharge time and evaluation of dizziness in 72h after transfusion were recorded. Regarding that dizziness is a term about lightheadedness, vertigo, confusion, headache, or head pressure, off balance, so, positive response to any of the above symptoms was considered as dizziness in patient. Our data were analyzed by SPSS15 software. We used ANOVA, Chi-square, and Fisher's exact test for quantitative and qualitative variables.

## Results

90 patients with anemia enrolled in this study as possible candidates for CABG surgery. Of those, 50 cases (55.6%) were males and 40 cases (44.4%) were females. The demographic characteristics for our patients have been presented in Table 1. Of all the participants, dizziness after 72 h from CABG surgery was observed in 35 cases (38.9%), 19 of whom were males (54.2%) and 16 (45.7%) of whom were females. There was not a significant relationship between sex and dizziness after CABG. The participants were divided into two age groups: less than 50 years old with the age average of  $43 \pm 4$  and above 50 years old with the age average of  $57 \pm 5$ . Postoperative dizziness occurred in 16 cases (38%) out of 42 with less than 50 years of age while this occurred in 19 cases (39.5%) out of 48 equal or over 50 years. There was

no significant relationship between age and increase in incidence of dizziness following CABG. In our patients, the significant stenosis of one, two, three, and left main coronary artery disease was 0 cases (0%), 15 cases (16.6%), 50 cases (56.2%), and 25 cases (28.1%), respectively. There were 6 cases (40%) of dizziness with two vessels, 21 cases (42%) with three vessels, and 8 cases (32%) of dizziness in those participants suffering from left main coronary artery disease. There was no significant relationship between the number of involved vessels and postoperative dizziness ( $P > 0.05$ ).

Hemoglobin and hematocrit levels' average before CABG was  $12 \pm 1.64$  g/dl and  $39.3 \pm 5.25$  g/dl, respectively. Hemoglobin and hematocrit levels average at 48 h and 72 h after CABG were  $10 \pm 1.7$  g/dl,  $30.9 \pm 3.18$  g/dl,  $10.07 \pm 9.4$  g/dl,  $29.5 \pm 2.72$  g/dl, respectively; therefore, these blood levels average about red blood cells had no significant differences between both groups; however, hemoglobin level average at discharge time was  $10.3 \pm 0.78$  g/dl and hematocrit level average at discharge time was  $32 \pm 2.61$  g/dl; therefore, hemoglobin and hematocrit levels at discharge time in the transfusion group is higher than in the control group. There were significant differences between two groups about hemoglobin and hematocrit at discharge time ( $P$  value for Hb = 0.001) ( $P$  value for Hct = 0.002). Data about blood and blood cells such as hemoglobin and hematocrit before and after surgery have been presented in Table 2.

Dizziness after CABG occurred in 35 cases (38.8%) from which 8 cases (17%) were of the transfusion group and 27 cases (62.8%) were of the control group; therefore, transfusion could significantly reduce dizziness ( $P=0.001$ ) [Figure 1]. In the control group, of all 27 patients suffered from dizziness, overall dizziness occurred in 18 patients with lower Hb 7 g/dl and 9 patients with higher Hb up to 10 g/dl ( $P=0.04$ ). Early mortality after the operation occurred in one case (1.1%) in hospital stay that was in the control group. There was no relationship between transfusion and post-CABG early mortality.

## Discussion

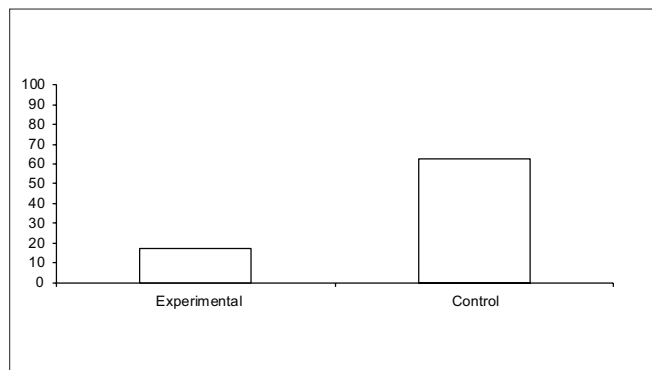
Neurological complications are the most common causes of morbidity after mitral valvuloplasty, valvular replacement, percutaneous coronary intervention, and coronary artery bypass

**Table 1: Demographic characteristics of both groups**

Variables	Control ( $n = 43$ )	Transfusion ( $n = 47$ )	P value
Age (year)	$64 \pm 9.82$	$63.2 \pm 11.48$	0.72
Sex (M/F) ( $n$ )	26/17	24/23	0.37
HTN [ $n$ (%)]	19 (44%)	22 (46%)	0.69
Diabetic mellitus [ $n$ (%)]	16 (37.2%)	14 (29.7%)	0.72
Cigarette smoking [ $n$ (%)]	21 (48.8%)	26 (55.3%)	0.33
History of surgery [mean $\pm$ SD]	$0.32 \pm 0.67$	$0.31 \pm 0.86$	0.96
Ejection fraction [mean $\pm$ SD]	$44.3 \pm 10$	$47.6 \pm 9$	0.10
History of used Nitrate [ $n$ (%)]	20 (46.5%)	28 (59.6%)	0.21
History of used $\alpha$ blocker [ $n$ (%)]	0 (0%)	2 (4.3%)	0.49
History of used $\beta$ blocker [ $n$ (%)]	14 (32.6%)	17 (36.2%)	0.71
History of used Statins [ $n$ (%)]	9 (20.9%)	7 (14.9%)	0.45
History of used anti-platelet drug [ $n$ (%)]	24 (55.8%)	25 (53.2%)	0.81
Preoperative PT [mean $\pm$ SD]	$12.9 \pm 2.24$	$14 \pm 4.55$	0.19
Preoperative PTT [mean $\pm$ SD]	$41.6 \pm 19$	$37.8 \pm 18.1$	0.32
Preoperative INR [mean $\pm$ SD]	$1.2 \pm 0.27$	$1.2 \pm 0.26$	0.86
Preoperative urea [mean $\pm$ SD]	$44.8 \pm 23$	$48.1 \pm 23.9$	0.50
Preoperative creatinine [mean $\pm$ SD]	$1.49 \pm 0.89$	$1.39 \pm 0.66$	0.54

**Table 2: Blood indices before, at 48 h, and at 72h after CABG and discharge time**

Variables	Control	Transfusion	P value
Hemoglobin (before surgery)	12.59 ± 1.72	12.8 ± 1.57	0.6
Hemoglobin (48 h)	9.9 ± 1.6	10 ± 1.8	0.72
Hemoglobin (72 h)	9.2 ± 1.21	9.5 ± 0.89	0.10
Hemoglobin (discharge time)	10 ± 0.67	10.6 ± 0.77	0.001
Hct (before surgery)	38.7 ± 5.99	40 ± 4.45	0.2
Hct (48 h)	31.5 ± 2.86	30.4 ± 3.52	0.09
Hct (72 h)	29.3 ± 2.76	29.8 ± 2.69	0.43
Hct (discharge time)	31.3 ± 2.55	32.7 ± 2.42	0.002

**Figure 1:** Incidence of dizziness after off-pump CABG in two groups

graft surgery. Dizziness is a neurological disorder that can increase hospital stay and diminish feeling of recovery. Dizziness has a relationship to anemia and hypoxia of tissue directly; therefore, the aim of this study was the treatment of dizziness with transfusion in anemic patients undergoing elective off-pump CABG.<sup>[1-5]</sup>

The results of a study done by Tang *et al.* indicated that anemia can aggravate cardiac dysfunctions and involvement of the nervous system in patients undergoing CABG.<sup>[11]</sup> In a study by Haljan *et al.*, it was found that preoperative administration of erythropoietin for treatment of anemia in anemic patient candidate for CABG could improve neurological complication significantly.<sup>[12]</sup> Our study reports that preoperative anemia can be a strong predisposing factor for dizziness after surgery, which is similar to other studies.

A study conducted by Darido *et al* on 595 patients undergoing CABG reported that the history of surgery, age higher than 70 years, and high creatinine levels could be risk factors for dizziness and neurological complications after surgery, and therefore, these risk factors can increase morbidity and mortality in major surgery.<sup>[13]</sup> A study carried out by Yau *et al.* suggested that cardiac ejection fraction (EF) can be one of the most important predictors about the involvement of the nervous system following cardiac surgery.<sup>[14]</sup> Karkouti *et al.* reported that preoperative hemoglobin level, high age, female sex, and low weight are common risk factors for treatment with transfusion.<sup>[15]</sup>

Regarding that, the type of surgical procedure for revascularizing can effect on outcomes; therefore, the incidence of dizziness in elective off-pump CABG is lower than on pump CABG via a cardiopulmonary pump. Ferraris *et al.* reported that a history of utilization of anti-platelet drugs and a history of emergency surgery are predisposing factors for dizziness after surgery.<sup>[16]</sup> In our study, there is no significant relationship between some variables such as sex, EF, history of surgery, history of used anti-platelet or statins, or  $\alpha$ - $\beta$

blocker drugs, levels of urea and creatinine, and incidence of dizziness after CABG indicating the results in contrast with other studies.

There were 35 cases (38.9%) of new postoperative dizziness in this study: 8 cases (17%) were in the transfusion group and 27 cases (62.8) were in control group; therefore, our findings indicate that transfusion can significantly reduce dizziness after CABG compared to the control group without transfusion. Our results are similar to studies done by Tang *et al* and Haljan *et al.*<sup>[11,12]</sup>

A study conducted by Karkouti *et al.* indicated that 302 patients (30%) of 1007 cases had undergone CABG need for transfusion,<sup>[15]</sup> however, in our study, 52% of all patients received transfusion. In this study, the type of surgery was elective off-pump CABG; therefore, we could not determine the exact measure of need for transfusion compared to other studies that the type of surgery was on pump CABG.

In our study, the average level of hemoglobin at 72 h after surgery (24 h after transfusion) did not reveal any significant difference between the two groups, this thus being unexpected and the findings about hemoglobin level at 72 h post-operation was not in line with some of previous studies.<sup>[14-16]</sup> Reasons for fall in Hb after 72 h in both groups include the preoperative hemoglobin is lower than postoperative Hb, it takes time for the postoperative Hb to get to normal level by bone marrow, medical therapy through iron causes modifying anemia but with delay, and nutrition also has a delaying modifying anemia. In this study, we detected significant differences between both groups about level average of hemoglobin at the discharge time of hospital; therefore, this finding indicated delayed improvement in anemic patients treated with transfusion. We concluded that transfusion at 48 h after off-pump CABG in anemic patients with hemoglobin level from 7 g/dl to 10 g/dl reduced the incidence of dizziness after surgery; thereto, it improved anemia at the discharge time of the hospital. Thus, we recommend transfusion for anemic patients (Hb <10 g/dl) who are candidate for cardiac surgery.

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