

Preoperative antiplatelet drugs on the hemorrhage and allogenic blood transfusion condition after coronary artery bypass graft surgery

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Abstract: Aim of the study was to observe and evaluate the postoperative hemorrhage and allogenic blood transfusion condition in patients who were exposed to different levels of clopidogrel and aspirin before on-pump coronary artery bypass graft surgery (CABG). A total of 180 patients underwent on-pump CABG at our hospital were enrolled and divided into treatment group, discontinuation group and control group based on their preoperative use of clopidogrel and aspirin, with 60 patients in each group. And the postoperative hemorrhage and allogenic blood transfusion condition were observed and evaluated. Compared with the control group, the postoperative total drainage and the occurrence of major bleeding were significantly higher in the treatment group ($p < 0.05$). The transfusion volume and infusion rates of packed red blood cells and fresh frozen plasma and the total blood transfusion rate were decreased progressively in accordance with the treatment group, discontinuation group and control group. The transfusion volume and infusion rates of packed red blood cells and fresh frozen plasma, and the total blood transfusion rate were significantly higher in the treatment group when compared with the control group ($p < 0.05$). And the total blood transfusion rate was significantly higher in the treatment group when compared with the discontinuation group ($p < 0.05$). The postoperative hemorrhage and allogenic blood transfusion rate would be significantly up-regulated when patients were exposed to clopidogrel and aspirin in the week before on-pump CABG.

Keywords: Antiplatelet drug, coronary artery bypass graft surgery (cabg), postoperative hemorrhage.

INTRODUCTION

Massive blood loss and blood transfusion in the perioperative period of on-pump cardiac surgery could lead to significant elevated incidence rate of complications and death rate. Patients underwent CABG would be up against higher possibility of severe bleeding and blood transfusion because of pre-operative antiplatelet treatment, use of heparin and antiplatelet drugs during early period of postoperation and generally seldom application of hemostatic agents (Wang *et al.*, 2017; Zheng *et al.*, 2015). As recommended by the American College of Cardiology guidelines, patients with non-ST-segment elevation acute coronary syndrome or coronary stent implantation can be treated with clopidogrel as antiplatelet therapy.

Currently, CABG and cardiac catheterization procedure are widely applied in the treatment of acute coronary syndrome (fig. 1) and severe diffuse coronary atherosclerosis (fig. 2). During clinical treatment, most cases were treated with clopidogrel and aspirin before coronary angiography and stent implantation to actively inhibit the platelet activity. The incidence of coronary stent thrombosis is decreased from 20% to 2% with use of clopidogrel (Shi *et al.*, 2015). Most cases had demonstrated that clopidogrel and aspirin are suitable for CABG while the postoperative hemorrhage and allogenic

blood transfusion rate would be significantly up-regulated, even causing severe consequences (Raman, Lambley 2018; Shiono 2016).

Other researches also showed that massive blood loss and blood transfusion would increase the total death rates of cardiac surgery, especially on-pump CABG. This study performed a close analysis on the postoperative hemorrhage and allogenic blood transfusion condition in patients who were exposed to antiplatelet drugs before on-pump CABG and reported as follows.

MATERIALS AND METHODS

General data

A total of 180 patients underwent on-pump CABG at the First Clinical Medical College of Lanzhou University from 2014 May to 2018 May were enrolled. This paper has a rigorous structure, and the conclusion has been approved by relevant ethics and relevant departments. The inclusion criteria are as follows: corresponding to diagnosis standards; first treated with simple on-pump CABG; without history of cardiac surgery; without severe damage of hepatic and renal function; not an allergy sufferer; not mentally disturbed; etc. There were 130 male patients and 50 female patients, with an average \pm standard deviation age of (48.5 \pm 3.2) years, ranging from 20 to 75. Based on their preoperative use of clopidogrel and aspirin, patients were divided into treatment group,

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discontinuation group and control group, with 60 patients in each group. Data obtained from all groups were comparable ($p>0.05$).



Fig. 1: Image of coronary syndrome

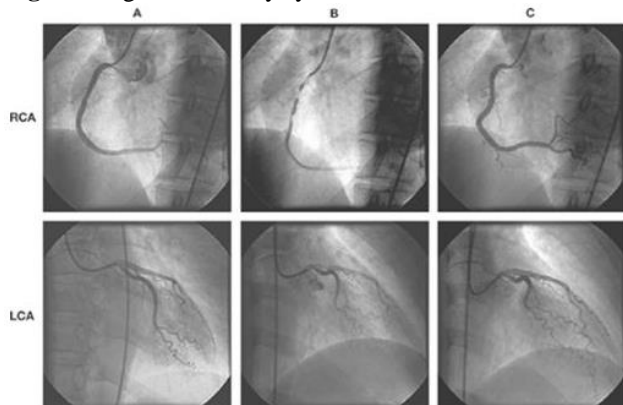


Fig. 2: Image of diffuse coronary atherosclerosis

Medication methods

Regular anti-platelet therapy was applied on patients of the treatment group, namely oral administration of 75mg clopidogrel, qd; 100mg aspirin, qd, for more than a week. And discontinuation was performed in the week before on-pump CABG. Patients in the control group: neither clopidogrel or aspirin was administered before surgery. Regular anti-platelet therapy was also applied on patients of the discontinuation group, namely oral administration of 75mg clopidogrel, qd; 100mg aspirin, qd, for more than a week. Meanwhile, discontinuation was performed at least one week before on-pump CABG.

Surgery methods

This surgery was performed by collaboration of professional surgeons, anesthetists and physicians responsible for extracorporeal circulation. And the postoperative recovery was managed by ICU physicians. Intravenous combined with inhalation general anesthesia was performed on all patients. The incision was made on the central part of the sternum. Then the ascending aorta was intubated and a two-step intubation was performed in the right atrium-inferior vena cava for extracorporeal circulation. During extracorporeal circulation, the perfusion flow of artery was set at $2.2-2.4L \cdot min^{-1} \cdot m^{-2}$ and the lowest nasopharyngeal temperature was $30^{\circ}C$. During operation, patients' vitals were closely monitored, including arterial pressure, temperature, rectal

temperature, nasal temperature, urine volume, ECG, SpO₂, etc (Zhao 2016). Patients were transferred to ICU after surgery, where sedation and analgesia therapy were performed. Remove tracheal catheter when autonomous respiration was resumed and the hemodynamics was stabilized.



Fig. 3: X-ray image of patient with coronary artery disease before surgery



Fig. 4: X-ray image of patient with coronary artery disease after surgery

Outcome measures

The postoperative hemorrhage and allogenic blood transfusion condition were observed and compared. Of those, there are three indicators regarding postoperative hemorrhage, namely the total postoperative drainage, postoperative massive blood loss, secondary thoracotomy

Table 1: Comparison of relevant perioperation indicators ($\bar{x} \pm s$)

Group	Duration of operation (min)	Duration of mechanical ventilation (h)	Duration of ICU stay (h)	Duration of drainage (h)	Duration of postoperative hospital stay (d)
Treatment group (n=60)	350.6±120.3	19.7±4.3	50.6±22.8	58.6±15.0	8.6±3.1
Discontinuation group (n=60)	322.8±117.5	16.9±2.8	46.5±12.0	57.6±14.7	8.3±1.6
Control group (n=60)	320.8±80.6	16.4±2.5	45.3±11.8	55.4±12.0	8.0±1.2

Table 2: Comparison of the hemorrhage and allogenic blood transfusion condition

Indicators	Treatment group (n=60)	Discontinuation group (n=60)	Control group (n=60)
Total drainage (ml)	1456.8±680.3	1254.8±457.0	1132.0±504.2
Massive bleeding rate (%)	47(78.33)	41(68.33)	31(51.67)
Transfusion volume of packed red blood cells (U)	9.1±11.2	6.5±3.2	5.1±4.9
Transfusion volume of fresh frozen plasma (U)	3.6±5.0	2.9±3.1	2.4±2.5
Transfusion volume of platelet (U)	0.5±1.9	0.1±0.6	0.1±0.6
Infusion rate of packed red blood cells (%)	54(90.00)	48(80.00)	43(71.67)
Infusion rate of fresh frozen plasma (%)	50(83.33)	46(76.67)	40(66.67)
Infusion rate of platelet (%)	5(8.33)	2(3.33)	6(10.00)
Total blood transfusion rate (%)	59(98.33)	49(81.67)	49(81.67)
Indicators	Treatment group (n=60)	Discontinuation group (n=60)	Control group (n=60)

operation to stop bleeding. And the indicators regarding allogenic blood transfusion condition are the transfusion volume and infusion rates of packed red blood cells, fresh frozen plasma and packed platelet. Meanwhile, the duration time of postoperative mechanical ventilation, ICU stay, drainage and hospital stay etc., were recorded.

STATISTICAL ANALYSIS

Statistical analyses were performed using SPSS21.0. All quantitative data are expressed as mean \pm standard deviation ($\bar{x} \pm s$) and comparisons were made with t-test. Enumeration data are expressed as natural number (n) and percentage (%) and comparisons were made with chi-square test. $p < 0.05$ was considered statistically significant.

RESULTS

Comparison of relevant perioperation indicators

The duration time of operation, postoperative mechanical ventilation, ICU stay, drainage and postoperative hospital stay etc., were observed. Results showed that compared with the treatment group, the duration of mechanical ventilation was significantly less in both discontinuation group and control group ($p < 0.05$). No significant difference was observed in other indicators ($p > 0.05$). Images of a patient before and after CABG were shown in figs. 3 and 4.

Comparison of the hemorrhage and allogenic blood transfusion condition

As shown in table 2, compared with control group, the postoperative total drainage and the occurrence of major

bleeding were significantly higher in the treatment group ($P < 0.05$). The transfusion volume and infusion rates of packed red blood cells and fresh frozen plasma, and the total blood transfusion rate were decreased progressively in accordance with the treatment group, discontinuation group and control group. The transfusion volume and infusion rates of packed red blood cells and fresh frozen plasma, and the total blood transfusion rate were significantly higher in the treatment group when compared with the control group ($P < 0.05$). And the total blood transfusion rate was significantly higher in the treatment group when compared with the discontinuation group ($p < 0.05$).

DISCUSSION

The incidence rate of coronary artery disease has gain ascendancy around the globe. Generally, patients require CABG therapy (Guo, et al., 2015; Varghese, et al., 2017). In the case of standardized treatment of coronary heart disease being popularizing, antiplatelet therapy is applied before CABG (Li, et al., 2015; Muranushi, et al., 2017; Peng, et al., 2017; Gao, et al., 2017; Rizvi, Saleh, 2018). This study has adopted a prospective clinical observation model and performed observation and exploration on the postoperative hemorrhage and allogenic blood transfusion condition in patients who were exposed to clopidogrel and aspirin before CABG. Results showed that continuous administration of clopidogrel and aspirin in the week before CABG would greatly improve the chances of postoperative bleeding and allogeneic transfusion. In addition, when clopidogrel and aspirin were discontinued

for more than one week before CABG, the postoperative hemorrhage and allogenic blood transfusion would be significantly decreased (Maltese *et al.*, 2017; Golezar *et al.*, 2017; Altun *et al.*, 2017). Also, piling researches have indicated that whether clopidogrel and aspirin were discontinued or not before CABG, the incidence rates of adverse events, complications and the death rate wouldn't be impacted at all.

There were also limitations in our study. First, there is still no definite and generally accepted transfusion standard for plasma and platelet transfusion. To effectively make up for this defect, we chose relatively fixed staff of surgeons, anesthetists, ICU physicians, aiming to reach relatively consistent criteria. Second, the sample size of this study is limited, restricting discernibility of relative indicators. Third, patients who underwent on-pump CABG and met the strict inclusion criteria were enrolled in our study, which could effectively avoid the interference factors and assure uniformity of the sample. However, it also restricted the extensibility of our conclusion. Therefore, before we could obtain further research data, results of this study will be mostly applied on patients underwent CABG.

CONCLUSION

To sum up, the postoperative hemorrhage and allogenic blood transfusion rate would be significantly up-regulated when patients were exposed to clopidogrel and aspirin in the week before on-pump CABG, which should be more valued.

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