

# Influences of prophylactic implantation IABP and passive emergency placement IABP in clinical prognosis of high risk of coronary bypass patients

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**Abstract:** This paper aims to study the influences of prophylactic placement of intra-aortic balloon pump (IABP) and passive emergency placement of IABP on the prognosis of patients with high risk of coronary bypass. In this study, 70 patients with high-risk coronary artery bypass IABP admitted to our hospital from August 2012 to August 2015 were selected and retrospectively analyzed. These patients were divided into two groups based on the timing of IABP placement, namely prophylactic placement of IABP group (group A, n=35) and passive emergency placement of IABP group (group B, n=35). In group A, the IABP running time, postoperative ventilation time, the blood transfusion, postoperative drainage, the mortality, incidence of myocardial infarction, the positive inotropic drugs auxiliary time, Intensive Care Unit (ICU) monitoring time, length of stay were all significantly less than that of group B ( $P < 0.05$ ). However, there was no significant differences between the two groups in the number of bypass, the incidence of postoperative complications 20.00% (7/35), 17.14% (6/35) ( $P > 0.05$ ). For patients with high risk of coronary bypass, prophylactic implantation of IABP is more effective in improving clinical outcomes than passive emergency placement of IABP.

**Keywords:** High risk of coronary bypass patients, prophylactic implantation IABP, passive emergency placement IABP, prognosis, clinical prognosis.

## INTRODUCTION

Intra-aortic balloon pump (IABP) can improve the diastolic blood pressure, increase coronary blood flow, reduce systolic blood pressure and reduce cardiac load, and improve the heart function, which is widely applied in the treatment of coronary heart disease, especially in perioperative period of patients with high risk of coronary bypass with usage rate gradually increased (Pérez Vela *et al.*, 2012; Babatasi *et al.*, 2003). However, malignant arrhythmia and acute myocardial infarction usually occur during or after surgery. IABP is often emergency used after the ineffective of large doses of vasoactive drugs, with perioperative mortality as high as 35%-50% (Arafa *et al.*, 1998). Therefore, with regard to the timing of IABP application in perioperative period of patients with high risk of coronary bypass, the principle of early, positive and rational use are advocated in clinic (Su *et al.*, 2009).

In order to reduce the high mortality of emergency placement IABP to a minimum, Prophylactic placement of IABP is increasingly widespread in the treatment of high-risk patients (He, 2011). To validate the benefits of prophylactic implantation of IABP in the clinical treatment of high risk patients, Clinical data of 70 patients with high-risk coronary artery bypass admitted to our hospital from August 2012 to August 2015 were selected and retrospectively analyzed in this study, to study the influence of prophylactic implantation of IABP and

passive emergency placement of IABP on clinical prognosis in patients with high risk of coronary artery bypass.

## MATERIALS AND METHODS

### *General materials*

70 patients with high-risk coronary artery bypass and placed with IABP admitted to our hospital from August 2012 to August 2015 were selected and retrospectively analyzed in this study. All patients were purely conducted bypass surgery, with the pre-operation sino SCORE  $\geq 6$ , and placed into IABP during the operation or within 6 h after operation. These patients were divided into two groups based on the timing of IABP placement, namely prophylactic placement of IABP group (group A, n = 35) and passive emergency placement of IABP (group B, n = 35). Group A included 18 males and 17 females, with aged between 55 to 71 years old, average aged (63.00 $\pm$ 5.10) years old. In terms of complications, there were 26 cases with high blood pressure, 17 cases with chronic obstructive pulmonary disease (COPD), 14 cases with diabetes patients, 12 cases with merging ventricular aneurysm and 8 cases with acute myocardial infarction. Group B included 20 males and 15 females, with aged ranging from 45 to 79 years old, and average aged (62.15 $\pm$ 7.95) years old. In terms of complications, there were 25 cases with high blood pressure, 18 cases with COPD, 13 cases with diabetes, 11 cases with merging ventricular aneurysm and 9 cases with acute myocardial

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infarction. There was no significant difference between the two groups in general data ( $P>0.05$ ).

**Methods**

*Implantation and withdrawal of the balloon*

Percutaneous femoral artery puncture was performed on the patients between the two groups, normally with a 8F30ml balloon catheter. If the patients had a shorter stature and a lighter weight, especially women, a 7F30ml balloon catheter should be used. The IABP tip was placed 1 cm below the left subclavian artery, and the position of the balloon was confirmed by a postero anterior chest radiograph. The routine application of heparin anticoagulation was the first choice for the ECG trigger mode, and the precondition of applying 1:1 model was the heart rate at 100 /min. A generally accepted testimony is a testimony to the removal of IABP, ie, monitoring of hemodynamic changes in both groups during IABP. If the patients had a stable circulation, no serious arrhythmia, a more satisfactory amount of urine, removed ventilator, and a normal blood gas analysis, then the counter pulsation frequency could be gradually reduced. Firstly, the counter pulsation frequency was reduced to 1:3 or 1:4. After a 30 min observation, the counter pulsation could be stopped if the disease was not repeated. IABP was removed with negative pressure to the balloon pores, and a small amount of blood was taken out so as to rush out

the possible formed thrombus. The puncture site was pressed for 30 min on the puncture parts and made a pressure dressing.

**Operation methods**

Two groups of patients were treated with surgery under the non-extracorporeal circulation or extracorporeal circulation. The incision was taken in the middle of the chest, and the sternum was sawed to select out of the left internal mammary artery, as well as the great saphenous vein. The blood vessels were exposed, and the target vessels were fixed with Octopus coronary artery fixator. The target vessels of anterior descending artery and vessels of the left internal mammary artery was anastomosed with 7-0 or 8-0 polypropylene suture, and the right coronary artery and circumflex artery were anastomosed with great saphenous vein. If the patients were given surgical treatment in non-extracorporeal circulation, while the stable circulatory function could not be effectively maintained under the action of the drug, then the patients should be treated under the extracorporeal circulation during the surgery.

**Observation indexes**

The postoperative indexes, the therapeutic effect and the occurrence of postoperative complications were analyzed retrospectively between the two groups of patients.

**Table 1:** Comparison of the General Material between the two group patients

Items	Categories	Group A (n=35)	Group B (n=35)
Gender	Male	18 (51.43)	20 (57.14)
	Female	17 (48.57)	15 (42.86)
Average age (year)		63.00±5.10	62.15±7.95
Complication	Hypertension	26 (74.29)	25 (71.43)
	COPD	17 (48.57)	18 (51.43)
	Diabetes	14 (40.00)	13 (37.14)
	Acute myocardial infarction	8 (22.86)	9 (25.71)

Note: Compared with group B, \* $P<0.05$

**Table 2:** Comparison between the two group patients in intraoperative and postoperative indexes ( $\bar{x}\pm s$ )

Grouping	Cases	Number of bypass (branch)	Running time of IABP (h)	Transfusion volume (ml)	Assistant time with breathing machine in postoperative (h)	Postoperative drainage volume (ml)
Group A	35	2.89±1.05	32.33±19.95*	144.44±264.34*	16.22±3.23*	460.00±179.23*
Group B	35	3.08±0.63	49.46±40.60	876.92±623.09	23.72±17.35	881.15±574.12

Note: Compared with group B, \* $P<0.05$

**Table 3:** Comparison of the therapeutic effect between the two group patients

Grouping	Cases	Mortality	Myocardial infarction	Positive myodynamia medicine assistant time (h)	ICU monitoring time (h)	Postoperative hospitalization time (d)
A	35	4 (11.43)*	0 (0)*	56.89±7.94*	48.25±4.37*	7.3±2.4
B	35	12 (34.29)	11 (31.43)	72.73±75.79	65.44±108.16	18.4±6.5

Note: Compared with group B, \* $P<0.05$

**Table 4:** Comparison between the two groups of the postoperative complications occurrence (%)

Grouping	Cases	2 tracheal intubation	Re-thorotomy hemaostsis	Adult type respiratory distress syndrome	Acute renal failure	Limb ischemia	Severe hemorrhage	Embolism	Severe infection	Occurrence in total
Group A	35	3 (8.57)	0 (0)	0 (0)	0 (0)	1 (2.86)	1 (2.86)	1 (2.86)	1 (2.86)	7 (20.00)
Group B	35	0 (0)	1 (2.86)	1 (2.86)	1 (2.86)	0 (0)	1 (2.86)	1 (2.86)	1 (2.86)	6 (17.14)

Note: Compared with group B, \*P<0.05

## STATISTICAL ANALYSIS

The measurement data are expressed by ( $\bar{x} \pm S$ ). Independent sample t was used to test the difference between the two groups. Fisher's exact probability test in X2 test was used to test the difference of counting data, with the test level as  $\alpha = 0.05$ .

## RESULTS

### *Comparison of the general material between the two groups*

There was no significant difference in gender, age and complications between the two groups ( $P > 0.05$ ) (table 1).

### *Comparison of intraoperative and postoperative indexes of two groups of patients*

The IABP running time and assistant time with breathing machine in group A were significant shorter than those in group B ( $P < 0.05$ ). The transfusion volume and postoperative drainage volume were significantly less than those in group B. However, there was no significant difference in the number of bypass between the two groups ( $P > 0.05$ ) (table 2).

### *Comparison of the therapeutic effect between the two group patients*

The mortality rate and the incidence of myocardial infarction in group A were significantly less than those in group B ( $P < 0.05$ ), and the positive myodynamia medicine assistant time, ICU monitoring time and hospitalization time were also significantly shorter than those in group B ( $P < 0.05$ ) (table 3).

### *Comparison of postoperative complications between the two groups*

The incidence of postoperative complications were 20.00% (7/35) and 17.14% (6/35) in group A and group B, respectively, with no significant differences ( $P > 0.05$ ) (table 4).

## DISCUSSION

In the treatment of coronary artery disease and heart failure, IABP, as a mechanical auxiliary device, has been widely used in the clinic of internal and external cardiac,

with the main mechanism of action as inflating air during the relaxing period to greatly promote the increase of diastolic pressure and perfusion of coronary artery, and exhausting air during the presystole period to promote a substantial reduction in afterload and myocardial oxygen consumption, thus effectively improving the balance of supply and demand of the myocardial energy, and to promote a substantial reduction in cardiac afterload and an effective increase in cardiac output (Dai *et al.*, 2011; Sun *et al.*, 2012; Zhou *et al.*, 2011; Chen *et al.*, 2011). Traditionally, IABP is urgently implanted in clinical only after the occurrence of the patients with cardiac incompetence. Its main application testy are: (1) to assist patients to get out of the extracorporeal circulation; (2) to assistant patients with a lack of stable hemodynamics. Clinical practice has proved that the method is effective (Han *et al.*, 2009; Song *et al.*, 2010). However, the patient's mortality is still high although the IABP has been applied. Relevant medical scholars have shown that the mortality rate is up to 35%-50% (Wang *et al.*, 2009; Du *et al.*, 2012; Su *et al.*, 2013). Recently, some medical researchers have shown (Litton and Delaney, 2012; Böning *et al.*, 2013) that active and preventive implantation of IABP in the early stage of high-risk patients can significantly reduce the high mortality related to the delay implantation of the IABP. The results of this study had shown that the IABP running time and postoperative ventilator assist time, the transfusion volume and postoperative drainage volume in group A are significantly less than those in group B ( $P < 0.05$ ), and the mortality, the incidence of myocardial infarction, positive myodynamia drug assistant time and ICU monitoring time in group A are significantly lower than those in group B ( $P < 0.05$ ).

## CONCLUSION

However, there was no significant difference between the two groups in the number of bypass and postoperative complications ( $P > 0.05$ ), which are consistent with the findings of relevant medical researchers. It fully illustrates that compared with passive emergency placement of IABP, the prophylactic implantation of IABP in high-risk patients with coronary artery bypass can effectively shorten the IABP running time and postoperative ventilator assist time, reduce the amount of blood transfusion and postoperative drainage volume, lower the

mortality and the incidence of myocardial infarction, and will not increase the postoperative complications to a great extent, which is safe and effective and can effectively improve clinical prognosis, thus deserving popularization.

## REFERENCES

- Arafa OE, Pedersen TH, Svennevig JL, Fosse E and Geiran OR (1998). Intraaortic balloon pump in open heart operations: 10-year follow-up with risk analysis. *Ann Thorac Surg.*, **65**(3): 741-747.
- Babatasi G, Massetti M, Bruno PG, Hamon M, Le Page O, Morello R and Khayat A (2003). Pre-operative balloon counterpulsation and off-pump coronary surgery for high-risk patients. *Cardiovasc. Surg.*, **11**(2): 145-148.
- Böning A, Buschbeck S, Roth P, Scheibelhut C, Bödeker RH, Brück M and Niemann B (2013). IABP before cardiac surgery: Clinical benefit compared to intraoperative implantation. *Perfusion*, **28**(2): 103-108.
- Chen W, Sheng B, Zhao L, Lu FP, Wang SZ, Liu L, Gu XY and Zhang JS (2012). Applied value of IABP on patients with infectious shock during emergency treatment. *Chin Crit Care Med.*, **24**(1): 46-49.
- Dai AL, Dai PP, Zhu JQ and Xiao MQ (2011). Application of IABP to coronary artery bypass surgery during perioperative period under non-extracorporeal circulation condition. *Med. Inform.*, **24**(10): 6861-6862.
- Du YM, Wang HM, Zhang SG and Sun RQ (2012). Patients of 91 cases with coronary artery bypass surgery use IABP. *China Med. Phar. J.*, **2**(1): 187-190.
- Han Z, Li YH and Zhang G (2009). Application of IABP to the patients with coronary artery bypass grafting during perioperative period. *J. Pract Med.*, **25**(20): 3457-3459.
- He Y (2011). Clinical analysis on coronary artery bypass grafting and cardiac valves operating on the same term. *PJCCPVD*, **19**(9): 1547-1548.
- Litton E and Delaney A (2012). Preoperative intra-aortic balloon pump in high-risk coronary bypass grafting. *Asian Cardiovasc. Thorac. Ann.*, **20**(2): 146-152.
- Pérez Vela JL, Martín Benítez JC, Carrasco González M, de la Cal López MA, Hinojosa Pérez R, Sagredo Meneses V and del Nogal Saez F (2012). Clinical practice guide for the management of low cardiac output syndrome in the postoperative period of heart surgery. *Med. Intensiva.*, **36**(4): e1-44.
- Song XC, Zhang C, Chen YM and Mu XW (2010). Application of IABP to patients during critical coronary artery bypass surgery. *Acta Universitatis Med Nanjing (Natural Sci.)*, **30**(11): 1626-1628.
- Sun J, Song JH, Chen TY and Jiang N (2012). Analysis of related risk factors to atrial fibrillation newly caused by coronary artery bypass grafting under non-extracorporeal circulation condition. *Chin General Prac.*, **15**(5): 1590-1593.
- Su PX, Gao J, Liu Y, Zhang XT and Wang JL (2013). Operation time of patients with critical coronary artery bypass use IABP. *Chin J. Cardiovasc Res.*, **7**(5): 364-366.
- Wang LC, Yang B, Zhang XL, Chen GF, Li SK, Zhao JT and Wang HY (2009). Clinical application to patients with heart disease during perioperative period. *Chin J. Cardiovasc. Res.*, **7**(8): 573-575.
- Zhou W, Xin J, Lu J, Du W, Zhou JP and Li WY (2011). Discussion on the application time and curative effect of the IABP in the coronary artery bypass surgery during the perioperative period. *Chin Heart J.*, **23**(1): 107-109.