ISSN NO: 2770-2936
May 2024

Ischemic Heart Disease. Blood Coagulation System in Tension Angina Pectoris

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Abstract. The purpose of the study was to evaluate the dynamics of changes in the parameters of the hemostatic system and the volume of blood loss in patients with coronary heart disease (CHD) and arterial hypertension (AH) who underwent coronary artery bypass grafting depending on their sensitivity to aspirin. It has been shown that the volume of blood loss in the intra- and postoperative period of coronary artery bypass surgery (CABG), the dynamics of coagulogram and thromboelastogram parameters do not depend on the low sensitivity of patients to aspirin.
Keywords: coronary artery bypass grafting, blood loss, aspirin resistance, aspirin, hemostasis.

Introduction

One of the most pressing problems in cardiac surgery is early thrombosis of shunts after coronary artery bypass grafting (CABG) [1]. Myocardial ischemia caused by spasm and thrombosis of the coronary arteries is most often observed at the end of surgery and in the early postoperative period. The reason for this is damage to the endothelium of the coronary arteries and an inextricably linked imbalance in the hemostatic system during cardiopulmonary bypass (CPB) [2, 3]

Materials And Methods

According to clinical studies, 40–50% of vein grafts cease to function within 10 years. Approximately 20–30% of shunts occlude within the first year, and 10–15% within the first month after surgery [4]. Thrombosis of shunts leads to the development of repeated myocardial infarctions and increases mortality in the early postoperative period after CABG. However, the prevention of these complications remains a problem that is far from a final solution [4]. One of the reasons for the development of thrombotic complications in operated patients with coronary heart disease (CHD) is considered to be the presence of aspirin resistance. A number of authors believe that it is this phenomenon that leads to the development of myocardial infarction (MI) and early thrombosis of shunts [5]. It is clear that aspirin significantly reduces the incidence of vein graft occlusions during the first year after CABG surgery and reduces the risk of cardiovascular events overall by almost 25%, but these complications often develop during its use. According to the literature, aspirin resistance reaches 50%, which may be associated with the use of an infrared apparatus during surgery.

We examined 66 patients with coronary artery disease and hypertension who underwent surgical revascularization of the myocardium under cardiopulmonary bypass conditions. The age of the patients ranged from 49 to 68 years (Table 1). Among those examined there were 27 women and 39 men. Diabetes mellitus type 2 was diagnosed in 9 people. 4 patients had varicose veins of the lower extremities. The duration of hypertension in all patients ranged from 2 to 10 years (6.3 ± 1.4 years). All patients underwent coronary angiography.

Table 1
General characteristics of patients

Index	Presence of aspirin resistance Group I (n=22)	Absence of aspirin resistance Group II (n=44)
Age, years	61 ± 10	61 ± 10
Duration of hypertension, years	6,0 ± 1,4	6,3 ± 1,4

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SBP, mmHg Art.	137,8 ± 23,3	135,8 ± 22,3
DBP, mmHg Art.	78,9 ± 10,8	78,9 ± 10,8
Quantity	3,4 ± 1,0	3,3 ± 0,8
shunts, n	97 ± 30	95 ± 33

Results And Discussion

A study of anthropometric data, duration of hypertension, blood pressure level, number of shunts and duration of cardiopulmonary bypass did not show significant differences between the two groups.

Table 2 shows data characterizing the state of hemostasis, the volume of intra- and postoperative blood loss in patients with hypertension and coronary artery disease who underwent CABG, depending on their sensitivity to aspirin.

Table 2

Influence of aspirin resistance on indicators of the hemostasis system during different terms of treatment in patients with arterial hypertension and coronary heart disease who undergoed coronary arto bypass surgery

Index	**Presence of aspirin resistance Group 1 (n = 22)**				**Absence of aspirin resistance, group 2 (n = 44)**			
	Before operas	**After IR**	**1st day**	**7th day**	**Before operas**	**After IR**	**1st day**	**7th day**
Col. tb, thousand/µl	201 ± 58	134 ± 42	168 ± 48	320 ± 98	208 ± 63	129 ± 32	156 ± 44	329 ± 91
MCF-I, mm	59,3 ± 4,7	51,0 ± 5,2	57,9 ± 5,8	70,6 ± 5,2	61,6 ± 6,2	51,8 ± 7,4	57,9 ± 5,0	73,6 ± 4,3
APTT, sec.	36,4 ± 5,1	43,3 ± 7,3	37,7 ± 7,2	34,5 ± 5,0	37,6 ± 5,1	41,7 ± 6,5	38,4 ± 6,1	33,9 ± 4,7
TV, sec.	16,1 ± 1,4	17,1 ± 1,9	17,0 ± 6,1	16,0 ± 1,2	17,2 ± 3,2	18,7 ± 3,5	15,7 ± 2,0	16,1 ± 1,5
PTV, %	88,1 ± 15,8	60,4 ± 9,3	72,3 ± 13,4	91,8 ± 17,8	82,2 ± 12,4	61,8 ± 15,4	66,8 ± 14,5	87,3 ± 13,2
K-i-FG, g/l	3,16 ± 0,63	1,97 ± 0,65	3,76 ± 0,69	6,22 ± 1,22	3,25 ± 0,93	2,13 ± 0,73	3,74 ± 0,86	6,42 ± 1,28
AT-III, %	85,7 ± 20,5	62,5 ± 12,9	86,5 ± 16,3	97,7 ± 13,7	80,3 ± 16,8	57,9 ± 15,0	77,7 ± 13,6	101,3 ± 15,5
Protein C, %	92,1 ± 21,5	54,1 ± 19,4	76,5 ± 16,1	91,8 ± 16,3	92,4 ± 22,2	68,1 ± 26,4	83,4 ± 21,2	95,6 ± 13,8
Protein S, %	90,3 ± 22,3	55,5 ± 16,4	75,9 ± 16,5	88,7 ± 17,4	84,8 ± 15,4	62,3 ± 26,4	83,4 ± 21,2	92,6 ± 18,6
CT-I, sec.	172 ± 45	194 ± 55	159 ± 26	165 ± 32	156 ± 26	196 ± 46	162 ± 24	164 ± 29
MCF-F, mm	15,0 ± 2,0	9,4 ± 2,9	16,6 ± 4,3	28,0 ± 6,1	16,9 ± 4,7	10,1 ± 3,0	17,1 ± 4,5	31,4 ± 9,1
Intraoperative blood loss, ml	324 ± 168				299 ± 127			

ISSN NO: 2770-2936
May 2024

Drainage blood loss, ml	365 ± 139	383 ± 132

Note: Qty. trb, thousand/μl—platelet count; MCF-I, mm—maximum clot hardness, reflecting the contribution of platelets to clot formation; APTT, sec. - activated partial thromboplastin time; TV, sec. - thrombin time; PTT, %—prothrombin time; K-I FG, g/l - fibrinogen concentration; AT-III, % - antithrombin-III; MCF-F, mm—maximum clot hardness, reflecting the contribution of fibrinogen to clot formation; CT-I, sec. — clot formation time.

The volume of intra- (from the moment of connecting the IR device until it is turned off and fixation of drains in the pericardial cavity with subsequent transportation of the patient to the intensive care unit) and postoperative blood loss (during the first day after surgery), ml/24 hours was assessed . The parameters of the hemostatic system were studied before surgery, 20 minutes after completion of CPB and neutralization of heparin with protamine sulfate, on the 1st and 7th days after surgery. For a more detailed assessment of the state of aspirin resistance and the volume of intra- and postoperative blood loss, patients with coronary artery disease and hypertension who underwent CABG surgery were divided into 2 groups. The first group included 22 patients with low sensitivity to aspirin, the second group included 44 patients with high sensitivity to aspirin. Patients in both groups had stage 2 hypertension. The phenomenon of “aspirin resistance” was detected in patients before surgery using the PFA-100 analyzer. For this purpose, a collagen/adenosine diphosphate cartridge with reference values of 68–121 sec was used.

The data obtained indicate the absence of statistically significant differences between the two groups, both in the dynamics of indicators characterizing the functional state of the hemostatic system, and in the volume of intra- and postoperative blood loss.

Conclusion

Effective treatment with antiplatelet agents always involves a balancing act between the risk of thrombosis and the risk of bleeding. In most patients, such balancing is accompanied by a decrease in platelet aggregation characteristics and provides a therapeutic effect even without appropriate control. It should be taken into account that in some patients the antiplatelet effect is absent due to the action of various factors, united by the concept of “resistance”, in others there is excessive suppression of platelet function, which threatens hemorrhagic complications of varying severity. Thus, taking into account the variability in laboratory assessment of the response to aspirin in patients with hypertension and coronary artery disease, the need for a differentiated approach to prescribing antiplatelet therapy is obvious.

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