Features of the Functional State of Vascular Endothelium in Elderly Patients after Splenectomy

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ABSTRACT

We studied functional state of arterial wall endothelium in elderly patients after splenectomy due to trauma of spleen in close post-operational period. Data showed that antithrombotic features of endothelium has changed heterogeneously, i.e. intensification of fibrinolytic activity due to low thromboresistance of endothelium, which is accompanied by reduced tissue plasminogen activator (tPA) in vascular wall and reduced secretion of it to bloodstream. This data suggests that certain biologically active substances are secreted by spleen, which facilitates release of tPA from endothelium, which in turn can lead to intravascular thrombus formation in these group of patients.

Keywords: splenectomy, functional state of arterial wall endothelium, elderly patients.

INTRODUCTION

Splenic rupture with abdominal trauma occurs in 23 - 40% of the victims [2,4,6]. The structure of the spleen, the fragility of its parenchyma cause significant bleeding even at small lesions of the capsule and make it impossible to achieve reliable hemostasis, owing to surgical treatment of the damaged organ in most cases ends with splenectomy [2]. However, it is proved that the spleen belongs to a number of important functions, the main of which - participation in hematopoiesis and immune status of the body [4]. It is noted that in patients who underwent splenectomy, there were disorders in the coagulation system. They appear as the development of hemorrhage and thromboembolism. However, if the application of autolientransplantation in pediatric patients, young and middle age does not cause doubts, but in elderly patients application of this method is controversial enough.

The purpose of the study - to examine the state of vascular endothelium in elderly patients after splenectomy performed about her injury in the immediate postoperative period.

MATERIALS AND METHODS

Studies of endothelial function of the vascular wall were performed in 21 elderly patients (study group 1) after surgery on a damaged spleen in the immediate postoperative period in the third - the fifth postoperative day. Comparison group consisted of relatively healthy elderly patients in the number of 19 persons (control group 2) and patients young and middle age in an amount of 19 people after splenectomy performed on the injured spleen (control group 3). All patients (elderly and young and middle age) had isolated splenic injury, light amount of blood loss, all patients underwent splenectomy. Study of the state of vascular endothelium of patients operated on the spleen was performed using functional cuff test, proposed by V.P.Baluda et al. (1992) [5]. The principle of the antithrombogenic properties of vessel walls based on the creation of a three-minute local ischemia caused by overlaying a sphygmomanometer cuff on the arm of the subject and creating pressure in it exceeds systolic 10 mmHg. This leads to the release of the vascular endothelium in the blood of healthy people prostotseklina, nitric oxide, endothelin and other natural antiplatelet agents (antithrombin III, tissue plasminogen activator). This study provides an examination of antiplatelet, anticoagulant and fibrinolytic activity of vascular endothelium. To characterize the functional state of the vascular endothelium, we used indexes of vascular wall thromboresistance, characterizing it antiagregatine, anticoagulant and fibrinolytic activity [5]. The test results attributed to positive in the event that after the creation of local ischemia observed increase in activity of more than 25%

from the data obtained before creating ischemia and activity of fibrinolysis activators and increased by 30% or more of the data obtained prior to the establishment of ischemia. It is proved that patients with these characteristics are not subject to intravascular thrombus formation [1]. In patients with increased anticoagulant activity and the growth activity of activators of fibrinolysis by 15-30% after local ischemia of the extremities possibility of thrombotic complications with additional exposure of the body to extreme factors considered doubtful. With a slight strengthening of the anticoagulant and fibrinolytic activity, as well as an increase in the activity of fibrinolysis to 15-20% results cuff test is considered negative, these patients are attributed to thrombotic dangerous [1].

Statistical data processing was performed using a nonparametric method U-test test Mann - Whitney (software package Statistica 6.0.). In this case, we calculated the main probabilistic characteristics of random variables: the average value; lower (25%) and the upper (75%) Quartile that have accuracy of not less than 95% ($p<0.05$).

RESULTS AND DISCUSSION

Results of the study of the functional state of the vascular endothelium in relatively healthy elderly patients are presented in Table. 1 The data presented in Table 1, it is seen that after the occlusion test in healthy elderly non-stabilized blood clotting time increased by 88.0%, the activity of antithrombin III – 45,1%, in euglobulin fibrinolysis - 17, 1%, and the activity of tissue plasminogen activator - by 25,5%. Indicators antithrombogenic activity of vascular endothelial thus correspond to the data of healthy persons, established by other authors [3,4,5].

Table 1

Some indicators of the hemostatic system in relatively healthy older people before and after the occlusion test (M ± m)

Indicators	The results of the comparison group (n = 19)	
	tosample	afterthetest
The clotting time of blood unstabilized, min	7,5 ± 0,3	14,1 ± 0,3*
Activity of antithrombinIII, %	86,3 ± 0,4	125,2 ± 0,1*
Euglobulinfibrinolysis,min	180,6 ± 0,2	154,2 ± 0,2*
The activity of plasminogen activators, mm^2	66,4 ± 0,3	83,2 ± 0,1*

Note: * - a sign of the significance of differences compared with the data before the occlusion test ($p <0,05$)

Occlusion test results obtained in the group of patients after splenectomy in patients young and middle age in the immediate postoperative period showed that the clotting time of a non-stabilized blood increased by 67.7%, the activity of antithrombin III - 41.5%, euglobulin fibrinolysis - 111, 6%, and the activity of plasminogen activators - by 13.3%, indicating that the stored anticoagulant activity of vascular endothelium. At the same time relative to the comparison group of relatively healthy elderly showed some decrease in the fibrinolytic activity of the vascular wall.

Occlusion test results obtained in patients after splenectomy in elderly in the immediate postoperative period, are presented in table 2.

Table 2

Some hemostatic parameters in elderly patients after splenectomy in the immediate postoperative period before and after the occlusion test (M ± m)

Indicators	The results of the comparison group (n = 21)	
	tosample	afterthetest
The clotting time of blood unstabilized, min	6,0 ± 0,3	9,0 ± 0,3*
Activity of antithrombinIII, %	82 ± 0,4	102,0 ± 0,2*
Euglobulinfibrinolysis,min	182,1 ± 0,4	140,1 ± 0,2*
The activity of plasminogen activators, mm^2	67,4 ± 0,3	74,4 ± 0,2*

Analyzing the results, it can be noted that in the group of elderly patients after splenectomy marked increase in blood clotting time of a non-stabilized 60% in the comparison group - by 88,0%, ($p < 0,05$), the activity of antithrombin III - 38% in the comparison group increase this figure was 45,1% ($p > 0,05$). Euglobulin fibrinolysis by 23,4% in the comparison group - by 25,5% ($p < 0,05$). Activity of plasminogen activators by 13,2% in the comparison group - by 25,3% ($p < 0,05$).

Thus, in the immediate postoperative period, removal of the spleen leads to changes in the functional state of the vascular endothelium, is evident in vascular endothelium thromboresistance.

For indices that characterize the antithrombogenic activity of the vascular endothelium, are presented in table 3.

Table 3

Indicators antithrombogenic activity of the vascular wall of patients operated with the trauma of the spleen, in the immediate postoperative period (M ± m)

Indicators	Resultsinthebands		
	main group	1 comparisongroup	2 comparisongroup
The index of vessels total thromboresistance	1,67 ± 0,4*	1,84 ± 0,3	1,88 ± 0,3
Index anticoagulant activity	1,42 ± 0,1	1,43 ± 0,3	1,45 ± 0,2
Index of fibrinolytic activity	2,11 ± 0,2*	1,21 ± 0,3	1,17 ± 0,1

CONCLUSION

Thus, obtained in the study data suggest that in the elderly patients operated at a trauma of the spleen, in the immediate postoperative period after splenectomy antithrombogenic properties of vascular endothelial are changed inhomogeneously: amid falling thromboresistance of vascular endothelial fibrinolytic activity has increased, accompanied, however, by decrease of tissue plasminogen activator reserves in the vascular wall and decrease of its secretion into the bloodstream. These data suggest that the spleen tissue produced bioactive substances which promote the release into the blood stream of produced in the endothelium of tissue plasminogen

activator, which in turn may lead to the development of intravascular thrombus formation in these patients.

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