Research letter

The condition of lipid metabolism, hemostasis and general homocysteine level as a manifestation of endothelial dysfunction at progressing course of atherosclerosis obliterans of the lower extremities

Svetlana S. Dunaevskaya, Daria A. Antufrieva

Voino-Yasenetsky Krasnoyarsk State Medical University, Krasnoyarsk, Russia

Received 5 October 2016, Revised 23 January 2017, Accepted 31 January 2017

Abstract: The problems related to studying predictors of atherosclerosis obliterans (ASO) of the lower extremities are quite relevant due to high disability and lethality rate of patients belonging to this group. This study aimed to evaluate the values of lipid profile, general homocysteine and hemostasis in relation to the clinical course of ASO.

Material and Methods — 55 patients with ASO of the lower extremities were divided into two groups: 30 patients with no progressive clinical course, 25 patients with progressive clinical course. The group division was based on the anamnesis (duration of the disease, decrease of painless walking distance during the year, the length of effect lasting from conservative treatment). Data presented as median with lower and upper quartiles – Me (LQ, UQ).

Results — As a result of research, there was a registration of moderate hyperhomocysteinemia – 23.6 (20.1, 26.4) mkmol/l, as well as high values of triglycerides – 2.10 (1.72, 2.51) mmol/l and low-density lipoproteins – 4.48 (3.95, 6.44) mmol/l, against low values of high-density lipoproteins – 1.14 (0.72, 1.40) mmol/l in lipid profile. Development of hypercoagulability and susceptibility to thrombosis in patients is manifestation of endothelial dysfunction, which plays a key role in progression of ASO of the lower extremities.

Keywords: atherosclerosis obliterans, progressive course, hemostasis, lipid profile, homocysteine

Cite as Dunaevskaya SS, Antufrieva DA. The condition of lipid metabolism, hemostasis and general homocysteine level as a manifestation of endothelial dysfunction at progressing course of atherosclerosis obliterans of the lower extremities. Russian Open Medical Journal 2017; 6: e0107.

Correspondence to Svetlana S. Dunaevskaya. Address: 1, Partizana Zheleznyaka str., Krasnoyarsk, 660077, Russia. E-mail: vikto-potapenk@yandex.ru

Introduction

Atherosclerosis obliterans (ASO) of the lower extremities has been one of the frequent manifestations of generalized atherosclerosis. It’s revealed in 2-3% of the population and forms 20% of all the patients with cardiovascular diseases. The severity of progressive course of ASO of arteries of lower extremities is due to gangrene, which forms during 3 to 5 years. It develops in 10-40% of the patients after they experience the first symptoms and eventually leads to an amputation of an extremity [1, 2].

The factors leading to progressive clinical course of ASO of the lower extremities are hypercholesterolemia, hypertension, smoking, diabetes, obesity, inactive lifestyle, old age [3-8]. It is known that in 1% of cases, the patients older than 55 years of age, during the first 5 years after the diagnosis is made, have critical ischemia of lower extremities and 20% have the episodes of acute ischemic conditions [9].

Dyslipidemia, endothelial dysfunction and changes of hemostasis system also take part in pathogenesis of atherosclerosis development and progressing [10]. According to one of the theories of development of atherosclerosis, the damage of endothelium lies in the base of pathological process, which is defined as an impairment of endothelial function. One of the first manifestations of endothelial dysfunction is increase of endothelium adhesive qualities for thrombocytes and monocytes, the increase of permeability of the endothelium and the development of hypercoagulability [11, 12]. It’s proved that the changes of hemostasis system are taking part in disease development and its progressing [13, 14].

The main functions of endothelium are regulation of vascular walls tonus, thrombocytes adhesion, and growth of smooth muscle cells in arterial wall. In other words, the dysfunction of endothelium characterizes the imbalance between vasodilatation and vasoconstriction factors, anticoagulant and procoagulant factors and also between vascular growth factors and its inhibitors [15-17].

Hyperhomocysteinemia is a predictor of blood clots development caused by atherosclerotic lesion of vessels [18]. The study of factors which influence the clinical course of ASO of the lower extremities is an actual task of the research.

Aim of study: to assess the values of lipid profile indicators, general homocysteine and hemostasis values in patients with ASO of the lower extremities depending on the clinical course.
Discussion

Lipid profile of the 1st group of patients with ASO of the lower extremities may be defined as antiatherogenic due to higher levels of TC and HDL. More athrogenic structure of lipid profile was revealed in the 2nd group of patients, as there are significantly higher levels of triglycerides and LDL against the lower levels of HDL. The most studied and significant risk factor of progression of pathological process is the so-called athrogenic lipid triad: large number of LDL, hypertriglyceridermia, and low concentrations of HDL cholesterol [20]. Moderate hyperhomocysteinemia was revealed in patients with progressive clinical course of ASO (2nd group). It is in accordance with the literature that endothelial dysfunction may lead to pro-atherogenic effects associated with hyperhomocysteinemia [21-23].

The indicators of coagulation link of hemostasis system show the tendency of development of thromboses. The manifestation of hypercoagulability in patients with ASO of the lower extremities might be rated as one of the signs of endothelial dysfunction [24].

The obtained data about the role of lipid metabolism disorder and manifestations of hypercoagulability at progressive clinical course of ASO of the lower extremities cohere with multiple findings in this field. A distinctive feature of this study is the assessment of level of general homocysteine as a marker of endothelial dysfunction at ASO of the lower extremities.

Table 1. Values of coagulatory component of hemostasis system depending on clinical course of ASO of the lower extremities

<table>
<thead>
<tr>
<th>Parameters</th>
<th>1st group</th>
<th>2nd group</th>
</tr>
</thead>
<tbody>
<tr>
<td>APTT, sec</td>
<td>35.7 (32.6, 36.4)</td>
<td>34.1 (31.9, 35.1)</td>
</tr>
<tr>
<td>PT, sec</td>
<td>13.5 (12.3, 14.7)</td>
<td>13.3 (11.9, 15.2)</td>
</tr>
<tr>
<td>TT, sec</td>
<td>14.5 (13.1, 15.4)</td>
<td>12.4 (11.6, 12.8)*</td>
</tr>
<tr>
<td>INR</td>
<td>1.01 (0.94, 1.17)</td>
<td>0.95 (0.86, 1.14)</td>
</tr>
<tr>
<td>Fibrinogen, g/l</td>
<td>3.67 (3.4, 4.1)</td>
<td>4.8 (4.5, 5.8)*</td>
</tr>
</tbody>
</table>

* – statistically significant (P<0.05) difference between 1st and 2nd groups.

APTPT, activated partial thromboplastin time; PT, prothrombin time; TT, thrombin time; INR, international normalized ratio.

Table 2. Values of coagulatory component of hemostasis system depending on clinical course of ASO of the lower extremities

<table>
<thead>
<tr>
<th>Parameters</th>
<th>1st group</th>
<th>2nd group</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC, mmol/l</td>
<td>6.35 (6.20, 7.10)</td>
<td>5.40 (4.90, 5.80)*</td>
</tr>
<tr>
<td>LDL, mmol/l</td>
<td>3.02 (2.78, 3.30)</td>
<td>4.48 (3.95, 6.44)*</td>
</tr>
<tr>
<td>HDL, mmol/l</td>
<td>1.86 (1.43, 2.34)</td>
<td>1.14 (0.72, 1.40)</td>
</tr>
<tr>
<td>TG, mmol/l</td>
<td>1.52 (1.03, 2.17)</td>
<td>2.10 (1.72, 2.51)</td>
</tr>
<tr>
<td>AI</td>
<td>2.36 (1.82, 2.94)</td>
<td>4.56 (3.92, 5.58)*</td>
</tr>
<tr>
<td>GH, mkmol/l</td>
<td>12.3 (10.2, 14.1)</td>
<td>23.6 (20.1, 26.4)*</td>
</tr>
</tbody>
</table>

* – statistically significant (P<0.05) difference between 1st and 2nd groups.

TC, total cholesterol; LDL, low-density lipoproteins cholesterol; HDL, high-density lipoproteins cholesterol; TG, triglycerides; AI, atherogenic index; GH, general homocystein.
Conclusion

The progressive clinical course of ASO of the lower extremities is characterized by impairment of functional condition of endothelium, which is manifested in hypercoagulability, moderate homocysteinemia, as well as in high values of LDL against lowering concentration of HDL.

Acknowledgements

The authors would like to thank the administration of the Road Hospital at Krasnoyarsk station of Russian Railways for the opportunity to conduct this clinical study.

Conflicts of interest: none declared.

References


Authors:

Svetlana S. Dunaevskaya — MD, Associate Professor, Department of General Surgery, Voino-Yasenetsky Krasnoyarsk State Medical University, Krasnoyarsk, Russia. http://orcid.org/0000-0003-8280-4737.

Daria A. Antufrieva — MD, Post-graduate student, Department of General Surgery, Voino-Yasenetsky Krasnoyarsk State Medical University, Krasnoyarsk, Russia. http://orcid.org/0000-0003-9190-7336.