BLOOD CLOTTING IN OIL AND GAS FACILITY WORKMEN DIAGNOSED WITH CATARACT, GLAUCOMA AND DACRYOCYSTITIS

Changes in parameters of hemostasis, such as, prolongation of prothrombin time and thrombin clotting time were registered in oil and gas facility workmen exposed to a combination of health hazards. The changes are determined by age and service record; being physiological they still can be the evidence for impairment of potential functional activity of the gastrointestinal tract and the liver. Hemostasis parameters can be used to study methods for prevention of hemorrhages in the preparation for eye surgery.

Keywords: Blood clotting, hemostasis, prothrombin time, platelets, oil and gas facility

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Introduction

Some ophthalmological surgeries, such as, flap extraction, that is, removal of a cataract by making a flap in the cornea, antiglaucomatous sclerectomy and dacryocystorhinostomy are fraught with profuse hemorrhage exhibiting dependencies on changes in hemostasis parameters, including prothrombin time, thrombin clotting time and number of platelets. The parameters are known to reflect activity of blood clotting (Vavilova et al., 2011; Panchenko and Kropacheva, 2007; Butchart et al., 2002). The changes in hemostasis parameters can be used in the combined eye surgery. Given the hemostasis parameters measured in oil and gas facility workmen, degree of health hazards affecting organisms of these people could be qualified.

Blood clotting is a complex multistage enzymatic process consisting of two links, such as, cell and plasma hemostasis (Vavilova et al., 2011; Panchenko and Kropacheva, 2007). Cell hemostasis can be defined as a process including aggregation of blood formed elements, their attachment to a vessel wall and release of substances activating plasma hemostasis (Vavilova et al., 2011; Butchart et al., 2002). Plasma hemostasis is a series of reactions known as the coagulation cascade, that is, a series of enzymatic reactions that ends in the formation of a fibrin protein fiber mesh (Vavilova et al., 2011; Butchart et al., 2002). Platelets play a leading role in adhesion-aggregation processes.

There are only few publications on changes in hemostasis parameters by age and service record of oil and gas industry facility workmen exposed to specific health hazards. In-plant atmosphere contains harmful substances, such as, hydrogen sulfide, sulfur dioxide, hydrocarbons and nitrogen, a workman’s organism suffering negative effects of thermal gradient, occupational noise and other factors. To our mind, a study on prothrombin time, thrombin clotting time and number of platelets aiming at assessment of blood clotting mechanisms and stages can facilitate diagnosis and surgical treatment of oil and gas facility workmen. The work was initiated to study the parameters in question.

Prothrombin Time (PT) Blood Test for Clotting Time. Prothrombin time (PT) is most commonly measured using blood plasma drawn into a test tube containing liquid citrate which acts as an anticoagulant by binding the calcium in a sample. Following incubation at 37°C an excess of calcium is added (thereby reversing the effects of citrate), which enables the blood to clot again is added to the plasma, time of clot formation registered. Tissue factor (also known as factor III) is added to both test and normal plasma, and the time the sample takes to clot is measured optically. The prothrombin time is the time it takes plasma to clot after addition of tissue factor. PT prolongation and increase in test-
to-normal plasma clotting time ratio by more than 1.5 times are the evidence for the underlying functional change.

**Materials and methods**

Upon occupational exposure survey of operational staff at oil and gas facilities in Kashkadarya, Bukhara and Fergana regions of Uzbekistan 66 operators and mechanics diagnosed with cataract, glaucoma and dacryocystitis were selected to comprise the experimental group. 22 in-patients at Kashkadarya regional eye care hospital were included into the control one. Blood was drawn from cubital vein into 3.8% liquid citrate at 9:1 ratio to be centrifuged at 1500 rpm for 10 minutes and subsequently analyzed at automated coagulation analyzer (Hospitex Diagnostics, Instrumentation Laboratory, Italy) with commercial standard set of kits. To study effect of age and service record on hemostasis the patients from the experimental group were subdivided into two groups, IА and IB subgroups comprising examinees under 49 years and those over 50 years of age, respectively. Hemostasis parameters by age can be seen in Table 1. To assess the effect of service duration the patients were subdivided into those with the service record under 10 years and one over 10 years (Table 2). All the participants gave the informed consent to take part in the study.

**Results and discussion**

The results of study on blood clotting in oil and gas facility workmen by age and service record can be seen in Table 1 and Table 2, respectively.

**TABLE 1. HEMOSTASIS PARAMETERS BY AGE (M±m)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>I-A group (n=10)</th>
<th>I-B group (n=12)</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT (s)</td>
<td>12.69 ±0.19</td>
<td>12.51 ±0.23</td>
<td>12.10±0.21</td>
</tr>
<tr>
<td>Thrombin clotting time (s)</td>
<td>17.18 ±0.41</td>
<td>15.29 ±0.33</td>
<td>14.39±0.14</td>
</tr>
<tr>
<td>Number of platelets x 10⁹/mkl</td>
<td>248.11 ±11.59</td>
<td>259.27 ±11.19</td>
<td>242.11±14.12</td>
</tr>
</tbody>
</table>

Note: P<0.01 in relation to the control group

As it can be seen, PT in I-A and in I-B subgroups is respectively 5.0% and 3% higher than the one in the control one. As to thrombin clotting time, it is respectively higher by 19.0% and 6.0% in I-A and I-B subgroups, than the one in the control group. Number of platelets in I-B subgroup is higher than the parameter in I-A subgroup and the one in the control group by 7.0% and 2.0%, respectively.

**TABLE 2. HEMOSTASIS PARAMETERS BY DURATION OF SERVICE (M±m)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Under 10 years (1st group)</th>
<th>Over 10 years (2nd group)</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT (s)</td>
<td>12.63 ± 0.33</td>
<td>12.59 ± 0.12</td>
<td>12.05± 0.19</td>
</tr>
<tr>
<td>Thrombin clotting time (s)</td>
<td>16.93 ± 0.72</td>
<td>16.22 ± 0.34</td>
<td>14.4± 0.2</td>
</tr>
<tr>
<td>Number of platelets x 10⁹/mkl</td>
<td>272.73 ± 10.26</td>
<td>251.23 ± 9.58</td>
<td>241.9± 14.0</td>
</tr>
</tbody>
</table>

Note: P<0.01 in relation to the control group

All hemostasis parameters by service duration were found higher in the first group. PT in workmen with service record under 10 years was 4.0% higher than the parameter in second group, thrombin clotting time being 17% higher than the parameter in the control group and 12.0% higher than the one in the group of workmen with service record over 10 years. Number of platelets in examinees having worked for the company under 10 years was 12.0% higher than the parameter in the control group, in those with service record over 10 years exceeding the control parameter by 4.0%. Thus, changes in most
parameters of hemostasis can be seen in the groups examined. In the first group patients number of platelets was found increased, PT and thrombin clotting time being longer than in those of the second group.

PT prolongation is known to indicate a deficiency of one or more prothrombin complex factors. Paralleling the prolongation of thrombin clotting time it can be the evidence for chronic gastrointestinal and hepatic disorders. Prolonged PT and thrombin clotting time in oil and gas industry workmen are manifested in tendency to hypocoagulation, conditioned by reduction in functional activity of blood clotting cascade outside the vessel. Changes in parameters of hemostasis in the workmen indicate alteration in the functional activity of hepatocytes participating in synthesis of many factors in both inside and outside blood coagulation routes. Apparently, the changes can be used as additional markers of health hazards on hepatobiliary, cardio-vascular, immune and other systems of a human organism.

Conclusion

Changes in parameters of hemostasis, such as, prolongation of prothrombin time and thrombin clotting time were registered in oil and gas facility workmen exposed to a combination of health hazards. The changes are determined by age and service record; being physiological they still can be the evidence for impairment of potential functional activity of the gastrointestinal tract and the liver. Hemostasis parameters can be used to study methods for prevention of hemorrhages in the preparation for eye surgery.

References