THE ACUTE EFFECTS OF RESISTANCE EXERCISE ON BLOOD COAGULATION IN ADULTS.

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INTRODUCTION

Previous studies have indicated that impaired blood coagulation and fibrinolysis could be associated with cardiovascular disease (Collen 1988). Activation of blood clotting system and increases in the activities of a number of coagulation factors have been reported during and immediately after endurance exercise (Dufaux 1991). Resistance exercise has emerged as a popular form of physical activity among athletes, normal healthy subjects, and high risk individuals (El-Sayed 1993). However, no data are available regarding the acute effects of resistance exercise on blood coagulation process. Therefore the present study was designed to investigate the acute effects of resistance exercise on parameters pertinent to blood coagulation mechanisms.

METHODS

Thirty-two normal healthy subjects volunteered to participate in the study. Subjects characteristics (mean±SD) were: age 20.5±6.3 yr; height 173±9.8 cm; body mass 67.8±10.5 kg; body fat 18.6±7.7%. Maximal resistance exercise protocol consisted of the performance of 3 sets of 7 exercises involving upper and lower body extremities at an intensity corresponding to 15 repetition maximum. Venous blood samples were removed, with no stasis, before and immediately after the maximal resistance exercise (MRE) test. Aliquots of whole blood were assayed for lactate, hematocrit (Hct) and haemoglobin (Hb). Changes in plasma volume were determined from Hct and Hb readings before and after exercise and values were corrected accordingly (Dill 1974). Citrated plasma was assayed for prothrombin time (PT), activated partial thromboplastin time (APTT), thrombin time (TT), factor VIII activity (FVIIIa), fibrinogen (Fb), and antithrombin III (ATIII).

RESULTS

Data showed a significant shortening of APTT (fig. A) and an increase in FVIIIa (fig. B) in response to MRE with no change being observed in PT, TT, Fb, and ATIII (Table 1).

Mean values(±SD) for APTT (fig. A) and FVIII activity (fig. B) before (PRE) and after maximal resistance exercise (POST). * denotes significantly (P<0.05) lower mean value, while ° signifies significantly (P<0.05) higher mean value than that observed at PRE.
Table 1. Blood coagulation parameters (mean±SE) at rest and in response to maximal resistance exercise.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rest</th>
<th>Immediately after exercise</th>
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<tbody>
<tr>
<td>Lactic acid (mmol.l⁻¹)</td>
<td>0.85±0.07</td>
<td>5.85±0.28*</td>
</tr>
<tr>
<td>Plasma Volume Loss (%)</td>
<td>-</td>
<td>-13.6±0.87</td>
</tr>
<tr>
<td>Prothrombin time (s)</td>
<td>16.3±4.4</td>
<td>15.0±1.1</td>
</tr>
<tr>
<td>Thrombin time (s)</td>
<td>10.9±1.1</td>
<td>9.6±1.0</td>
</tr>
<tr>
<td>Fibrinogen (mg dl⁻¹)</td>
<td>216.4±47.4</td>
<td>220.4±45.2</td>
</tr>
<tr>
<td>Antithrombin III (%)</td>
<td>104.2±8.8</td>
<td>103.7±7.5</td>
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</tbody>
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* signifies significantly higher (P<0.05) value than that found at rest.

DISCUSSION

Maximal resistance exercise encompassing upper and lower body extremities significantly shortened APTT and increased FVIII activity, thus indicating an overall hypercoagulable condition. These results are in agreement with earlier observations using endurance type of exercise (Andrew 1986; Ferguson 1987). The increase in FVIII activity has been suggested as responsible for the accelerated functional state of the blood coagulation mechanism, as indicated by the post-exercise shortening of APTT (Dufaux 1991). This increase may be attributed either to activation of FVIII within the circulation or to the release of stored or freshly synthesized FVIII (EL-Sayed 1993). It is suggested that the exercise-induced hypercoagulable state is counterbalanced by hyperfibrinolysis, thus maintaining, at a higher level of activity, a delicate dynamic balance between blood coagulation and fibrinolysis. In conclusion MRE, similar to endurance exercise, activates certain blood coagulation assays in man.

REFERENCES


