

## Blood coagulation at major orthopedic surgery

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**Background:** Strengthening the coagulation and fibrinolytic activities in response to surgical trauma greatly increases the risk of bleeding and thromboembolic complications in orthopedic patients. The thromboelastography (TEG) can detect hypercoagulable and hypocoagulable states, it is useful for monitoring coagulation during surgical procedures. In this work we studied the dynamics of blood clot formation and lysis as well its relation to hemostasis markers by total hip arthroplasty.

**Materials and Methods:** Blood samples were examined in 61 patients (29 men and 32 women, ranging in age from 33 to 72 years, with an average of  $54 \pm 2$  years) undergoing primary total hip arthroplasty. Anticoagulant prophylaxis was carried out using low molecular weight heparin (enoxaparin); to prevent excessive blood loss it was administrated tranexamic acid perioperatively. Conventional TEG and common coagulation tests, fibrinogen, thrombin-antithrombin complexes (TAT), D-dimer, the platelet count,  $\beta$ -thromboglobulin were determined preoperatively, 30 minutes after the end of surgery, and at 1, 3, 7 and 14 days after arthroplasty. The data was assessed using descriptive statistics, ANOVA, Pearson's correlation analysis.

**Results:** The TAT concentration reached maximum level up to the end of the operation, decreased in a day and normalized on the third day after surgery. The highest concentration of fibrinogen was noted by the 3 day after surgery and remained elevated for up to 14 day. The platelet levels decreased during the first postoperative day and increased after the third postoperative day, with the highest concentration measured from 7 till 14 postoperative days. The  $\beta$ -thromboglobulin level increased sharply to the maximum level at the end of surgery, which was followed by active release of  $\beta$ -thromboglobulin for seven days, after which it returned to its initial level.

At the same time, the total blood haemostatic potential as defined by the TEG coagulation index (CI), increased immediately after hip replacement surgery with the maximum on the 7 day and CI remained elevated in comparison to preoperative level up to 14 day. At the same time, the total blood haemostatic potential as defined by the TEG coagulation index (CI), increased immediately after hip replacement surgery with the maximum on the 7 day and CI remained elevated in comparison to preoperative level up to 14 day. At 30 min after operation there was identified significant correlation between CI and platelet levels ( $r=0.31$ ,  $p<0.05$ ) and  $\beta$ -thromboglobulin levels ( $r=0.60$ ,  $p<0.05$ ). On the first postoperative day the correlation between CI and fibrinogen levels ( $r=0.42$ ,  $p<0.05$ ) and platelet levels ( $r=0.36$ ,  $p<0.05$ ) was revealed. Three postoperative days later, the correlation between CI and activity of extrinsic pathway of coagulation was noted. On 7 and 14 days correlation between the CI and PTV levels were respectively  $r=-0.45$ ,  $p<0.05$  and  $r=-0.47$ ,  $p<0.05$ .

The D-dimer concentration increased sharply at the end of the operation, which was followed with decline at day 3, and the subsequent significant increase in the D-dimer level by the 7th day remained till 14 days. Contrary to that, index of whole blood lysis (Ly30) was not changed at the end of the surgery and during the first day, on third day the Ly30 level significant increased and then returned to their admission level by seven day after surgery. Significant correlation between D-dimer levels and CI were not fined.

**Conclusion:** After major orthopedic surgery the total blood CI defined by the TEG showed the highest level at 7 day, remains elevated in comparison to preoperative level up to 14 day and correlated with the activity of the extrinsic pathway of coagulation at this time. Opportunities of TEG for monitoring coagulation and antithrombotic prophylaxis following major orthopedic surgery require further investigation.

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