**Abstract**

Hemostatic system is designed to maintain blood in a fluid state yet provide important defenses against bleeding when injury occurs to the vessel. During surgery, patients are exposed to hemostatic stress causing complications of either hypercoagulability or hemorrhage. The goal of the present study was to describe the clotting changes in patients who underwent major surgeries especially procoagulant mechanisms.

**Methods**

30 patients belonging to both sexes who were undergoing surgery for various reasons were included in the study. Tests to assess the integrity of hemostatic system were conducted. Results: Analysed and expressed in mean and SD. There was a significant (p<0.05) difference in the hemostatic parameters like bleeding time, clotting time, thrombin time, platelet count and fibrinogen concentration between the preoperative and postoperative periods.

**Introduction**

Hemostatic system is designed to preserve the integrity of the blood circulation by complex physiologic mechanisms that maintain blood in a fluid state yet provide important defenses against bleeding when injury occurs to the vessel. Initiation of coagulation is brought about by physical disruption of the resting endothelium either by injury or surgery and converts it into an area of procoagulant activity. Intrinsic and extrinsic pathways then propogate the blood coagulation mechanism through a group of plasma proteins. The intrinsic pathway starts with the formation of factor XIIa which finally forms factor Xa that enters the common pathway where extrinsic and intrinsic pathways merge to form thrombin. The extrinsic pathway starts with interaction of blood components with tissue factor following injury and finally converges at the factor Xa level leading to thrombin formation (1). It is recognized since several
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10 females) between 20-65 years undergoing major surgeries like orthopedic (mainly surgeries for fractures), urology, gastroenterology and plastic surgery were included in the study. Duration of surgery was about 2-4 hrs, the average blood loss was about 800-1000ml and the post operative recovery time varied between 5-7 days in all the cases. All female subjects selected were having regular menstrual cycles and were in the secretory phase of the cycle. Patients with medical disorders that interfere with normal clotting mechanisms like Diabetes mellitus, Hypertension, Bleeding disorders, liver disorders, during menstruation phase, immediate post partum period, on Oral contraceptive pills (OCP), smokers and patients with signs of dehydration were excluded from the study. Laboratory investigations like bleeding time (by Duke's method), clotting time (by Capillary tube method), Prothrombin time using Tissue factor reagent, APTT with Cephalin phospholipids, Thrombin time using thrombin reagent, platelet count measured with an Automated Cell Counter and Fibrinogen concentration measured with an Automated analyzer were performed in the preoperative period and on the 3rd post operative day. Literature suggests that the clotting mechanisms stabilize and return to normal within 24-48 hrs. Also, as variety of surgeries were included in the study the earliest period after 48 hrs that is 3rd post-operative day was selected to look for any changes. An informed consent was taken from all the study participants. The Institutes Ethics Committee permission was obtained.

Results

Results were tabulated and analysed using Statistics Calculators version 3.0 BETA software. ‘t’ test was done to compare the means and to see the significance.

The mean age of the subjects was 45.9 years.

Mean and Standard deviation of bleeding time, clotting time, prothrombin time, activated partial thromboplastin time (aPTT), thrombin time, platelet count and fibrinogen concentration were calculated.

Methods

30 patients belonging to both sexes (20 males and
The mean bleeding time was found to decrease postoperatively from 3.5 to 2.56 min which was found to be statistically significant (p<0.05).

The mean clotting time decreased from 7.8 min preoperatively to 6.86 min postoperatively which was found to be statistically significant (p<0.05).

Prothrombin time, however did not show much difference postoperatively and was not found to be significant.

APTT and thrombin time were found to be significantly decreased postoperatively (p<0.05).

Platelet count in the present study was found to be higher in the post-operative period when compared to pre-operative period. But, the increase was within normal limits. Studies show that platelet count exhibits a bimodal response (14, 15) where there is an initial decrease as the platelets are used up in the process of temporary hemostatic plug formation. Later on, there is an increase in the count due to reactive thrombocytosis which is caused by early rise of TPO (16, 17, 18). It is generally a self-limiting condition that resolves with the inciting condition.

The present study also shows that the prothrombin time that measures the extrinsic pathway is reduced. It determines the clotting tendency of the blood and measures factor I (fibrinogen), factor II (prothrombin), V, VII and X and is usually measured in association with aPTT. The decreased prothrombin time post-operatively indicates that the hemostatic mechanism is coming to normal within 72 hr of surgery without producing hypercoagulability.

aPTT measures efficacy of both intrinsic and common coagulation pathway and is found to be reduced in the study post-operatively also indicating that hypercoagulability is prevented and normal hemostasis is accomplished.
The present study shows that even in the normal ranges a significant change can occur in clotting mechanisms, and in our study these mechanisms returned to normal within 72 hrs.

**Conclusion and limitations:**

Tests of hemostasis measuring procoagulant activity help us assess the tendency towards bleeding or thrombosis so that appropriate interventions if required may be given to the patients to maintain normal hemostasis. Also, these parameters give an indication of the presence of sepsis and inflammation both of which lead to a hypercoaguable state. Appropriate treatment maybe given in the form of replacing the consumed coagulation factors and treating the underlying focuss of infection and or inflammation if any. Medications that depress the platelet functions may be used with caution in such condition.

However, the present study has its own limitations in that the anticoagulant mechanisms were not assessed in the study which would give a broader picture of the hemostatic condition. Serial measurements of the procoagulant parameters at 24 hours, 48 hours and 72 hours postoperatively would be more accurate and useful in assessing the hemostatic condition. The degree of hypercoagubility caused by each type of surgery also were not assessed in the present study. Further tests are needed to more accurately measure the hemostatic response following surgery.

**References**


