The Role of Rotational Thromboelastometry (Rotem coagulation analyzer) in A Protein S Deficiency Parturient

Shih Kung-Chien, Kuen-Bao Chen, Tsung-Yang Lee, Liu ShihKai
Department of Anesthesiology, China Medical University Hospital, Taichung, Taiwan

Case presentation

The patient is a 34-year-old pregnant woman(gravida IV para I spontaneous abortion II) diagnosed with protein S deficiency two years ago due to habitual abortions. She has no family history of coagulopathy or hematological diseases, and she has never had claudication, deep vein thrombosis(DVT), pulmonary embolism or any other thromboembolic diseases. In addition, she received Enoxaparin (low molecular weight heparin, LMWH) 6000 International Units (IU)/day via subcutaneous injection, and she gave birth to a normal baby via normal spontaneous delivery approximately a year ago.

This time, she was pregnant with gestational age 36+1 weeks, and she planned to deliver via Cesarean section because of breech presentation. She started the same dose of Enoxaparin via subcutaneous injection in the early pregnancy until she had vaginal and vulvar bleeding easily two days before delivery.

According to the physical examination and lab study right before Cesarean section, the woman was 167cm in height and 65kg in weight (BMI=23.3). There was no visible ecchymosis or purpura throughout the skin, and there was no visible woozing or bleeding of the oral, nasal, vaginal or anal mucosa. The patient had normal platelet count, prothrombin time (PT), international normalized ratio (INR) and activated partial thromboplastin time (aPTT), but had high fibrinogen (640 mg/dL), high D-Dimer (1151.08 ng/mL) and low Protein S (43.7%) levels.

However, unaware of the residual effects of LMWH, we obtained a "rotational thromboelastometry" via Rotem coagulation analyzer for coagulant and fibrinolytic functions before anesthesia. The result of the INTEM (intrinsic pathway) of rotational thromboelastometry revealed normal clotting time (CT) and normal clot formation time (CFT). The alpha angle, amplitude 10 minutes after CT (A10), maximum clot firmness (MCF) and maximum lysis (ML) were also within normal range; (Figure.1). Thus, we performed combined spinal and epidural anesthesia for Cesarean section according to normal thromboelastometry.

The puncture wound on the back skin was clear without woozing or local hematoma, and there was no neurological defects 5 days after Cesarean section.

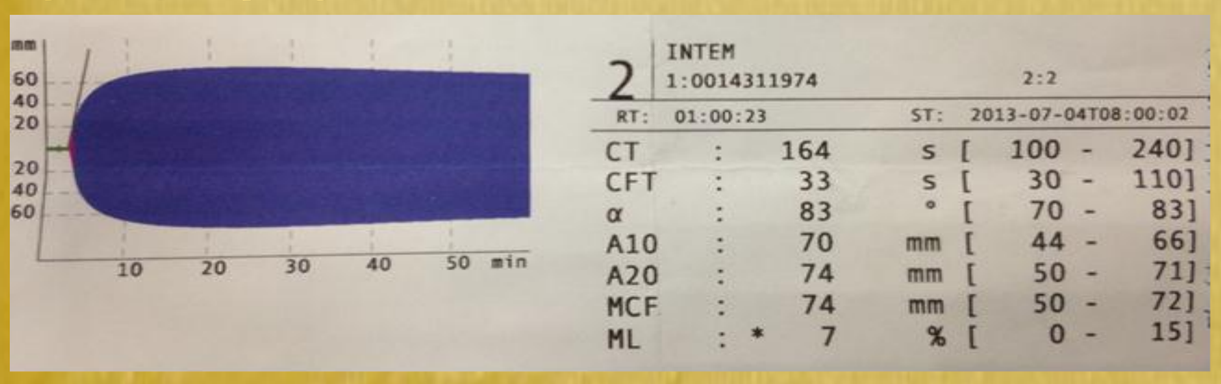

Figure.1

Discussion

In combination with the physiological changes in blood coagulation and fibrinolysis during normal pregnancy, hereditary thrombophilic defects are associated with an increased risk of uteroplacental thromboembolism. Most pregnant women with hereditary deficiencies of antithrombin, protein C or protein S receive anticoagulant treatment during pregnancy to reduce the high fetal loss rate [1]. However, anesthesiologists usually consider coagulopathy as one of the most common, relative contraindication of regional anesthesia clinically. A quick and accurate monitoring of the coagulant function will give anesthesiologists lots of information for clinical management.

Enoxaparin, a low molecular weight heparin, is one of the best anticoagulant agent for antenatal thromboprophylaxis. For pregnant females with thrombophilia (confirmed laboratory abnormality) without prior DVT, Enoxaparin 40 mg via subcutaneous injection once daily or surveillance is recommended (to maintain anti-factor Xa level of 0.2-0.6 IU/ml), and it should be continued for at least 7 days following Cesarean section [2].

At the above recommended dose, Enoxaparin does not specifically affect platelet activity, PT or aPTT. It exerts its antithrombotic activity by binding to and accelerating the activity of antithrombin and inhibited coagulation factor Xa and factor IIa (thrombin) with a ratio of 4:1 [3]. The significant anti-factor Xa activity persists in plasma for about only 12 hours. Thus, we need an indicator instead of PT, aPTT to monitor the coagulant activity. Throughout Rotem coagulation analysis, it shows dose-dependent prolonged CTs, followed by CFT prolongation, alpha angle reduction and reduction in the clot firmness on INTEM (the intrinsic pathway) of rotational thromboelastometry, but no effect on EXTEM (heparin inhibitor included) [4].

In high risk patients, a modern coagulation monitoring like Rotem coagulation analyzer provides a solid evidence to help anesthesiologists making a reasonable decision.

Referance

1. Nienke Folkeringa et al, Reduction of high fetal loss rate by anticoagulant treatment during pregnancy in antithrombin, protein C or protein S deficient women. BJH research paper 2006

2. Ginsberg JS, Hirsh J. Use of antithrombotic agents during pregnancy. Chest 2001; 119:122S-31S.

3. Inherited thrombophilias in pregnancy. [Guideline] American College of Obstetricians and Gynecologists - Medical Specialty Society 2010-04-01

4. Tivadar Fenyvasi et al, Effect of Direct Thrombin Inhibitors, Unfractionated Heparin, Low Molecular Weight Heparins Dalteparin and Enoxaparin and of the Heparinoid Danaparoid on the Rotation Thromboelastometry Method. GTH congress 2005, Poster 139