THE LABORATORY CONTROL OF ANTICOAGULANT THROMBOPROPHYLAXIS DURING THE EARLY POSTPARTUM PERIOD AFTER CESAREAN DELIVERY

[1]Dmitry Rogachev National Research and Clinical Center of Pediatric Hematology, Oncology and Immunology, Moscow, Russia, [2]Center for Theoretical Problems of Physicochemical Pharmacology RAS, Moscow, Russia, [3]Kulakov Research Center for Obstetrics, Gynecology and Perinatology, Moscow, Russia, [4]HemaCore Labs LLC, Moscow, Russia, [5]Laboratory Medicine Federation, Moscow, Russia, [6]Lomonosov Moscow State University, Moscow, Russia

E. Koltsova[1], A. Balandina[1,2], K. Grischuk[3], M. Shpilyuk[3], E. Seregina[1], N. Dashkevich[2,4], A. Poletaev[1], A. Pyregov[3], G. Sukhih[3], I. Serebriyskiy[5], F. Ataullakhanov[1,2,6]

Introduction

The incidence of VTE after caesarean section reaches 0.6% and the widespread use of it draws attention to this group. The dosage and duration of low molecular weight heparin (LMWH) prophylaxis is estimated by anamnestic risk-scales, which predictive potency can be low in case of individual patient's risk estimation. The laboratory hemostasis assays are supposed to solve this problem.

Objectives

The aim of this study was to estimate a potency of tests to reflect the coagulation state of patients, receiving prophylactic doses of LMWH in early postpartum.

Methods

We conducted an observational study in 97 women undergoing caesarean section (CS) with age median (minimum-maximum range) 33 (21-45) years, gestational age 38 (28-41) weeks, BMI 27.0 (21.3-38.4). All gave their written informed consent. The protocol was approved by ethics committee. Blood samples were collected 3-5 hours after the CS (P1) and 2 days after the CS (P2). Standard tests (Fg, APTT, prothrombin, D-dimer), anti-Xa assay, ROTEM and thrombodynamics/thrombodynamics-4D were performed (Figure 1). ROC-analysis, Wilcoxon signed rank test and Mann-Whitney U-test were used for statistical analysis of the data.

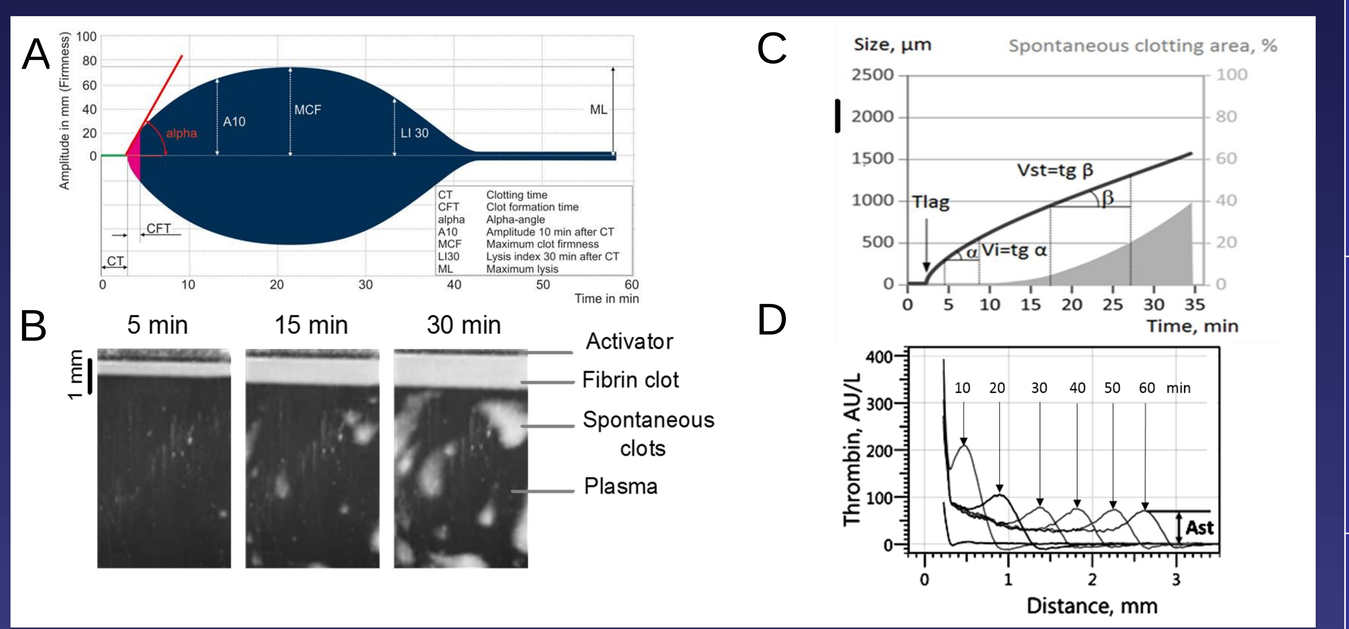

Figure 1. ROTEM, thrombodynamics and thrombodynamics-4D methods principle. A – Clotting graph and parameters in ROTEM. B - Photos of fibrin clot growth in thrombodynamics/thrombodynamics-4D. The edge of the activator is covered with immobilized tissue factor. The clot starts growing from the edge of the activator. The process of fibrin clot formation is recorded in a time-lapse video microscopy mode by the dark-field light scattering method. C - Plot of clot size versus time, representing the thrombodynamics parameters. D – Plot of thrombin activity versus time. Each peak represents the spatial distribution of thrombin in plasma with a 10 min interval. Parameter Ast is calculated as the amplitude of the thrombin peak after 60 minutes of the experiment.

Results

At P1 fibrinogen and D-dimer concentrations, CFT and α in ROTEM, Vi, V, Vst in thrombodynamics and Ast in thrombodynamics-4D were shifted to hypercoagulation and had the tendency to normalization at P2 (Table 2). Coagulation parameters were compared in groups formed in presence or absence of LMWH for estimation of laboratory assays sensitivity to LMWH influence. V had maximal AUC in ROC-analysis (AUC=0.76), Ast had AUC=0.75 (Figure 2). At P2, 12 women (31% of AC group) had marked hypercoagulation despite anticoagulation, as demonstrated by the thrombodynamics assay (dashed circle on Figure 2).

Table 2. Laboratory coagulation test parameters

Parameter Median [5-95 %]	Reference intervals	P1	P2	p
Fg, g/l	2.0-4.7	5.7 [3.3-7.3]	6.5 [4.8-8.3]	<0.001
APTT, sec	28-40	28 [24-34]	29 [24-34]	<0.001
Prothrombin, %	80-119	113 [87-137]	119 [92-145]	<0.001
D-dimer, µg/l	<550	5118 [1532-9999]	1705 [789-8677]	<0.001
CT, sec	575-891	582 [388-832]	623 [341-816]	<0.05
CFT, sec	164-430	156 [93-292]	173 [90-427]	<0.05
Alpha, degree	32-60	61 [46-73]	60 [36-73]	NS
MCF, mm	39-65	57 [45-69]	59 [39-73]	NS
Tlag, min	0.6-1.5	0.75 [0.65-1.15]	0.8 [0.6-1.25]	NS
Vi, µm/min	38-56	63 [54-70]	60 [50-68]	<0.001
V, µm/min	20-29	39 [32-57]	35 [25-53]	<0.001
D, i.e.	15000-32000	31367 [27421-33736]	31894 [26848-34295]	<0.05
Ast, AU/l	40-100	206 [97-344]	138 [60-297]	<0.001

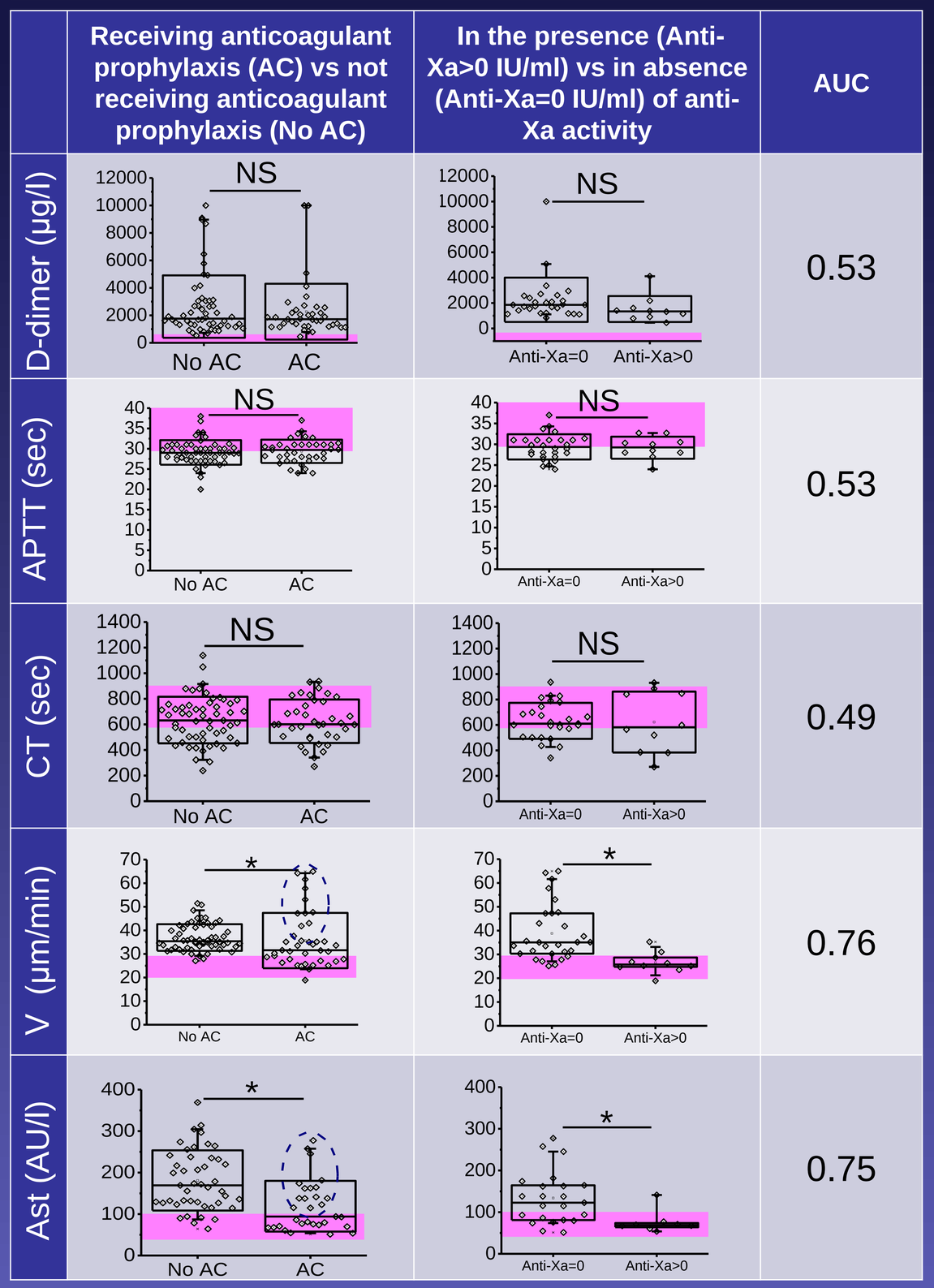

Figure 2. Sensitivity of laboratory coagulation test parameters to LMWH
* - significant difference, NS – non-significant difference - ref.range

Conclusions

Coagulation assays reveal hypercoagulation after the delivery and tendency to normalization of coagulation during early postpartum. Parameters of thrombodynamics/thrombodynamics-4D had the highest sensitivity to the presence of LMWH-prophylaxis.