PW3-6

Impaired whole blood coagulation and plateled function in patients with cyanotic congenital heart disease

Mebus S. (1), Braun S. (2), Eicken A. (1), Hager A. (1), Hess J. (1), Kaemmerer H. (1)
(1) Department of Pediatric Cardiology and Congenital Heart Disease and (2) Institute of Laboratory Medicine, Deutsches Herzzentrum München, Technische Universität München,

Objectives: Many patients with cyanotic congenital heart disease (CCHD) suffer from hemostatic and coagulation abnormalities resulting in both - bleeding diathesis and thrombembolic events. Bleeding diathesis may be related not only to coagulation abnormalities but also to reduced platelet count and function. Measurements of the velocity and firmness of clotting by thromboelastometry have sporadically been discribed as a useful method for detection of hypercoagulability. This study was performed to assess the impact on thromboelastography and platelet aggregometry in patients with CCHD.

Methods: 55 consecutive patients with CCHD presenting in our center were studied. Blood samples were taken for detailed laboratory analysis including modified thrombelastography. Blood cells were counted on a Sysmex XE2100 analyser and the Multiplate™ system was used for measuring the whole blood impedance platelet aggregometry. Thrombelastometry was performed using tissue-factor as activator (EXTEM) and tissue-factor plus platelet inhibitor cytochalasin (FIBTEM) with the ROTEM™ system. Concomitant medication with potential impact of blood coagulation and platelet function were noted.

Results: Median hematocrit (Hct) was 57% (range: 42-78%). There are negative correlations between Hct-levels and platelet counts (r=-0.5372), platelet aggregation after activation with ADP (r=-0.4103), arachidonic acid (r=-0.5249) and TRAP (r=-0.3327) similarly to EXTEM-analysis (maximum clot firmness -MCF- r=-0.5729) and the alpha angle (r=-0.6978).The median MCF-value in the FIBTEM test was 9 mm, showing fibrinogen components of blood coagulation after in-vitro inhibition of platelet function. Hence, 50% of all investigated patients with CCHD had fibrinogen equivalents below the reference range and in patients with higher Hct-levels FIBTEM-values were even lower (see table).

Conclusions: Complex hemostatic abnormalities, including thrombocytopenia and suppressed platelet function, are common in CCHD. Thrombelastometry and platelet aggregometry are useful instruments for assessment of the whole blood coagulation and platelet function also in these patients. Thrombometry demonstrated a tendency for inferior clot formation dynamics (alpha angle in EXTEM), decreased fibrinogen and disturbed clot polymerization (small MCF in FIBTEM), even though no tendency for hypercoagulability could be found. Particularly with regard to decisions about anticoagulation or antiplatelet therapy, in patients with CCHD this analytical methods could become relevant.

	Median [25.-75. percentile] (Hct < 57%)	Median [25.-75. percentile] (Hct ≥ 57%)	Kruskal-Wallis test significance level p	Reference range
Platelet count [/nl]	178 [80-313]	120 [56-297]	p = 0.0013	200-400
ROTEM EXTEM MCF [mm]	57 [43-68]	50.5 [31-68]	p = 0.0025	50-72
ROTEM EXTEM alpha angle [°]	66 [51-75]	52 [32-77]	p = 0.0001	63-83
ROTEM FIBTEM MCF [mm]	10.5 [3-23]	7 [2-20]	p = 0.0534	9-25
Multiplate ADP-ind. Aggregation [AU*min]	492 [56-879]	320 [200-844]	p = 0.0829	534-1220