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Evaluation of impact of glycaemic control on haemostasis in PGDM pregnant women using a novel quantitative assessment of whole-blood thrombogenicity

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Objective

Hypercoagulable influences of insulin resistance and hyperglycaemia on haemostasis are well evidenced. They contribute to a chronic inflammatory state, reducing fibrinolysis and in consequence the risk of thrombotic events is increased. Data regarding impact of glycaemic control on haemostasis in pregnancy complicated by diabetes is limited, and standard laboratory parameters of haemostasis do not give a full picture of these disturbances and they do not predict the patient's risk of a thrombotic event. The aims of the study were to assess the process of whole blood clot formation in pregnant women with diabetes and also to investigate the influence of glycaemic control in pregnant women with diabetes on this process.

Methods

For analysis peripheral venous blood was used. The analysed groups of women comprised of healthy non-pregnant women (n=10); healthy pregnant women (n=13) and PGDM pregnant women (n=25) divided to subgroups of efficient glycaemic control and poor glycaemic control (HbA1c > 6, 5%, n=6). Exclusion criteria were: prior episode of venous or arterial thrombosis, diagnosis of acquired or inherited thrombophilia, neoplasia and uncertain family history of thrombosis. Evaluation of whole blood thrombogenicity – thrombus formation under flow condition was assessed using T-TAS ® at a shear rate of 240 s-1 (Total Thrombus Analysis System, Fujimori Kogyo, Zacros, Japan, AR-chip) equipped with AR microchip and thrombogenic surfaces (collagen with thromboplastin). In each patient blood samples were analysed for thrombus formation area under the curve (AUC30), time of blood clot formation initiation (T10) and OT (occlusion time) - time of complete thrombus formation inside the AR-chip. For statistical analysis Shapiro-Wilk, ANOVA Kruskal-Wallis, Dunn-Bonferroni Post-hoc, Spearman's rank correlation and Mann-Whitney tests were used.

Results

There were no differences in age, blood pressure, BMI, LDL and HDL in non-pregnant controls, pregnant controls and in the PGDM pregnant group of patients. T10, OT, AUC30 were different in those groups (p=0, 01; p=0, 02; p=0, 029). There were statistical differences between T10, AUC30 and OT between non-pregnant and pregnant controls. Median values were: 668 s vs. 407 s (p=0, 04, Mann-Whitney); 1427, 6 vs. 1804 (p=0, 04, Mann-Whitney) and 800, 5 s vs. 536 s (p=0, 04, Mann-Whitney) respectively. There were statistical differences between T10, AUC30 and OT in the efficient and poor glycaemic control subgroups of PGDM. Median values were: 343 s vs. 229, 5 s (p=0, 003, Mann-Whitney); 1828, 8 vs. 2024 (p=0, 01, Mann-Whitney) and 486 s vs. 329 s (p=0, 02, Mann-Whitney) respectively. We observed positive statistically significant correlation between AUC30 and HbA1c (r= 0, 383604, p=0, 007).

Conclusion

The results of our pilot study showed the prothrombotic influence of pregnancy and poor glycaemic control on haemostasis in pregnancy complicated by diabetes mellitus. Our results suggest AUC30 and OT level assessed by T-TAS as a potentially useful diagnostic tools for evaluation of the hypercoagulable state in pregnancy and in diabetes. Due to the limited number of analysed women in our pilot study further research on a larger cohorts is needed to ultimately confirm our findings.