Impact of ABO blood group on global coagulation assays

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INTRODUCTION

- ABO blood group can influence coagulation and associate with risks of thrombosis and bleeding.
- Previous meta-analysis have reported an association between blood group O and the risk of bleeding, while non-O blood groups have been linked to the risk of venous thromboembolism.
- Standard coagulation studies are not predictive of these risks, while global coagulation assays (GCAs), which provide a more comprehensive assessment of haemostasis, have been shown potential in predicting bleeding and thrombosis risks.

This study aimed to evaluate the effects of ABO blood group on GCAs in healthy adults.

METHODS

- Healthy adults aged between 18 and 80 years old were recruited. Participants on anticoagulation or hormonal therapy, history of thrombotic disease, or with any known cardiovascular risk factors were excluded
- Blood samples were obtained for routine laboratory testing and GCAs, including Thromboelastography® (TEG), overall haemostatic potential (OHP) assays, calibrated automated thrombogram thrombin generation (CAT-TG) and plasmin generation (CAT-PG) (Figure 1).
- Statistical analysis was performed using SPSS version 27.0.1.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 113 healthy participants were included, comprising of 47 individuals with blood group O, 33 blood group A, 25 blood group B and 8 blood group AB.

Routine coagulation tests showed subtle differences across blood groups

Compared to non-O groups, blood group O individuals showed more prolonged APTT, lower Factor VIII, Von Willebrand Factor (VWF) antigen, and higher levels of P-selectin (Figure 2a-d).

The impact of ABO blood group varied across GCAs

In CAT-TG, individuals with blood group O demonstrated significantly lower thrombin peak and velocity index (Table 1, Figure 2e-f). While in whole blood TEG, blood group O individuals showed lower Lysis30 compared to non-O group, despite no differences in maximum amplitude. No statistical significance when analysing individual ABO subgroups. No other significant differences were found on OHP or CAT-PG parameters across blood groups.

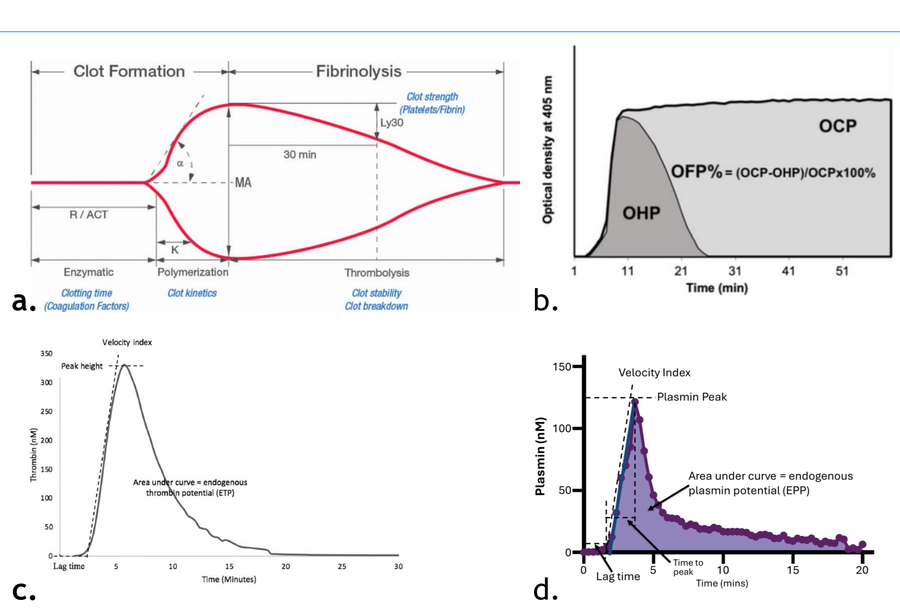

Figure 1. The illustration of GCAs and relative parameters. (a)TEG (b) OHP (c) CAT-TG (d) CAT-PG

Table 1. Comparisons of demographics and GCAs across blood groups

Blood Group	O (n = 47)	Non-O (n = 66)	p-values (O Vs non-O)	A (n = 33)	B (n = 25)	AB (n = 8)
Female sex, n (%)	28 (59.57%)	46 (69.70%)	0.139	24 (72.72%)	17 (68.00%)	5 (62.50%)
Age (years)	38.00	37.50	0.956	35.00	45.00	36.00
Thromboelastography® (TEG)						
R-time (min)	6.55	6.30	0.566	6.10	6.50	6.90
K-time (min)	2.25	2.10	0.315	2.15	2.05	1.90
α-angle (°)	57.15	58.70	0.563	61.10	57.90	51.70
Maximum amplitude (mm)	61.52	59.97	0.237	58.43	61.66	60.53
Lysis30 (%)	0.15	0.60	**0.038**	0.65	0.60	1.90
Calibrated automated thrombogram thrombin generation (CAT-TG)						
CAT-TG Lag time (min)	3.30	3.03	0.110	3.00	3.00	3.28
Endogenous thrombin potential (nM·min)	1259	1378	0.051	1407	1289	1444
Thrombin Peak (nM)	204.68	241.75	**0.006**	256.81	228.96	219.54
Velocity index (nM/min)	56.20	81.35	**0.001**	99.94	71.70	75.51
Calibrated automated thrombogram plasmin generation (CAT-PG)						
CAT-PG Lag time (min)	2.33	2.50	0.907	2.50	2.33	2.62
Endogenous plasmin potential (nM·min)	258.66	263.32	0.734	263.56	276.46	305.44
Plasmin Peak (nM)	44.14	45.23	0.547	46.21	43.35	46.73
Time to plasmin peak (min)	4.67	4.67	0.421	4.67	4.83	4.84
Velocity index (nM/min)	20.03	19.73	0.727	20.10	19.10	20.05
Overall haemostatic potential (OHP) assays						
Overall Coagulation potential (units)	34.65	36.42	0.362	35.70	37.89	34.89
Overall hemostatic potential (units)	6.13	6.65	0.316	6.68	7.47	6.04
Overall fibrinolytic potential (%)	81.15	81.20	0.908	80.93	80.76	82.19

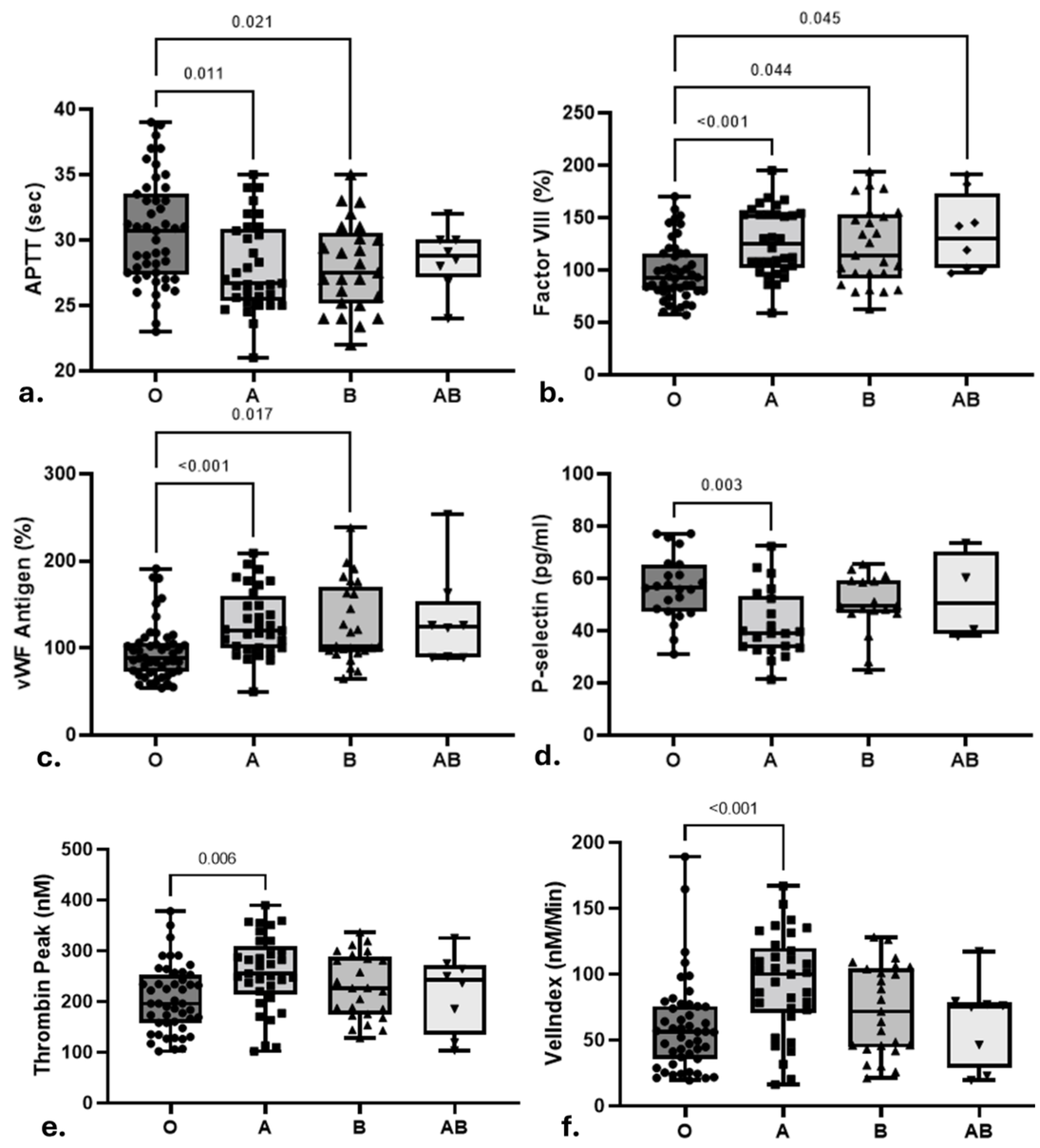

Figure 1. Comparisons of routine laboratory test and CAT-TG across blood groups. (a) APTT, (b) Factor VIII, (c) VWF antigen, (d) P-selectin, (e) Thrombin peak, and (d) CAT-TG Velocity Index. Data represent individual measurements of individuals divided into different ABO groups.

CONCLUSIONS

- This is the first study to evaluate the impact of ABO blood group using multiple GCAs in healthy adults.
- Individuals with blood group O demonstrated reduced thrombin generation and mildly reduced fibrinolysis in whole blood TEG.
- These findings suggest a potential compensatory mechanism in individuals with blood group O, to maintain normal coagulation physiology.
- Future studies with larger and more diverse cohorts may determine how this compensation may be modulated when O group individuals encounter thrombotic or bleeding challenges.

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