Effect of acute strenuous exercise on platelet aggregation, thrombin generation and fibrinolysis in patients with coronary artery disease

J. Kristiansen¹, E.L. Grove², T. Sjurdarson³, M. Mohr⁴, S.D. Kristensen², A.M. Hvas⁵

¹National Hospital of the Faroe Islands, Torshavn, Faroe Islands
²Aarhus University Hospital, Department of Cardiology, Aarhus, Denmark
³University of the Faroe Islands, Faculty of Health, Torshavn, Faroe Islands
⁴University of Southern Denmark, Department of Sports Science and Clinical Biomechanics, SDU Sport and Health Sciences Cluster, Odense, Denmark
⁵Aarhus University, Faculty of Health, Aarhus, Denmark

Funding Acknowledgements: Type of funding sources: Public Institution(s). Main funding source(s): Aarhus University, Denmark Research Council Faroe Islands (grant number 3029)

Introduction: Acute strenuous exercise may cause coronary thrombosis and sudden cardiac death.

Purpose: To investigate the effect of acute strenuous exercise on platelet aggregation, thrombin generation and fibrinolysis in patients with stable coronary artery disease (CAD) and healthy individuals.

Method: Patients with stable CAD (n=164) and healthy individuals (n=25) performed acute strenuous exercise on a cycle ergometer until exhaustion. Blood samples were taken at baseline (before exercise), immediately after and 2 hours after acute strenuous exercise.

Results: From baseline to immediately after strenuous exercise, TRAP-induced platelet aggregation increased significantly in CAD patients (Δ77 AU×min, 95% confidence interval (CI): 55;98, p<0.001) and also in healthy individuals (Δ153 AU×min, 95%CI: 103;225, p<0.001), and remained slightly elevated 2 hours after strenuous exercise in both groups (CAD patients: Δ53 AU×min, 95%CI: 27;80, p<0.001; healthy individuals: Δ140 AU×min, 95%CI: 56;225, p=0.002). Thrombin generation was not affected immediately after exercise, but decreased after 2 hours in patients with CAD (endogenous thrombin potential: Δ-5%, 95%CI: -9.-2, p=0.004). Fibrin clot lysis time increased immediately after exercise (CAD patients: Δ10%, 95%CI: 3-16, p=0.003, healthy individuals: Δ30%, 95%CI: 18;46, p<0.001), whilst plasminogen activator inhibitor-1 (PAI-1) decreased (CAD patients: Δ-17%, 95%CI: -33;-10, p<0.001; healthy individuals: Δ-40%, 95%CI: -53;-25, p<0.001). After 2 hours, an increased fibrinolysis was seen in both groups, expressed as a decrease in PAI-1 in both groups (CAD patients: Δ-41%, 95%CI: -46;-35 p<0.001; healthy individuals: Δ-64%, 95%CI: -78;-46, p<0.001) and a reduced fibrin clot lysis time in patients with CAD (Δ-18%, 95%CI: -24;-11, p<0.001).

Conclusions: Acute strenuous exercise induced an immediate increase in platelet aggregation. Platelet aggregation remained slightly elevated after 2 hours while fibrinolysis was increased and thrombin generation slightly decreased indicating a more favourable haemostatic profile after 2 hours.