



Immobilization as a risk factor for arterial and venous thrombosis

av

Karin Arinell

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Opponent: Docent Joakim Alfredsson
Kardiologiska kliniken
Linköping

Örebro universitet
Institutionen för Medicinska vetenskaper
701 82 ÖREBRO

Abstract

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Aim: Immobilization and a sedentary lifestyle are correlated with an elevated risk of both arterial and venous thrombosis. The goal of this research was to investigate whether markers associated with cardiovascular disease risk are altered during long term immobilization in a human model and in the brown bear, which survives annual cycles of long-term immobilization.

Methods: In study populations assigned to 20-60 days of strict head-down-tilt bed rest 24h a day, we analysed blood levels of the emerging cardiovascular disease marker cystatin C, soluble markers of *in vivo* platelet activation P-selectin and PDGF-BB, and platelet aggregation. Blood samples were taken from free-ranging brown bears in summer and again during hibernation for analysis of lipid profile and platelet aggregation. Histological examination was performed on the left anterior descending coronary artery and aortic arches of bears harvested during the hunting season.

Results: During prolonged bed rest in humans, levels of cystatin C and platelet aggregation remained unchanged, but we observed a significant decrease in platelet activation markers. Brown bear plasma lipids were elevated during hibernation compared with the active state and cholesterol levels were generally considerably higher than normal human values. The arterial specimens showed no signs of atherosclerosis. Platelet aggregation was halved during hibernation compared to the active state.

Conclusions: Long-term immobilization has effects on several cardiovascular risk factors in both humans and bears. Increased knowledge and understanding of the protective mechanisms that allows the brown bear to survive repeated periods of immobilization could contribute to new strategies for prevention and treatment of cardiovascular disease in humans.

Keywords: venous thrombosis, arterial thrombosis, atherosclerosis, cystatin C, cholesterol, platelet activation, platelet aggregation, immobilization

Karin Arinell, School of Health and Medical Sciences
Örebro University, SE- 701 82 Örebro, Sweden.