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Blood Flow, Fibrinolysis and Anti-Procoagulant Activity After Treatment with a Portable Electrostimulation Device (Bodyflow™) in Healthy Subjects

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Background

There is documented evidence that the application of low intensity electric fields not only stimulates smooth muscle contraction and facilitates venous flow but also enhances adrenergic responses which may lead to the release of components of the fibrinolytic mechanism and activation of clotting factors.

Aims

To investigate the effect of a portable electrostimulation device (Bodyflow™) designed primarily to enhance lymphatic flow, on venous tone and haemostatic factors with a particular emphasis on fibrinolysis.

Methods

Bodyflow™ electrodes generating a low intensity 50Hz electrical field were applied for 45 minutes to 23 healthy volunteers (M:F ? 1:1). Blood samples were collected immediately before and after the procedure, at 2 and 6 hours later. Ultrasound was used to assess venous parameters such as vessel diameter, velocity of blood flow and overall venous flow. Coagulation assays and plasma viscosity tests were carried out for each time point. ELISA assays were used to determine proteins of thrombosis and fibrinolysis including tissue plasminogen activator (t-PA), plasminogen activator inhibitor 1 (PAI-1) and soluble P-Selectin.

Results

Individual variation in response to the Bodyflow™ device and no adverse side effects to the procedure were noted. Following treatment there was a tendency towards higher blood flow velocities (24.2% increase) and volume flow (19.5% increase) in the common femoral vein. An increase in euglobulin clot lysis (ECL) activity was observed directly after electrostimulation, 2 hours and 6 hours afterwards in 44%, 77.8% and 83.3% of subjects respectively indicating enhanced fibrinolysis. A similar trend was observed for t-PA. Plasma levels of PAI-1 were lower in 68.4% of the subjects immediately after treatment and continued to decrease at 2h and 6h in 78.9% and 88.8% of subjects respectively. However, these changes were not significantly different from those obtained from the placebo group i.e. the same subjects without Bodyflow™ treatment (n=5), indicating these changes are likely the result of natural diurnal rhythm. Soluble P-Selectin was significantly lower immediately following treatment (15.9% decrease, p value = 0.006). This occurred in conjunction with a decrease in procoagulant phospholipid activity in 66.9% of subjects as measured the XACT assay. There were no significant changes in FDP D-dimer and factor V and VIII levels.

Summary

Bodyflow™ has a tendency to increase venous velocity and blood flow in deep veins of some normal individuals tested. The treatment appeared to enhance fibrinolysis, but the difference could be due to circadian variation. A significant decrease in soluble P-Selectin in conjunction with a decrease in phospholipid activity may indicate reduced platelet activation and procoagulant microparticle activity.