Abstract

Implantation of left ventricular assist devices (LVADs) is an integral treatment modality in patients with heart failure. In most cases, it refers to a machine which generates continuous blood flow with reduced pulse pressures. The effect of reduced pulsatility on organ function, such as homeostatic regulatory mechanisms is still unknown. The goal of our study was to understand whether continuous blood flow generated by mechanical support devices affects cerebrovascular regulatory mechanisms (study A), and whether or not hemocoagulation is affected in regard to complications relating to hemocompatibility (study B).

Study A utilized finger plethysmography and TCD ultrasonography to detect possible changes in static cerebral auto-regulation when compared to a range of rotations per minute (rpm) of the LVAD, which served as a model for either accentuation or reduction in residual arterial pulsatility. Study B divided patients with implanted LVADs based on the incidence of selected thrombophilic mutations. Both groups of patients were placed on individualized anticoagulation protocols. The results were focused on the incidence of thromboembolic and hemorrhagic complications, and eventual morbidity/mortality of the patient.

Our findings did not confirm disruption to static cerebral auto-regulation, based on unchanged MAP and mean CBF velocity in correlation with variable speeds – LVAD rpms. The studied thrombophilic states in LVAD patients uncovered varying predisposition of individual types of mutations in the development of thromboembolic states. The presence of a mutated prothrombin gene was identified as a significant risk factor associated with LVAD thrombosis.

Keywords: Mechanical circulatory support, continuous blood flow, pulsatility, static cerebral autoregulation, thrombophilic mutations