Abstract

Introduction: This dissertation thesis aims to describe microcirculatory changes in cardiac arrest setting and to assess the impact of circulatory supports (i.e. mechanical chest compressions and extracorporeal membrane oxygenation (ECMO)) on tissue microcirculation.
Methods and results: Two separate studies were designed. Microcirculation was monitored sublingually by a recent Sidestream Dark Field (SDF) technique and its parameters were evaluated offline, separately for small (of diameter ≤ 20μm) and other vessels.
In order to monitor microcirculation during cardiac arrest (CA) and resuscitation (CPR) an experimental pig model was used; eighteen pigs were commenced to 3 minutes of untreated CA and subsequent 5 minutes of mechanical CPR. During CA the microcirculatory parameters deteriorated, in CPR they improved and reached 59 – 85 % of the prearrest values. The microcirculatory variables correlated neither to parameters of systemic circulation (mean arterial blood pressure and carotid blood flow) nor to lactate.
In the second, clinical, study the sublingual microcirculation was monitored 29 (± 17) hours after the CA onset in 15 patients, who were after unsuccessful conventional CPR rescued by ECMO. In comparison to healthy (sex and age matched) volunteers, the patients showed mild but significant reduction of proportion of perfused vessels and microvascular flow index, but other microcirculatory indexes did not differ significantly. Microcirculation did not correlate to systemic hemodynamics. Further on, we documented only insignificant microcirculatory difference between the subgroup of patients with spontaneously pulsatile blood flow (pulse pressure above 15 mmHg) versus those with low or non-pulsatile blood flow.
Conclusion: This dissertation thesis not only summarizes recent body of knowledge on microcirculatory video-imaging in CA setting, but it describes also microcirculatory changes during CA and CPR in a porcine model and demonstrates surprisingly tight compensation of the microcirculation in ECPR patients. Our results support the opinion that microcirculation in CA victims might be affected independently of the systemic hemodynamics.

Key words: microcirculation, cardiac arrest, Sidestream Dark Field imaging, CPR, ECMO