

Cerebral hypoxia in chronic kidney disease and its relation to cognitive decline

Dissertation abstract – MUDr. Lucie Kalendová

Introduction: Patients with chronic kidney disease in need of regular hemodialysis treatment have high rates of cognitive impairment. In its multifactorial etiology, vascular changes, cerebral ischemia and hypoxia play a major role. In our work we first studied the association between low cerebral oxygenation and cognitive impairment in this population. Subsequently, we focused on one of the possible etiological factors in this association – the presence of a vascular shunt for hemodialysis.

Methods: Chronic hemodialysis patients without overt cognitive impairment participated in the studies. We used a near-infrared spectroscopy (NIRS) device named INVOS for monitoring cerebral oxygenation (rSO₂). Cognitive function was assessed with the Montreal Cognitive Assessment (MoCA). To assess the effect of vascular shunt, we performed an interventional study based on short-term ultrasound-confirmed manual compression with continuous monitoring of rSO₂.

Results: In 39 patients (49 % women, age 64 ± 14 years) we observed a significantly lower rSO₂ in the subgroup presenting cognitive decline than in patients without this diagnosis (48 ± 9 vs. 57 ± 10 ; $p = 0.01$). The association remained significant even after adjustment for age and gender. In a group of 19 patients (68 % women, age 66 ± 11 years) we observed a significant rise in cerebral rSO₂ following the compression of the shunt (from $53,6 \pm 11,4$ % to $55,6 \pm 10,8$ %; $p = 0,000001$) while patients with lower baseline rSO₂ displayed a more pronounced increase of rSO₂ ($r = -0,46$; $p = 0,045$).

Conclusion: We have been the first study group to describe an association between low NIRS-measured cerebral oxygenation in hemodialysis patients and cognitive impairment. We described its slight increase in relation to short-term manual compression of arteriovenous shunt. Subsequent work by our group expanded this finding into a complex study of the relation between vascular shunt and rSO₂ in hemodialysis patients.