

Summary

Multimodal monitoring in severe brain damage of different etiology regarding optimal patients therapy and outcome.

Objectives: The common aim during treatment of patients with brain damage is to maintain adequate cerebral oxygenation. It is necessary to monitor vulnerable areas of the brain in terms of oxygen content. This paper summarizes the theoretical and practical aspects of noninvasive continuous monitoring of regional cerebral oxygenation (rSO₂) with near - infrared light of specific wavelength (infrared spectroscopy) by means of the device INVOS (In Vivo Optical Spectroscopy) in neurosurgical patients.

Methods: The authors present the results of monitoring rSO₂ in four groups of patients with brain damage of different etiology (n=10). Patients after spontaneous intracerebral hemorrhage (Group 1, n₁=10) were followed by rSO₂ before and after treatment of reactive hypertension. In patients with vasospasm after subarachnoid hemorrhage of ruptured aneurysm (Group 2, n₂=16) were measured and investigated the value of rSO₂, which was resulted in remission of symptoms. In patients prior to cerebral vascular anastomosis (Group 3, n₃=18) was followed rSO₂ during stress test and the results were compared with SPECT examination. In patients with traumatic brain injury (Group 4, n₄=30) were measured rSO₂, ICP and CPP during the treatment of intracranial hypertension.

Results: In group 1 (patients with ICH) after correction of reactive hypertension we demonstrated a decrease values rSO₂ of 29 % on the hematoma side and 10 % on the uninvolved side. When treating patients with vasospasm in SAH (Group 2), we found that for the resolution of clinical symptoms of vasospasm is required rSO₂ increase by 27 % (p = 0.0001). In group 3 (patients before cerebral vascular anastomosis), we showed that measurements rSO₂ and SPECT examinations in stress test are the same. In Group 4 (patients with traumatic brain injury), we demonstrated in the acute phase of a positive correlation between rSO₂ and CPP (p<0,0001) and negative correlation between rSO₂ and ICP (p<0,0001). We found a correlation between CPP and Rankin scores at discharge (p = 0.0436). Statistically significant decrease of rSO₂ previous the rise of the ICP was not confirmed.

Conclusion: During rSO₂ continuous measurements, we demonstrated a potential risk of reduction in cerebral oxygenation in the treatment of reactive hypertension in patients with ICH. We have shown that monitoring by INVOS can be used as a monitoring method of therapy in the management of vasospasm and alternative method of investigation prior to cerebral vascular anastomosis. Using continuous monitoring rSO₂ in neurointensive care as part of a multimodal monitoring may improve treatment outcomes in patients with brain damage of different etiology.