MONITORING BRAIN DAMAGE USING SURFACE CURRENT INJECTIOIN

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Disturbance in the blood supply to the brain causes a cerebrovascular accident (CVA). This can be due to ischemia (lack of blood flow) caused by blockage (thrombosis, arterial embolism) or a hemorrhage. In this study, the feasibility of injected low amplitude high frequency surface current over the center line of the scalp between the Nasion and the Inion points of the 10/20 EEG system, for monitoring such damage was analyzed in a computerized model. Simulations were conducted on a realistic 3D numerical model of the head. Tissues were assumed to act as linear volume conductors and electrical potentials were calculated by solving the volume conductor problem. Left-right asymmetry over the 10/20 EEG leads system was calculated for several conductivities and volumes of the damaged region. The results were compared with the left-right asymmetry found in a head model with normal brain. A negative asymmetry was revealed for ischemia (i.e. the potential amplitude over the ischemic hemisphere was greater than that over the intact hemisphere). In case of hemorrhage, a positive asymmetry was found. Furthermore, correlation was found between the location of the damaged region and the electrodes with significant asymmetry. The 3D numerical simulations revealed that the volume and the electrical conductivity of the damaged tissue are correlated with the left-right asymmetry of the surface potentials. These findings support the hypothesis that using surface current technique for monitoring brain damage is feasible.