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Editorial

MEG and End Stage Renal Disease

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Chronic renal failure is characterized by the gradual and progressive inability of the kidneys to regulate the quantity and quality of body fluids. In the final stage of renal failure the kidneys are not able to maintain catharsis, so that symptoms from various organs become manifest. Hemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPD) are two methods which substitute kidney function and are used in patients with end-stage renal disease. Both methods of renal substitutive treatment offer improvement of many symptoms and prolong survival.

We investigated the effect of HD and CAPD on brain function of patients with end stage renal disease by means of magnetoencephalography (MEG) [1-6]. Two groups of patients were studied. Group A included 12 patients treated with HD and group B comprised 12 patients treated with CAPD. All patients had their medical history taken, underwent physical examination, laboratory tests, EEG, cerebral CT scan and triplex of carotid arteries. Informed consent for the methodology and aim of the study was obtained from all participants prior to the procedure.

Biomagnetic measurements were performed using a second order gradiometer MEG (model 601 of the Biomagnetic Technologies Inc.) located in an electrically shielded room. The noise level of the environment was of the order of 50 fT/ÖHz. The MEG recordings of the group A were performed during the day between two hemo-dialysis sessions and without any motivation during this time period. The MEG recordings of the group B were performed also during the day with a time period of 30 days after a peritonitis event or another infection. The 1st MEG measurements followed 2nd MEG recordings in a time period of 12 months under the same circumstances. During the recording procedure the patients were relaxed lying on a wooden bed, with closed eyes, in order to avoid artifacts from eye flickering. The MEG recordings were performed after positioning the MEG sensor 3 mm above the scalp of the patient, with the use of a reference system. This system is based on the International 10 - 20 Electrode Placement System and uses any one of the standard EEG recording positions as its origin. In this study we used the P3, P4, T3, T4, F3, and F4 recording positions. The reference system was devised to retrieve maximal information from a specified area of the skull given that the gradiometer coil is theoretically equally sensitive to all magnetic flux lines perpendicular to a circular area of the brain. In our case, this circle has been an effective diameter of 2.36 cm, i.e. the diameter of the MEG sensor coil. Around the origin a rectangular 32-point matrix was used (4 rows x 8 columns, equidistantly spaced in a 4.5 cm x 10.5 cm rectangle) for positioning of the MEG. The MEG was recorded from each cerebral hemisphere at each of the 32 matrix points on the scalp for 32 consecutive epochs. Each epoch was of 1 second duration and was digitized with a sampling frequency of 256 Hz. The MEG signal was band-pass filtered with cut-off frequencies of 0.1 and 60 Hz. The MEG recordings were digitized using a 12 bit precision analog to digital converter with a sampling frequency of 256 Hz, and were stored in a PC peripheral memory for off-line Fourier statistical analysis [1-6].

With this technique we obtained two dimensional isocontour spectral amplitude maps. These maps were useful in obtaining clearly defined areas of high spectral density in the 2 - 7 Hz band frequencies. In addition they are helpful in providing clear identification of the coordinates of the point on the scalp where the MEG power spectrum has its maximal power as well as its maximal magnetic field

intensity. In patients of both groups two MEG recordings were performed at an interval of 12 months. After the 12th month a significant reduction of high-emitted magnetic activity was demonstrated in group B, but not in group A.

MEG evaluation showed no particular changes in the maps among patients on hemodialysis after a treatment period of 12 months, but a significant reduction of abnormal points in patients on CAPD after the same treatment period. These results indicate that CAPD may be more effective in the management of uremic encephalopathy. It seems reasonable that this effectiveness of CAPD is attributable to better clearance of middle molecular weight toxins. Nonetheless, the exact mechanism by which CAPD improves brain function awaits clarification.

Bibliography

1. Anninos P., *et al*. "Combined MEG and pT-TMS study in Parkinson's disease". *Journal of Integrative Neuroscience* 15.2 (2016): 145-162.

2. Anninos P., *et al*. "Biomagnetic activity and non linear analysis in obstetrics and gynecology in a Greek population". *Clinical and Experimental Obstetrics and Gynecology* 43.3 (2016): 406-408.

3. Anninos P., *et al*. "MEG as a Medical Diagnostic Tool in the Greek Population". *Acta Medica (Hradec Kralove)* 58.3 (2015): 71-78.

4. Anninos P., *et al*. "MEG evaluation of pico-Tesla external TMS on multiple sclerosis patients". *Multiple Sclerosis and Related Disorders* 8 (2016): 45-53.

5. Anninos PA., *et al*. "Magnetic stimulation in the treatment of partial seizures". *International Journal of Neuroscience* 60.3-4 (1991): 141-171.

6. Thodis E., *et al*. "Evaluation of CNS-function in CAPD patients using magnetoencephalography (MEG): comparison with hemodialysis patients". *Advances in Peritoneal Dialysis* 8 (1992): 181-184.

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