

EVOKED POTENTIALS AND Tc-99m-HMPAO SPECT IN CEREBRAL INFARCTION PATIENTS

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The present study aims at assessing the correlation between the regional cerebral blood flow and the functional state of the afferent and efferent conductive systems in 12 patients with hemispheric cerebral infarctions. All patients underwent a battery of tests: Tc-99m-HMPAO SPECT, somatosensory evoked potentials (SSEP), motor evoked potentials (MEP), and sympathetic skin responses (SSR). The above mentioned investigations were performed twice: 48 hours and two weeks after the cerebral infarction onset. The positive correlation between the regional cerebral blood flow (rCBF) and the electrophysiologic parameters reflected the presence of a moderate dependence between the cerebral perfusion changes and neural conductivity.

Key-words: Cerebral infarction, evoked potentials, stroke outcome, Tc-99m-HMPAO SPECT, cerebral perfusion

The cortical somatosensory evoked potentials (SSEP), the motor evoked potentials (MEP) and the sympathetic skin responses (SSR) are well-established methods for objective assessment of conductive neural pathways' functional state. This assertion is supported by the comparative investigations of regional cerebral blood flow (rCBF) by means of Tc-99m-HMPAO SPECT and the above mentioned evoked potentials (1,3,4).

The present study aims at evaluating the correlation between the regional cerebral blood flow and the functional state of the afferent and efferent conductive systems in patients with cerebral infarctions with hemispheric localization.

MATERIAL AND METHODS

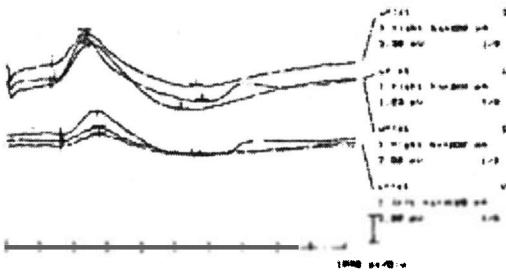
Subject of investigation were 12 patients with cortico-subcortical cerebral infarctions (mean age of $58,6 \pm 10,2$ years; 8 males and 4 females). The electrophysiologic and radioisotope investigations were performed twice: 48 hours and two weeks after the cerebrovascular accident onset.

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I. SSEP - methodical background

Neuropack-II plus, MEB 5200 (two channels) was used. Electrical stimulation of *N. medianus* and *N. tibialis* was carried out. By means of 256 responses averaging the SSEP from superficial electrodes localized on head areas, corresponding to the cortical somatosensory representation were registered. The latencies (ms) and the amplitudes (μV) of N20 and P40 waves were analyzed.

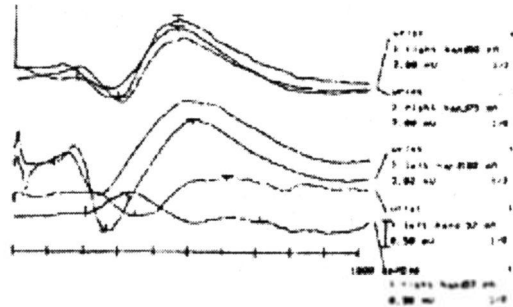


SSR - CI in LCMA at admission;
good outcome

Fig. 1. SRR in patients with cerebral infarction

II. MEP - methodical background

Transcranial magnetic stimulation of motor cortex by means of Cadwell MES-10 electromagnetic stimulator was performed. MEPs were registered with superficial electrodes from *M. tibialis anterior* and *M. abductor digiti minimi*. The amplitudes (A) and the central conduction time (CCT) of MEP were analyzed.



SSR - CI in LCMA at discharge from hospital;
good outcome

III. Sympathetic skin responses (SSR) - methodical background

Toennies Jager Duo-Liner was used for the SSR investigations. The peak-to-peak amplitude (μV) was assessed according to the method of B. Shaghani (1983).

IV. Tc-99m-HMPAO SPECT - methodical background

The investigations of rCBF were carried out by means of single

head gamma-camera system (DIACAM, Siemens). Computerized analysis of 64 frames from 3-transversal OM-slices was performed 15 min. after i. v. injection of 270 MBq Tc-99m-HMPAO. The perfusion indices (PI) from 10 symmetric areas corresponding to the cerebral hemispheres, the cerebellum and the brain stem were analyzed. The results were expressed as right-to-left ratio.

RESULTS AND DISCUSSION

I. 48 hours after cerebral infarction onset

Amplitude decrease and latency elongation of SSEP homolaterally to the cerebral infarction were found in 9 patients. The SSEP parameters in 3 patients were normal at this observation point. The central conduction time of MEP contralaterally to the brain injury was longer than 17 ms in 10 patients. In 2 cases we were not able to register MEP at all. SSR amplitudes decreased contralaterally to the cerebral infarction. SPECT symmetric sector analysis showed pathologic asymmetries of rCBF in the parietal, occipital, and temporal areas. Decreased tracer's uptake in the contralateral cerebellum was registered in 3 patients.

II. Two weeks after cerebral infarction onset

In 6 patients the SSEP latencies normalized two weeks after cerebral infarction onset. The N20- and P40-waves amplitudes increased, while the amplitude asymmetry was still present in 9 patients at this observation point. MEP central conduction time contralaterally to the brain injury decreased when compared with the first investigation although it remained beyond the normal range. An amplitude increase was registered in all the patients under investigation. SSR were within the normal limits in 7 patients two weeks after the stroke onset (Fig. 1). In 5 patients a P-

potential decrease was demonstrated. The second SPECT examination detected an asymmetry reduction in the temporal and occipital areas. Abnormal PI values in *Capsula interna* of the thalamic and parietal regions corresponded to the pathological findings from the evoked potential investigations.

The tendency for SSEP parameter improvement correlates with the localization and width of the hypoperfused areas. Evoked potential improvement occurs in cases with decreased cerebral perfusion in the posterior thalamus, in the temporal and occipital areas. These findings are in contrast to the results from patients with thalamic and parietal localization of the cerebral infarction. Similar results are previously reported (1,2,5).

In the first few hours after the stroke onset an increase of the correlation coefficients between the haemodynamic and electrophysiologic parameters is registered ($r = + 0,47$; $p < 0,05$). The haemodynamic phenomena such as steal-syndromes, luxury perfusion, diaschisis and brain oedema are probably involved in the rCBF and evoked potential changes obtained (3). At the second point of observation the poor correlation between the cerebral perfusion and the neural conduction utilities ($r = + 0,18$; $p < 0,02$) corresponds to the stage of the functional and metabolic improvement of neuronal tissue and is related with brain oedema restriction (4).

Our results suggest the existing correlation between the rCBF, the functional state of neural afferent and efferent pathways, and the cerebral infarc-

tion location. This conclusion owns incontrovertible diagnostic and prognostic perspectives.

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Евокирани потенциали и Tc-99m-НМРАО SPECT при болни с мозъчен инфаркт

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Резюме: С цел да се проучат зависимостите между нарушената мозъчна перфузия и функционалното състояние на аферентните и еферентни проводни системи при 12 болни със супратенториален мозъчен инфаркт бе проведено сцинтиграфно изследване на мозъка с Tc-99m-НМРАО SPECT и комплекса от соматосензорни (ССПП), моторни предизвикани потенциали (ММП) и симпатикови кожни отвори (SSR). Пациентите бяха проследени двукратно: в първите 48 часа и 2 седмици след началото на мозъчносъдовия инцидент. Регистрираните положителни корелации между показателите на мозъчния кръвен ток и електрофизиологичните параметри отразяват наличието на умерена зависимост между промените в мозъчната перфузия и нервната проводимост.