CHANGES OF BRAIN HAEMODYNAMICS AND BIOELECTRICAL ACTIVITY OF EARLY STAGE BLUNT CRANIO-CEREBRAL TRAUMA IN CHILDREN

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The rheoencephalography (REG) is only recently introduced as a diagnostic method in case of blunt cranio-cerebral trauma (BCCT) but its importance is already pointed out by numerous authors (2, 5, 6, 7, 8, 11). The synchronic REG and EEG registrations play an important role for evaluation of haemodynamic and neurodynamic disturbances caused by cerebral commotion (CC) and brain contusion (BC) in children. In the literature available there are a few studies like these in adults (1).

Material and methods

We studied dynamically the EEG and REG indexes in 47 children with CC and 59 ones — with BC at the early stage after the trauma. Registrations were carried out mainly synchronically in regular time intervals on the 1st, 5th, 10th and 30th day after the accident. A 16-channels electroencephalograph "Schwarzer" and an EEG appliance was used in our study. Three methods (visual, histographical and mathematical) were applied to elaborate the data received.

Results and discussion

The investigation of REG indexes in the first day after the trauma shows some changes of the vascular tone in all observed patients. They include the disorder of the architectony of the pulse track and changes of the quantitative indices towards a vasospasm. There is a decrease of REG wave amplitude, its peak is rounded and the dicrotic waves are plateaulikely changed. According to their degree of expression these findings correspond to the severity of the trauma. The dynamic study of REG indexes testifies for gradual recovery of normal vessel tone and improvement of brain circulation. Certain authors report manifestations of vasospasm at early stage BCCT in adults (5, 8, 13) and in children (10) but others establish symptoms of vasodilatation (14). In our cases we found out an expressed dynamics of vascular tone. Initially, the vasospastic reactions predominate but subsequently a vascular dystonia is quite often observed. In the children with BC the manifestations of vasospasm are more definite and accompanied frequently by interhemispheric vascular tone asymmetry in the early period after the trauma. The recovery of normal haemodynamics in cases of BC needs a longer time for its realization.

The EEG picture of CC in children is characterized by an initial sharp generalized delay of the track with maximal changes in the parieto-occipital lobes. Some authors (2, 16, 17, 18) assumed that these changes are typical for the age

between 4 and 11 years. K. Richter (5) considers that they are due to local injury which seems less probably according to our own opinion as we establish this phenomenon quite often in CC where a contusion focus coexists most incredibly, indeed (fig. 1).

In case of BC the EEG changes are more constant and severe. The diffuse alterations dominate, too. Sometimes they are combined with focal lesions and differently expressed manifestations of dysfunction of deep structures. The gross changes of the bioelectrical activity in the initial period undergo a rapid regress and the EEG track normalizes till the 30th day after the trauma in 82 per cent of the cases. This is supported by the histographical analysis of EEG resistrations. The dynamic follow-up of EEG and REG indices of an acute BCCT in children demonstrates a more subsequent and complete recovery of the cerebral bioelectrical activity while the alterations of the haemodynamics have a fluctuating course and also often an incomplete restitution in the definite interval of observation (fig. 2).

The origine of generalized disorders of brain rhythms in case of BCCT are caused in the first place by the already occurred reflectory reaction of vasospasm followed by brain hypoxia. The changes of the REG track which show well-expressed vasospastic manifestations testify for the presence of haemodynamic disturbances. The total diffuse reaction of the brain in traumatic cases causing the clinical picture of CC in children is reflected in generalized EEG changes and in an absence of clear distinct hemispheric REG asymmetry of vascular tone. We establish some definite focal EEG alterations and an asymmetry of haemodynamic REG indexes in children with BC more rarely than in adults.

This phenomenon can be explained with the child's predisposition to generalized reactions.

Our observations show that the combined investigation of brain haemodynamics and bioelectrical activity and its confronted analysis with the clinical manifestations allows to evaluate the status of the child at the moment of accident and to prognosticate the further course of the disease.

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ИЗМЕНЕНИЯ ГЕМОДИНАМИКА И БИОЭЛЕКТРИЧЕСКОЙ АКТИВНОСТИ МОЗГА В РАННИЕ СТАДИИ ЗАКРЫТОЙ ЧЕРЕПНО-МОЗГОВОЙ ТРАВМЫ У ДЕТЕЙ

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РЕЗЮМЕ

Проведено прослеживание РЭГ и ЭЭГ показателей 106 детей, из которых 47 с сотрясением мозга и 59 с контузией мозга. Исследование проведено в динамике до тридцатого дня после трамы.

В наиболее ранний период после травмы в РЭГ доминируют проявления вазоспазма, особенно отчетливо выраженные при контузиях мозга. Динамическое прослеживание показывает тенденцию к восстановлению нормального тонуса сосудов до тридцатого дня. ЭЭГ картина характеризуется выраженным в различной степени генерализованным замедлением основного ритма с максимумом изменений в парието-окципитальных полях.

Параллельное прослеживание гемодинамика и биоэлектрической активности мозга в сопоставлении с клиническими проявлениями дает возможность оценить состояние пострадавших детей в момент травмы и прогнозировать дальнейшее протекание болезни.