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**EEG changes in critical patients (Tbilisi, Georgia)**

Coma is the most common disorder of the consciousness caused by a severe damage of the brain which is reported in 3-4% of patients at a resuscitation and intensive therapy departments. In spite of wide capability of modern methods of visualization EEG still holds the leading position in estimation of brain functional state as well as in diagnostic confirmation of a vegetative state, the terminal state and the death of brain. Despite the vast data accumulated in scientific literature about EEG in coma it is not fully defined and studies in this direction are being continued all over the world. In the presented study we made an effort to estimate the EEG patterns of coma of different etiology in Georgian population. By registration of bioelectric brain activity a localization of motor and sensorial sphere pathological process, changeability of behavioral reactions, and the level of consciousness is defined. EEG allows us to evaluate thalamus-cortical disorders of patients in coma state which is impossible clinically. According to EEG patterns the process and result of the disease or brain death can be stated.

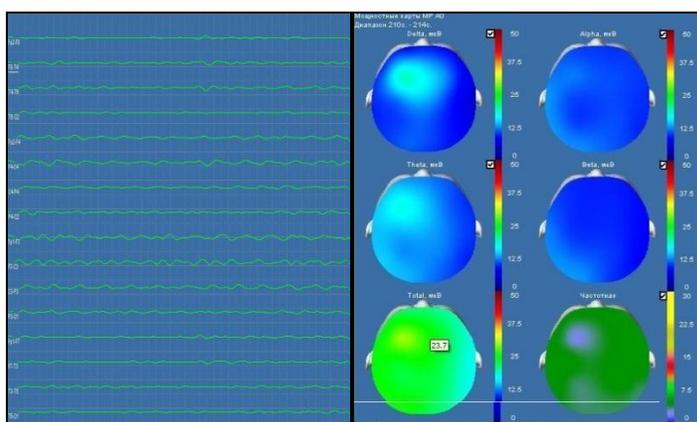
**Key words:** EEG, coma, brain death, **Critical Condition, EEG, Coma, intensive therapy**

**Actuality:** Development of such branches of medicine as neurosurgery, transplantology and resuscitation supports the prolongation and maintenance of patients' life. From this point, changing of brain function activity is of particular interest. Registration of bioelectric activity of its changes make possible to look after the dynamics of a disease, correct the process and make prognosis of the result. The presented study aimed at defining EEG data in 3-point coma according to Glasgow Scale on the 1st, 3d, 5th days. is defining of peculiarities of EEG changes aroused during the critical state according to a type, frequency, amplitude, distribution gradients, mapping of their frequency and amplitude. The goals of the study are to research the EEG patterns in 3-point coma; To study the correlation of dominated EEG rhythms in coma according to the days.

**Materials and methods:** The study was conducted in 226 patients with coma of various etiologies, aged from 18 to 75; 127 men and 99 women. According to coma etiology patients were divided as toxic coma (18 patients), diabetic coma (12 patients), hepatic coma (7 patients), coma due to hemorrhage stroke (32 patients), coma due to ischemic stroke (40 patients), coma due to subarachnoid- parenchymal hemorrhage (19 patients), post-hypoxic coma (40 patients), and traumatic coma (58 patients). Consciousness was evaluated by Glasgow Coma Scale (GCS); Patients were assessed clinically and by Electroencephalography (16 channel EEG apparatus – Neurocom, Independent Component analysis (ICA) computed, USA, 2006.) In case the brain death was stated EEG was carried out twice in 24 hours. The definition of brain bioelectric activity by

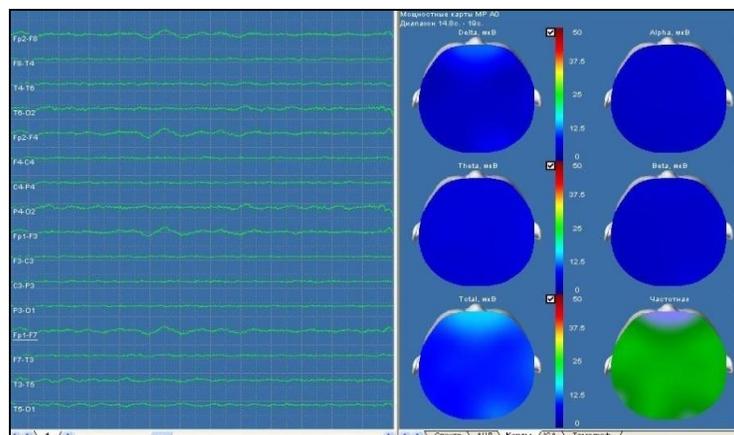
EEG was conducted according to international demands and a 16- channel EEG computer was used with ICA software. Electrodes were distributed due to International system 10-20% and 2 ear electrodes, between electrodes is minimum 100 ohm and maximum 10 kOhm, a distance between them is 10cm and record on channels was carried out using constant time, minimum 0.3 seconds, and intensification minimum 2mcv/mm. The top level of frequency permeability minimum 30 hz. EEG responsiveness was estimated on light, sound stimulus and pain. Duration of stimulus impact was minimum 10 min, the frequency of light source varied from 1 to 30 hertz, the frequency of sound stimulus 10 dB. Electric silence i.e. isoelectric line corresponds to such activity when amplitude from peak to peak is not more 2 mc.v. EEG was recorded on the 1st, 3d, 5th days and in dynamics of coma. To estimate the dominated frequency and amplitude we took for each case 40age with duration 30 seconds and the average indices of obtained results we calculated by frequency and amplitude mapping of the spectral indices of rhythms density distribution. Coma state was estimated by Glasgow coma scale.

**Results and discussion:** 50 patients were in terminal i.e. 3- point coma. The coma in patients was caused by the following nosologies: brain trauma-15 cases, brain hypoxic damage after cardiac arrest-11, ischemic insult-7, hemorrhagic insult-8, subarachnoid- hemorrhage insult-9. Coma was estimated by Glasgow scale as 3- point coma. After objective examination the neurologist admitted the death of the brain, EEG stated nonreactive responses to light, sound and pain stimulus. Slow – wave delta rhythm of 0, 5-3 Hz. Frequency and amplitude with 2-70mc.v range dominated on EEG record. On the first day from the development of coma EEG stated electric silence in 64%. In 36% delta rhythm varied 1-2 Hz. and amplitude range variation 10-70 mc.v. In 56,6% - range accentuation of delta rhythm in frontal-central areas and in 44,4% - frontal areas



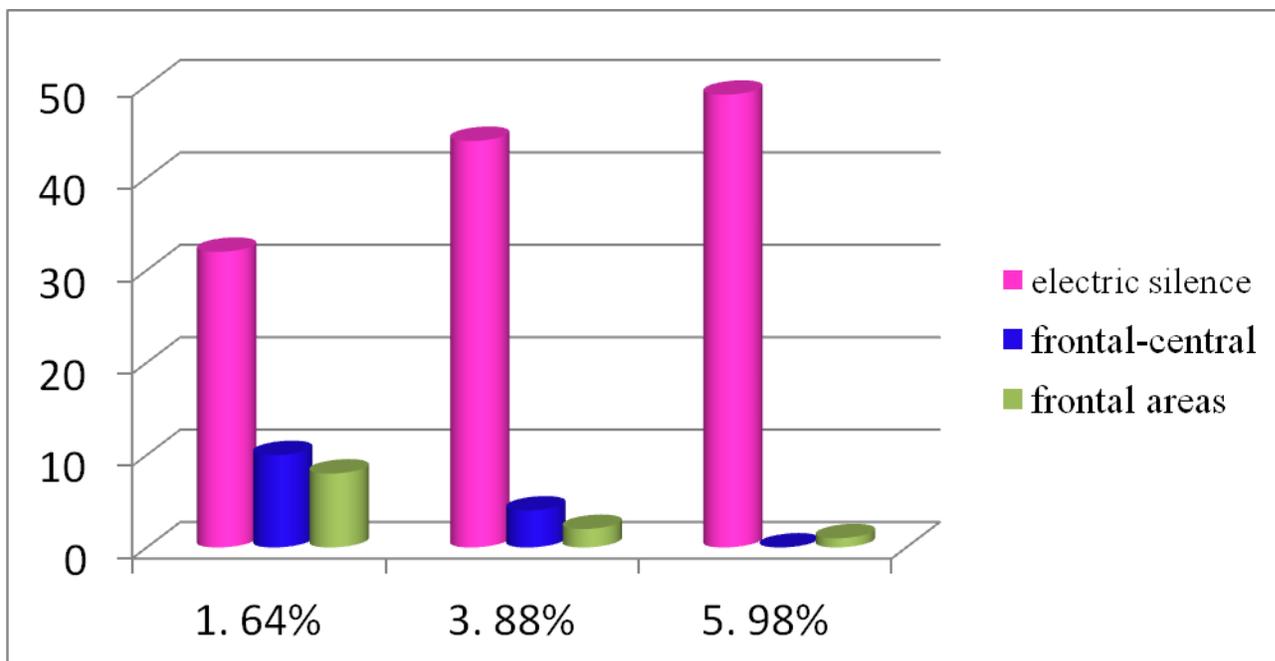
Accentuation of delta rhythm in frontal-central areas (fig.1)

On the third day from the development of coma the research was quitted by 2 patients because of their death. From those who left (36%) electric silence appeared in 20% while in 12% was stated an average variation of delta rhythm frequency 0,5-1,5hz. and amplitude range variation, range accentuation of delta rhythm was stated in frontal areas in 67% and in frontal-central areas in 33%.



Accentuation of delta rhythm in frontal areas(fig.2)

On the 5-th day 2 more patients passed away. Electric silence was stated in 6% and a range of delta rhythm more than 2mc.v –in 2%. Electric activity induces of delta rhythm frequency as well as amplitude, were decreasing alongside the time passing in the cases where the brain death was objectively stated. The density of delta rhythm was changing from frontal- central areas to frontal areas. It was followed by ceasing of areal differentiation and was substituted by electric silence.



Electric silence (fig.3)

On the basis of our data, while stating a diagnosis of brain death, EEG gave 98% specification on the 5-th day of the development of coma.

### Conclusions:

.After establishing of brain death in comatose patients with GCS=3 the EEG gives the 98% specificity on the 5<sup>th</sup> day of coma onset.

The brain death is not always registered in 3-point coma patients. The spectral indices of rhythms density in objectively registered brain death on the 1<sup>st</sup>, 3<sup>d</sup> and 5<sup>th</sup> days

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შესწავლილია ევგ ცვლილებათა თავისებურებანი კრიტიკულ მდგომარეობათა დროს. ყველაზე ღრმა ცვლილებანი ინახა სამბალიანი კომების დროს. თუმცა ეს სურათი ყოველთვის არ შეესაბამებოდა თავის ტვინის სიკვდილის სურათს და ზოგიერთ შემთხვევაში ევოლუციას განიცდიდა.