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**9<sup>th</sup> Congress of Clinical Neurophysiology Society of Serbia and Montenegro with International Participation  
Belgrade, Serbia, October 15-17, 2009**

**1. Quantification of epileptic activity for therapeutic monitoring – H. Stefan (University Hospital Erlangen, Epilepsy Center, Germany)**

The aim of treatment of epilepsies is to control seizures without causing adverse effects by reaching the best possible quality of life. For this aim diagnostic and therapeutic monitoring became an increasingly clinically important tool because seizures are transient events difficult to observe. An assessment of the amount of knowledge gain by the different examination methods such as routine EEG, sleep EEG, ictal routine EEG, long-term video EEG. Evaluation of antiepileptic drugs can be performed with the aid of therapeutic intensive seizure analysis including neuropsychological testing. Computer supported seizure detection in emergency cases Adifficult to treat epilepsies. Here adequate methods of computerized analysis can be employed to quantify seizure activity in long-term EEG recordings. Computer supported seizure detections now can assist as an essential and practical aid to decision making in therapeutic monitoring, providing more objective results and also a telemedical monitoring in an in- and outpatient network for treatment.

**2. Diagnosis of Brain Death: the role of Neurophysiological Methods - Jean-Michel Guérit (CHIREC, Brussels, Belgium)**

The diagnosis of brain death (BD) relies on prerequisites (the cause of coma must be identified and be sufficient to produce BD), on the clinical evaluation (non-reactive coma, loss of brainstem reflexes, apnea), and on confirmatory tests, which can be subdivided into neurophysiological tests (electroencephalogram: EEG, evoked potentials: EPs) and assessment of brain circulation (four-vessel angiography, radioisotopic techniques, intracranial Doppler). Clinical neurophysiology has sometimes been reproached not to provide assessment of the whole brain. It should be mentioned that the same reproach can be heaped on all other diagnostic methods, including clinical examination and angiographic techniques. This argumentation underlines the flaws of a purely phenomenological approach of BD. We advocate instead a pathophysiological approach, which could give rise to an extension of the concept of “individual death” in ethically acceptable safety limits. Finally, there is no single way to confirm BD and learned societies should try their utmost to persuade lawmakers to adapt their rules accordingly. Indeed, the choice of a confirmatory test should be guided both by the current clinical features and the expertise of each laboratory.

**3. Guidelines for the diagnosis and treatment of chronic autoimmune neuropathies - Slobodan Apostolski** (The Member of the Neuropathy Association Medical Advisory Committee, Belgrade, Serbia)

The “Guidelines for Diagnosis and Treatment of Chronic Autoimmune Neuropathies” was developed by the Medical Advisory Board of the Neuropathy Association as an aid to the management of patients with peripheral neuropathy. The chronic autoimmune neuropathies (CAN) are a diverse group of syndromes that result from immune-mediated damage to the peripheral nerves. For many of these disorders, there is a lack of definitive diagnostic tests, and a paucity of controlled therapeutic trials. Consequently, the diagnosis can be missed, and the patients remain untreated. The information presented in this paper is intended to help physicians recognize these disorders and provide the appropriate treatments. The guidelines include classification of the CAN, their clinical presentations, associated electrodiagnostic and laboratory abnormalities, and reported responses to therapies. CAN are divided into 3 major categories. The first include the acquired demyelinating neuropathies; chronic inflammatory demyelinating polyneuropathy (CIDP), multifocal motor neuropathy (MMN), and the neuropathies associated with IgM monoclonal gammopathy. The second category focuses on the Neuropathies associated with vasculitic, rheumatologic or granulomatous disorders, and the third category is composed of the Purely Sensory and Autonomic Neuropathies.

**4. MR perfusion imaging in diagnostics of brain pathologies - T. Stošić-Opinčal<sup>1</sup> i M. Daković<sup>1,2</sup>** (<sup>1</sup>Center for magnetic resonance, Clinical Center of Serbia, and<sup>2</sup>Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia)

The knowledge of parameters which describe oxygen and nutrients supply to tissues is essential from standpoint of diagnostics and follow-up of pathologies of brain. Due to their low spatial resolution MR angiographic techniques can not visualize blood flow inside bulk tissue. MR perfusion imaging is technique which use drop in tissue signal during the first pass of contrast agent in order to obtain the haemodynamic parameters which describe perfusion. Calculation of those values requires determination of time course of change of agent concentration in both tissue and feeding artery. Decrease in MR signal is proportional to intravascular concentration of contrast agent, which provides basis for calculation of regional cerebral volume (rCBV), regional cerebral flow (rCBF) and mean transition time (MTT) and corresponding maps of these parameters. Such maps can pinpoint to changes in perfusion of brain tissue which can be consequence or cause of pathologic changes. Perfusion MRI can help in more precise definition of the area affected by stroke and, in comparison with diffusion weighted imaging, in assessing volume which can be potentially saved with aid of thrombolytic therapy. Maps of perfusion parameters provide information on existence and follow-up of tumor angiogenesis which further helps in differentiation and grading of brain tumors. Perfusion technique can also contribute in distinguishing between radiation therapy effects and recurrent tumors.

**5. The adjustment of autonomic nervous system function(ANSA method)and personalized medicine:new approach in diagnostics and treatment of disease -**

**Branislav Milovanović, Sanja Pavlović, Tatjana Krajinović, Anita Milovanović  
(Clinical Center "Bezanijska Kosa", Neurocardiologic laboratory, Belgrade)**

According to new data from different studies about connection of heart rate variability and genetical factors is confirmed that there is clear genetical determination of autonomic nervous system status. Regarding to possible existence of constant sympathovagal balance in the basal stage, we made hypothesis that the matching of the drug and dose of every disease treatment depend of the type of sympathovagal balance. The goal of research was to use this methodology in the testing of patients with myocardial infarction, hypertension, syncope and healthy persons. The patients were divided in two clear groups related to predominance of sympathetic or vagus with subgroups with moderate and strong activity. The groups were created according to normal values from tables. After the follow up of patients in different time periods we confirmed by 22 patients clear existence of the same sympathovagal balance also with the same values during the short time spectral analysis. These results definitely confirmed our hypothesis that sympathovagal balance is genetically determined and that the treatment of every patient depend of the type of autonomic status, with new possibilities in the treatment of patients with principle one patient-one disease.

**6. Impaired autonomic cardiac control in patients with amyotrophic lateral sclerosis and it's prognostic significance - S. Pavlovic<sup>1</sup>, B. Milovanovic<sup>1</sup>, Z. Stevic<sup>2</sup>, B. Milicic<sup>3</sup>  
(<sup>1</sup>Clinical Center "Bezanijska Kosa", <sup>2</sup>Institute of Neurology, Clinical Center of Serbia, <sup>3</sup>Institute of Medical Statistics and Informatics, School of Dentistry, Belgrade, Serbia)**

**Purpose:** to assess autonomic cardiac control in ALS patients and the impact of autonomic dysfunction on outcome. **Methods:** Fifty five patients with sporadic ALS (28 women, 27 men; average age  $56,00 \pm 10,34$ ) were compared to 30 healthy controls (17 women, 13 men; average age  $42,87 \pm 11,91$ ). Ewing's cardiovascular reflex tests, short-term power spectrum analysis of heart rate variability (HRV), real time beat-to-beat ECG monitoring with HRV analysis and baroreceptor function analysis (BRS) were performed at the beginning of the study. Cardiovascular responses to 5-minute hyperventilation were also assessed. Time domain parameters of HRV were obtained from 24-hour ECG monitoring. The follow-up period was 38 months. Kaplan-Meier method and Cox proportional hazard model were used to assess survival and mortality risk. **Results:** ALS patients had a significantly higher score of autonomic dysfunction ( $p < 0.001$ ) with predominant parasympathetic dysfunction ( $p < 0.001$ ). LF/HF index was significantly increased and BRS and time domain parameters of HRV were significantly decreased in ALS patients ( $p < 0.001$ ). Abnormal response to stand-up test and reduced SDNN index were independent predictors of poor outcome. **Conclusion:** Our results demonstrated impaired cardiac autonomic control in ALS with parasympathetic dysfunction and sympathetic predominance. Reduced parasympathetic activity, sympathetic predominance and reduced HRV influence survival of ALS patients.

**7. Cardiovascular reflex tests in autonomic nervous system evaluation in Parkinson's disease and multiple system atrophy - S.R. De Luka<sup>1</sup>, B. Milovanović<sup>2</sup>, M. Svetel<sup>3</sup>, T. Pekmezović<sup>4</sup>, V. Kostić<sup>3</sup> (<sup>1</sup>Institute of Pathological Physiology, <sup>2</sup>Clinical Hospital**

**“Bežanijska kosa”,<sup>3</sup>Institute of Neurology and<sup>4</sup>Institute of Epidemiology, School of Medicine, Belgrade, Serbia)**

The manifestations of dysautonomia in PD and MSA are broad and include gastrointestinal, urogenital, cardiovascular, sudomotor and thermoregulatory symptoms. The aim of our study was to evaluate the degree of dysautonomia in PD and MSA, as well as the usefulness of cardiovascular tests in differentiating parkinsonian syndromes. We evaluated 72 patients with PD and 19 with MSA, as well as 35 age-matched controls. The patients were divided in four groups (*de novo* patients - group I, patients with controllable PD without therapy complications - group II, patients with complications of levodopa treatment - group III, and MSA patients – group IV). Only orthostatic hypotension test showed statistical significance ( $p < 0.0001$ ), between the groups, while parasympathetic tests (RR variation on deep breathing and standing test) distinguished one group from the other with statistical significance ( $p < 0.001$  and  $p < 0.0001$ , respectively). Our results indicate that dysfunction of ANS is the integral part of clinical features of Parkinson's disease, however a degree of dysautonomia is closely connected with the length of the disease. Ewing's tests are useful in determining the presence of dysautonomia, but can hardly help in differentiating the degree of dysfunction in parkinsonian patients. For that purpose, tests with higher sensitivity should be used.

**8. Autonomic status epilepticus - Žarko Martinović<sup>1,2</sup> (<sup>1</sup>Belgrade University Medical School; <sup>2</sup>Institute of Mental Health, Department of Epilepsy and Clinical Neurophysiology, Belgrade, Serbia)**

Although autonomic dysfunction associated with both interictal and ictal epileptogenic activity may have serious consequences, autonomic seizures and autonomic status epilepticus (Aut SE) is a relatively neglected topic. According to a recent definition of an international consortium, autonomic seizures are characterized by prominent alterations of autonomic function. Aut SE is a condition lasting at least 30 min and characterized by epileptic activity causing altered autonomic function of any type at seizure onset or in which manifestations consistent with altered autonomic function are prominent (quantitatively dominant or clinically important) even if not present at seizure onset. Aut SE most frequently occurs in otherwise normal child aged 4 and 5 years with Panayiotopoulos syndrome, an idiopathic childhood epileptic disorder. The occurrence of Aut SE of symptomatic etiology is also more common in children than in adult epilepsy patients. Ictus emeticus and other characteristic symptoms of Aut SE in children have not been described in adult. Aut SE in adults occur in some forms of temporal lobe epilepsy. Ictal EEG in Aut SE is mostly related to the type of epileptic seizures rather than to the ictal autonomic manifestations. Further studies are needed to elucidate the pathogenesis of Aut SE.

**9. Electroneuromyography in children with neuromuscular disorders, once and now  
V. Milic Rasic (Clinic for Child Neurology and Psychiatry, School of Medicine,  
University of Belgrade, Serbia)**

The most frequent neuro-muscular (NM) disorders in children are dystrophinopathy, spinal muscular atrophy (SMA) and hereditary neuropathy (HN). Molecular genetic studies are

available for most of them. In typical Duchenne-dystrophy and SMA we go directly to genetic diagnostic procedures. In typical HN, we still perform ENMG and then genetic study, because of heterogeneous genotypes with over 40 known genes. "Floppy infants" is syndrome diagnosis with variable etiologies. ENMG is necessary in differentiating the types of NM disorders and sometimes in separating congenital NM dysfunctions from central nervous system dysfunction. With some rare syndromes, like congenital myasthenic syndromes, channelopathies, ENMG test could be very useful before genetic studies. **Conclusion:** ENMG is an invasive diagnostic method, especially with children. The phenotypes of some hereditary NM disorders do not necessarily require ENMG testing and direct need for molecular genetic testing. As for some other disorders, it is advisable to do ENMG testing with older, already affected family members and then decide on genetic testing. Finally, with some disorders we still do need invasive methods, as ENMG type or muscular biopsy, before doing genetic studies.

**10. The importance of electromyoneurographic examination of adult patients with neuromuscular diseases in molecular genetics era - Z. Perić (Department of Neurology, Medical Faculty, University of Niš and Clinic for neurology Clinical Centre of Niš, Serbia)**

Electromyoneurography (EMNG) is the method of choice for examination of adult patients with neuromuscular diseases, besides invasive character of EMG muscles examination with needle electrodes. Needle EMG examination includes evaluation of muscles insertional and spontaneous activities (fibrillations, complex repetitive discharges, myotonic discharges etc.), motor unit action potentials recruitment and morphology (amplitude, duration, shape) and ENG evaluation based on motor and sensory conduction velocities values and characteristics of motor and neural potentials. Limitations for EMNG use in adult patients are relatively rare. In patients with acquired neuromuscular diseases with different etiological factors and traumatic injuries of neuromuscular system, EMNG examination is very important. In hereditary neuromuscular diseases, molecular genetic examination can establish a genetic diagnosis (with confirmation the inheritance pattern of the disorder and consideration of the risk for other family members), but in this patients without EMNG examination the functional state of neuromuscular system could not be established. EMNG parameters are important for disorder severity, course and prognosis evaluation, and also for optimal selection of therapy. Because of that, the genetic study results and EMNG parameters are complementary in adult patients with neuromuscular diseases.

**11. Neurophysiological findings in patients with new mutation in GJB1 as a cause of X-linked Charcot-Marie-Tooth disease - J. Mladenovic<sup>1</sup>, M. Keckarevic<sup>2</sup>, V. Milic Rasic<sup>1</sup>, J. Nikodinovic<sup>3</sup>, S. Pržulj Toković<sup>4</sup>, S. Todorovic<sup>1</sup> (<sup>1</sup>Clinic for Neurology and Psychiatry for Children and Youth, Belgrade University, Belgrade, Serbia, <sup>2</sup> Faculty of Biology, Belgrade University, <sup>3</sup> Institute of Neurology Clinical Centre of Serbia, Belgrade University, <sup>4</sup> Health Centre Savski venac, Belgrade, Serbia)**

**Purpose:** To introduce basic clinical and neurophysiological characteristics in patients with mutation c.94A>G, in Gap Junction Protein  $\beta$ 1 (GJB1), on a gene encoding Connexin32 (Cx32) located on chromosome Xq13.1. **Methods:** We identified 12 patients from 5 families from Serbia, who expressed identical, novel mutation in GJB1 gene and analyzed main neurophysiological parameters. EMNG tests were carried out on Premier apparatus (Medelec) to De Lisa et al. Protocol of 1987. **Results:** The patients were classified as CMT polyneuropathy,

with transitional characteristics between demyelinating (CMT1) and axonal (CMT2) type. Neurophysiological findings showed intermediary clinical picture: MCV: 28.8-55.9 m/s, amplitudes were from 0.2 to 4.0 mV and TL from 3.7 to 6.3 ms. In all families, males were affected more severe than females. GJB1 c.94A>G mutation was found in all 12 patients from 5 families, making it the most frequent GJB1 mutation revealed in Serbian patients. Haplotype analysis showed the presence of founder effect. **Conclusion:** New mutation (c.94A>G) in GJB1 gene could be the founder mutation in Serbian families. The clinical and neurophysiological findings do not differ from the typical CMT1X findings.

**12. Dose-dependent anticonvulsive effect of valproate on D, L homocysteine-thiolactone induced seizures in adult rats - A. Rašić – Marković, D. Hrnčić, D. Djurić, O. Stanojlović (Laboratory for Neurophysiology, Institute of Medical Physiology “Richard Burian”, School of Medicine, University of Belgrade, Serbia)**

**Purpose:** The aim of our study was to investigate the effects of valproate on D,L homocysteine-thiolactone induced seizures in rats. **Methods:** Adult male Wistar rats were divided into groups: 1. Saline-treated (C, n=10); 2. D, L homocysteine-thiolactone 8 mM/kg, i.p.(H, n=7); 3. Valproate i.p. in doses: 50 (V<sub>50</sub>, n=8), 100 (V<sub>100</sub>, n=8) and 150 mg/kg (V<sub>150</sub>, n=8) and 4. Valproate (V<sub>50, 100, 150</sub>) 30 minutes prior to H (V<sub>50</sub>H, n=10; V<sub>100</sub>H, n=10; and V<sub>150</sub>H, n=8). Seizure behaviour was assessed by incidence, latency, number and intensity of seizure episodes. Seizure severity was determined by a descriptive scale with grades 0-4. **Results:** There were no behavioural signs of seizure activity in groups C, V<sub>50</sub>, V<sub>100</sub> and V<sub>150</sub> groups. Seizure incidence was reduced in all VH groups, but not statistically significant. Pre-treatment with valproate increased the latency to the first seizure onset in V<sub>100</sub>H (p<0.05) and V<sub>150</sub>H (p<0.01) comparing to the H. Valproate decreased median number of seizure episodes dose-dependently but statistical significance was attained only in V<sub>150</sub>H (p<0.05) comparing to the H. Severity of seizure episodes was reduced in V<sub>150</sub>H (p<0.01) comparing to the H group. **Conclusions:** Our findings suggest that valproate has a dose-dependent anticonvulsive effect on D, L homocysteine-thiolactone induced seizures in adult rats.

**13. L – Arginine, endogenous NO donor, potentiates lindane – induced seizures in rats. - D. Hrnčić<sup>1</sup>, A. Rašić – Marković<sup>1</sup>, V. Šušić<sup>2</sup>, D. Djurić<sup>1</sup>, O. Stanojlović<sup>1</sup> (Laboratory for Neurophysiology, Institute of Medical Physiology “Richard Burian”, School of Medicine, University of Belgrade, <sup>2</sup>Serbian Academy of Sciences and Arts, Belgrade, Serbia)**

**Purpose:** The aim of the current study was to examine the influence of L – Arginine, precursor of NO synthase, on seizure susceptibility induced by subconvulsive dose of lindane in rats. **Methods:** Adult male Wistar albino rats were intraperitoneally (i.p.) treated with lindane 8 mg/kg and observed for seizure behavioral manifestations during next 30 min. Increasing doses of L – Arginine (600, 800 and 1000 mg/kg, i.p.) or saline were injected 30 min prior to lindane administration. Seizure behavior was assessed by incidence and severity of seizures as well as duration of latent period (time from lindane administration to the first convulsion). Seizure

severity was assessed by descriptive rating scale with grades 0-4. **Results:** L-Arginine in dose of 800 and 1000 mg/kg significantly decreased latent period to lindane seizures ( $p < 0.01$ ) and increased seizure severity ( $p < 0.01$ ) when compared with saline –injected rats. L – Arginine 600 mg/kg had no statistically significant effect on these parameters. Applied doses of L – Arginine increased seizure incidence in dose – dependent manner, but not statistically significant. **Conclusion:** Based on these results it could be concluded that L – Arginine, NO donor, is proconvulsive drug in lindane - induced seizures, showing involvement of NO in lindane-evoked epileptogenesis.

**14. The effects of L-NAME on spike-and-wave complexes in homocysteine thiolactone – induced seizures in adult rats - D. Hrnčić<sup>1</sup>, A. Rašić – Marković<sup>1</sup>, V. Šušić<sup>2</sup>, D. Djurić<sup>1</sup>, O. Stanojlović<sup>1</sup> (<sup>1</sup>Laboratory for Neurophysiology, Institute of Medical Physiology “Richard Burian”, School of Medicine, University of Belgrade, <sup>2</sup>Serbian Academy of Sciences and Arts, Belgrade, Serbia)**

**Purpose:** The aim of the present study was to determine the effects of L-NAME, inhibitor of NO synthase, on spike-and-wave discharges (SWD) appearance in homocysteine thiolactone (H) – induced seizures in rats. **Methods:** Adult male Wistar albino rats were anesthetized and three gold-plated electrodes were implanted into the skull. In freely moving rats, EEG were registered, digitized and analyzed off-line by NeurosciLaBG software. L –NAME (700 mg/kg, i.p., n= 7) or saline (n=9) were injected 30 min prior to H (5.5 mmol/kg, i.p.). The inclusion criteria for the SWD were as follows: 1. spontaneous and generalized, rhythmic 5 to 7 Hz discharges; 2. lasting >1 s and 3. amplitude of at least twice the background EEG. The number and duration of SWDs were calculated during 90 min after H. All SWDs were detected in the full length of EEG recordings. **Results:** No SWD were registered in rats receiving saline or L-NAME alone. Median number of SWD per rat was significantly higher in rats pretreated with L-NAME comparing to vehicle-treated rats ( $p < 0.05$ ). No statistically significant differences were found in duration of SWD between experimental groups. **Conclusions:** These results indicate that L-NAME potentiated absence-like seizures in model of H-induced epilepsy in adult rats.

**15. Physiological mechanisms of non-invasive cortical stimulation - TV Ilic (Military Medical Academy, Belgrade, Serbia)**

Non-invasive cortical stimulation comprises application of safe and comfortable methods of repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS). Common physiological principles for both methods are founded on prolonged post-interventional effects represented by cortical excitability changes. Patterns of stimulation (frequency, intensity, intervals between consequent trains) are determining direction of excitability changes. Current physiological models suggest predominant activation of cortical interneurons similar to mechanisms of synaptic plasticity, long-term potentiation and long-term depression. This hypothesis is supported by several studies performed on healthy volunteers with administration of CNS active agents with well known effects on neurotransmitters. Prolonged post-stimulation effects on cortical excitability are mediated at synaptic level through activation of N-methyl-D-aspartate, but in case of tDCS, with changes of neuronal membrane excitability (non-synaptic plasticity), as well. Furthermore, animal experiments have shown effects on

spontaneous neural activity (increased firing rate) in deep cortical layers, and possible alterations of physiological local network oscillators (e.g. cathodal tDCS and increase of slow EEG rhythms).

#### **16. Transcranial neuromodulation techniques for treatment of neurological and psychiatric disorders - SR Filipović (Institute for Medical Research, Belgrade, Serbia)**

Transcranial neuromodulation techniques (TNT), repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS), are promising treatment methods in neurology and psychiatry. Although, in contrast to DBS in movement disorders or ECT in depression, the efficacy of TNT to treat neurological or psychiatric disorders has not been undoubtedly demonstrated yet, the potential advantages are considerable. TNT techniques avoid surgical risks and provide theoretical advantages of potential specific neural circuit modulation. So far, the most encouraging results have been reported in neuropathic pain and depression. In addition, promising are the results obtained in treatment of epilepsy, parkinsonism, dyskinesia, dystonia, hallucination, and tinnitus. There are indications for potential cognitive enhancing effects in dementia as well. Multiple mechanisms likely contribute to the clinical effects of TNT, including normalization of cortical excitability, rebalancing of distributed neural network activity, and induction of neurotransmitter release. Neuromodulatory effects depend on extrinsic stimulation factors (cortical target, frequency, intensity, duration, number of sessions) and intrinsic patient factors (disease process, individual variability, medication). It is still unclear how to optimally adjust these factors. Nonetheless, the noninvasive nature, minimal side effects, positive effects in preliminary clinical studies, and increasing evidence for rational mechanisms make TNT attractive for further investigation.

#### **17. Predictive value of multimodal evoked potentials in brain contusion qualification - J. Jancic (Clinic of neurology and psychiatry for children and youth, Medical faculty, University of Belgrade, Belgrade, Serbia)**

**Introduction:** Multimodal evoked potentials (MEP) nowadays often occurs as one of the most supreme neurophysiologic and forensic techniques in head injured patients, and predictional methods in brain function approach. **Purpose:** Investigation of MEP prognostic value in brain contusion qualification. **Methods:** We analyzed 45 patients, aged 5 to 24, with brain contusion, treated and clinically evaluated with somatosensory (SSEP), brain stem (BAEP) and visual (VEP) evoked potentials procedures in Clinic of neurology and psychiatry for children and youth, up to a month after head injury. **Results:** Analyses showed SSEP cortical response delay in 5 (11.6%), altered cortical response and lower amplitudes in 3 (7%), central conduction time delay in 6 (14%) and normal findings in 13 (30,2%) patients. AEP showed altered all waves morphology in 3 (13.6%), V wave degradation in 4 (18.2%), interpeak latency I-V delay in 11 (50%) and normal findings in 5 (22,7%) patients. VEP showed altered morphology in 7 (15.6%), lower amplitudes in 17 (37.8%), P100 latency delay in 7 (15.6%) and normal findings in 17 (37.8%) patients. **Conclusion:** MEP, especially SSEP and AEP, have significant prognostic value in head injured patients with brain contusion and help determine their outcome or posttraumatic neurological sequels.



**18. Neurophysiological evaluation of central and peripheral motor conduction in cervical spondylotic myelopathy – study with transcranial magnetic stimulation- S Stankovic<sup>1</sup>, S Kostic<sup>2</sup>, S Petkovic<sup>2</sup>, TV Ilic<sup>1</sup> (<sup>1</sup>Military Medical Academy, <sup>2</sup>Special hospital „Gamzigradska banja“, <sup>3</sup>Policlinical center «Ristić», Belgrade, Serbia)**

**Introduction:** Central motor conduction time (CMCT<sup>M</sup>) is recognized as highly reliable indicator in planning neurosurgical treatment. **Methods:** We have tested 12 patients (48.2 ± 11.4 yrs) with clinical diagnosis of probable cervical myelopathy. For each patient, in addition to conventional neurophysiological tests (SSEP, MEP, EMG, nerve conduction studies), we have calculated root conduction time, with previous calculation of total peripheral conduction time, aiming to define motor conduction exclusively for central motor pathways (CVMP<sup>F</sup>). TMS was performed on conventional way, as well in position of maximal ante- and retroflexion. **Results:** Prolonged CVMP<sup>M</sup> were found in 1/3 of patients, the same proportion with CVMP<sup>F</sup> analysis, but in different patients, because in several cases we have established slower root conduction time (max. 4.34 msec). Comparison of conventional MEP registration in middle position vs. maximal neck flexion and extension didn't show significant group differences, but analysis of individual cases reveals positive findings in 25% of patients. **Conclusion:** Extended neurophysiological protocol of testing corticospinal functions is immediately relevant for optimal treatment choice. In addition to central motor pathways evaluation, we found useful to include dynamic tests (during TMS) and root conduction time measurement in diagnostic evaluation of cervical spondylotic myelopathy.

**19. Multimodal evoked potentials in hereditary motor and sensory neuropathy type 1 (J. Jancic, V. Milic-Rasic, J. Mladenovic) Clinic of Neurology and Psychiatry for Children and Youth, Medical Faculty, University of Belgrade, Serbia**

**Purpose:** Hereditary motor and sensory neuropathy type 1 (CMT1) is most frequent hereditary neuropathy clinically, neurophysiologically and histopathologically described. Evaluation of parameters changes in all evoked potentials (EP) modalities, depending to CMT1 type. **Methods:** 15 patients aged 8 to 50 (average 20.1) were examined: 5 with sporadic CMT1 (SCMT1); 4 with hereditary pressure palsy neuropathy (HNPP); 3 with autosomal dominant form (ADCMT1); 2 with X-linked (XCMT1) and 1 with autosomal recessive form (ARCMT1). We performed somatosensory (SSEP) in 13, visual (VEP) in 14, and auditory (AEP) evoked potentials in 8 cases. **Results:** SSEP showed prolonged N13 latency in 9, peripheral conduction time delay in 8, prolonged N9 latency and central conduction time delay both in 6 cases. Only 2 patients had normal SSEP findings. VEP had prolonged P100 latencies and normal findings each in 5 cases, while elevated and depleted amplitudes were noticed both in 4 cases. AEP showed prolonged relative latencies IPL I-V in 5 and normal findings in 3 patients. All patients with XCMT1 showed EP parameters pointed to central conduction disorders. **Conclusion:** EP could be included in HN diagnostic protocol, and together with ENMG may influence molecular genetic analyses order, as it is the case with conexinopathies (X CMT1).

**20. Low-frequency repetitive transcranial magnetic stimulation conjugated with partial sleep deprivation in treatment of major depression – pilot study - J Krstić<sup>1</sup>, V**

**Diligenski<sup>1</sup>, TV Ilić<sup>2</sup> (**<sup>1</sup> **Clinical Hospital Center „Dragiša Mišović“,** <sup>2</sup> **Military Medical Academy, Belgrade, Serbia)**

**Purpose:** The study was designed to evaluate effects of *low*-frequency rTMS conjugated with partial sleep deprivation in treatment of major depression. **Methods:** Eleven patients ( $45 \pm 4.6$  yrs) with diagnosis of unipolar major depression, unsuccessfully treated, on stable pharmacotherapy were treated with 1 Hz rTMS at threshold intensity, over right dorso-lateral prefrontal cortex, during two weeks; 5 trains (60 stimuli per session). Twice during the period of two weeks partial sleep deprivation was applied (4 h). Study design comprises active and *sham* rTMS. Therapeutic effects were estimated by blind rater. **Results:** Active rTMS has shown HAMD score reduction  $25.83 \pm 1.94$  (pre-stimulation) to  $13.67 \pm 1.96$  (two weeks later), and  $14.50 \pm 4.76$  (three weeks later) opposite to complete failure among *sham*-treated patients ( $23.60 \pm 1.14$ , pre;  $20.00 \pm 3.00$ , after two weeks;  $21.80 \pm 3.83$  after three weeks). CGI improvement were observed among rTMS treated patients ( $4.83 \pm 0.41$ , baseline;  $3.00 \pm 0.63$ , after two weeks;  $2.83 \pm 0.75$ , after three weeks) while *sham* treated have shown no changes ( $4.2 \pm 0.45$ , baseline;  $4.00 \pm 0.71$ , after two weeks;  $4.20 \pm 0.84$ , after three weeks). **Conclusion:** Pilot study results have justified further application of *low*-frequency rTMS conjugated with partial sleep deprivation in treatment of major depression in patients with pharmacoresistant depression.

**21. MR perfusion imaging in diagnostics of brain pathologies - T. Stošić-Opinčal<sup>1</sup> and M. Daković<sup>1,2</sup> (**<sup>1</sup>**Center for magnetic resonance imaging, Clinical Center of Serbia, and** <sup>2</sup>**Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia**

The knowledge of parameters which describe oxygen and nutrients supply to tissues is essential from standpoint of diagnostics and follow-up of pathologies of brain. Due to their low spatial resolution MR angiographic techniques can not visualize blood flow inside bulk tissue. In order to obtain the hemodynamic parameters which describe perfusion, MR perfusion imaging use drop in tissue signal during the first pass of contrast agent. Decrease in MR signal is proportional to intravascular concentration of contrast agent, which provides basis for calculation of regional cerebral volume (rCBV), regional cerebral flow (rCBF) and mean transition time (MTT) and corresponding maps of these parameters. Such maps can pinpoint to changes in perfusion of brain tissue which can be consequence or cause of pathologic changes. Perfusion MRI can help in more precise definition of the area affected by stroke and, in comparison with diffusion weighted imaging, in assessing volume which can be potentially saved with aid of thrombolytic therapy. Maps of perfusion parameters provide information on existence and follow-up of tumor angiogenesis which further helps in differentiation and grading of brain tumors. Perfusion technique can also contribute in distinguishing between radiation therapy effects and tumor recurrence.

**22. Single photon emission computed tomography (SPECT) in presurgical evaluation of temporal lobe epilepsy - L. Brajković<sup>1</sup>, D. Sokić<sup>2</sup>, N. Vojvodić<sup>2</sup>, A. Ristić<sup>2</sup>, S. Janković<sup>2</sup>, V. Obradović<sup>1</sup> (**Institute of Nuclear Medicine<sup>1</sup> and Institute of Neurology<sup>2</sup>-Clinical Center of Serbia, Belgrade, Serbia)

**Aim:** To show results of neuroimaging ictal and interictal SPECT in our patients. **Method:** We performed brain SPECT in four patients with refractory temporal lobe epilepsy. For ictal studies patients had continuous video EEG monitoring. Radiotracer (stabilized  $^{99m}\text{TcHMPAO}$ , 740 MBq) injected in the first 30 seconds after seizure onset. For interictal study radiotracer injected when patients have been without seizure. Study was performed 90 min after radiotracer injected. **Results:** SPECT has shown regional cerebral blood flow (RCBF) to be abnormal at the site of the epileptic focus. Interictal SPECT demonstrates regional hypoperfusion (in 3 patients) and hypoperfusion in medial temporal region and hyperperfusion in lateral part of the same temporal region (in 1 patient). Ictal SPECT has shown hyperperfusion in the temporal lobe at the site of epileptic event (in all patients), and in ipsilateral basal ganglia and frontal lobe (zone of seizure propagation). Comparing ictal, and interictal SPECT and subtraction images we can visualize epileptic foci region. The seizure foci were left temporal in three and right temporal in one. **Conclusion:** Especially ictal SPECT is useful for lateralizing and localizing epileptic foci in presurgical evaluation of patients with pharmaco-resistant temporal lobe epilepsy.

### **23. Single photon emission computed tomography (SPECT) and DaTSCAN in diagnosis of parkinsonian syndromes - Lj Jauković, B Ajdinović (Institute of Nuclear Medicine, Military Medical Academy, Belgrade, Serbia)**

The role of nuclear medicine is functional brain imaging based on two strategies. A first approach is related to brain functional activity and energy metabolism and the second is related to the function of the chemically heterogeneous neurons. SPECT is nuclear medicine technique, presently widely used for imaging of neurovascular disorders, brain tumours, dementia, epilepsy, encephalitis, parkinsonism and various psychiatric diseases. Radiopharmaceuticals developed for SPECT can be categorized into a number of broad categories. Technetium-99m-labeled hexamethylpropyleneamineoxime ( $\text{Tc-}^{99m}\text{-HMPAO}$ ), and technetium-99m-labeled ethyl cysteinate dimer ( $\text{Tc-}^{99m}\text{-ECD}$ ) are widely used to visualize and to measure cerebral blood flow.  $^3\text{-}[(123)\text{I}]\text{i}odo\text{-}\alpha\text{-methyl-L-tyrosine}$  ( $(\text{I-}123\text{-IMT})$ ), Thallium-201 chloride,  $\text{Tc-}^{99m}(\text{I-hexakis}(2\text{-methoxyisobutylisonitrile}))$  ( $\text{Tc-}^{99m}\text{-MIBI}$ ) and  $\text{Tc-}^{99m}$  tetrofosmin are used for functional imaging of tumour metabolism;  $[(123)\text{I}]\text{i}odole\text{-benzovesamicol}$  is used for the evaluation of acetylcholine transport and  $^{123}\text{-I}$  Ioflupane (DaTSCAN) for dopamine reuptake in evaluations of patients with movement disorders. The use of DaTSCAN facilitates the differential diagnosis in patients with isolated tremor symptoms not fulfilling Parkinson's disease or essential tremor criteria, drug-induced, psychogenic or vascular parkinsonism and dementia when associated with parkinsonism. The role of SPECT will continue to evolve alongside positron emission tomography (PET), because of available radionuclides, cost-effectiveness and adaptability to specific imaging situations.

### **24. Brain SPECT and PET imaging in the differential diagnosis of dementias - L. Brajkovic (Center for Nuclear Medicine, Clinical Center of Serbia, Belgrade)**

**Aim:** To study the usefulness of PET and SPECT in clinical practice in dementias. Using numerous specific radiotracers ( $^{99m}\text{Tc-HMPAO}$ ,  $^{99m}\text{Tc-ECD}$ ,  $^{18}\text{F-FDG}$ ,  $^{123}\text{J-FP-CIT}$ ,  $^{123}\text{J-}$

IBZM, 123J-MIBG, 11C-PIB) SPECT or PET can visualize various aspects of brain function in differential diagnosis of dementia: brain perfusion, glucose metabolism, presynaptic and postsynaptic level of dopaminergic system integrity, amyloid plaque imaging. 18F-FDG PET (cerebral metabolism) and perfusion SPECT are commonly used in clinical practice. Images of Alzheimer's disease (AD) demonstrate hypometabolism (PET) and hypoperfusion (SPECT) involving especially the posterior cingulate and bilateral parietal and temporal association cortices. Frontotemporal dementia- hypometabolism and hypoperfusion in frontal cortex and temporal areas are usually asymmetrically affected. Vascular dementia- deficits affect areas, correspond to ischemic zone on CT or MRI. Dementia with Lewy bodies – deficits are similar to those of AD, but affect occipital areas. SPECT with 123I ioflupane (DaTSCAN) or 123I-MIBG may be useful in the differentiation of DLB and AD. DaTSCAN in AD is normal, but in DLB demonstrate decreased uptake in the striatum. The reduction in cardiac 123I-MIBG uptake is characteristic feature of DLB. **Conclusion:** SPECT and PET are useful for early diagnosis and differential diagnosis of dementias, especially neurodegenerative disorders, when CT and MR are normal.

## **25. Video and EEG as a Diagnostic Tool – which one is better? - Z. Boskovic, N. Rajsic (Military Medical Academy, Belgrade, Serbia)**

**Purpose:** To check which of the two diagnostic tools give better results – Video or EEG?  
**Methods:** We used Video system Nicolet One Healthcare Viasys t® with the Sony® camcorder.  
**Results:** Three cases have been selected for presentation. Case 1. D.B., 59-year old female with the first epileptic seizure of generalized tonic-clonic type at the age of 47. During hospital investigation she has got the non-convulsive seizure with ictal finding in left temporal region. Case 2. P.B., 23 year-old. Her first seizure occurred at age of 7. No diagnosis of epilepsy has been made during four days continuous EEG and Video investigation at the regional hospital in Switzerland where she lives, neither during six days in our department. However, her home video recording of two seizures discovered a clear epileptic origin of her nocturnal seizures. Case 3. AA, 9-year old. Seizures etiology was double cortical layer on magnetic resonance imaging as a consequence of cortical dysplasia. **Conclusion:** EEG and Video monitoring are complementary investigations. Interictal epileptiform discharges are more frequently recorded than seizures on EEG and Video. Diagnostic importance of seizures recorded only in Video seems to be underestimated.

## **26. Effect of hyperventilation in patients with mechanical brain injury - Biljana Lješević<sup>1</sup>, Žarko Martinović<sup>2,3</sup>, Stevan Jović<sup>1</sup> (<sup>1</sup>Rehabilitation Centre „Dr Miroslav Zotović“, Beograd, <sup>2</sup>Belgrade University Medical School, and <sup>3</sup>Institute of Mental Health, Belgrade, Serbia)**

**Purpose:** to investigate the hyperventilation (HV) effect on quantitative background EEG activity in subjects with mechanical brain injury. **Methods:** The study was performed on a sample of 69 patients with mechanical brain injury (31 female and 38 male, mean age 45,04 years), 36 of them with posttraumatic epileptic seizures (PTS). Control group consisted of 34 age-matched healthy subjects. Electrodes were positioned according to 10-20 System. Data were processed using program package PERSYST Insight II (Persyst Development Corporation, 1060 Sandretto

Drive, Suite E-2, Prescott, AZ 86305). Multiple comparisons of HV effect between control and patient groups, as well as subgroups with and without PTS, were performed with spectral EEG analysis in Laplacian montage. **Results:** The group of patients demonstrated significant differences in all frequency domains for all derivations in comparison with controls ( $p < 0,05$ ). The group with PTE and the group without PTS were statistically significantly different in all frequency ranges except the range 0-1 Hz. **Conclusion:** Spectral EEG analysis demonstrates significant differences between subgroups of patients with mechanical brain injury, which are related to the existence of epileptic disorder.

**27. EEG in early prediction of epilepsy prognosis in malformations of cortical development of childhood -N. J. Jovic (Clinic for Neurology and Psychiatry of Children and Youth, Belgrade, Serbia)**

Malformations of cortical development (MCD) are often recognized as underlying etiology for intractable seizures in children. Prognosis of epilepsy in them is often difficult to predict.

**Methods:** A Group of 244 patients aged 0.5 to 17 years with MCD was prospectively studied (3.5-10 years) for prognosis. **Results:** Seizures occurred in 182(74.6%) patients with mean seizure onset of 4.1 years. Pharmacoresistant seizures occurred in 44.5% (Group A). Favorable seizure control was achieved in 55.5% (Group B). Initial normal EEG was recorded in 3.7% (A) vs. 9.9% (B). Generalized SW discharges (34.6%) and multifocal spike/SW (17.3%) were more often associated with intractable seizures, comparing with 25.5% and 13.8% of patients with favorable course. Focal EEG patterns were more frequently recorded in a group B but with no significant difference. Burst suppression pattern was significantly more frequent in children with poor seizure control (7.4% vs. 2.0%). No EEG correlated with MCD location and extent in patients with later intractable epilepsy. **Conclusions:** Initial EEG abnormalities, specific EEG patterns and poor correlation of EEG with MCD location/extent were identified as main EEG predictors of seizure intractability in children with MCD.

**28. Electroencephalographic features of epilepsies caused by temporal lobe tumors - M. Milovanović<sup>1</sup>, Ž. Martinović<sup>1,2</sup> (<sup>1</sup>Institute of Mental Health, Belgrade, <sup>2</sup>Medical School, Belgrade University, Serbia)**

**Purpose:** to define the electroencephalographic (EEG) features of symptomatic focal epilepsies caused by temporal lobe tumors. **Method:** We analyzed EEG features of 20 patients with symptomatic focal epilepsies caused by temporal lobe tumors. **Results:** Focal polymorphous delta activity (FPDA) on the same side as tumor, intermittent rhythmic delta activity or monorhythmic delta activity, and localized loss of activity over the tumor region were recorded in patients with gliomas and metastatic tumors. More localized abnormalities with a well-preserved alpha rhythm with normal EEG background in normal hemisphere were recorded in anterior temporal lobe tumors, particularly astrocytoma or oligodendroglioma. Monorhythmic theta activity occurred as the ictal pattern was due to oligodendroglioma of the right hippocampus and parahippocampal formation. FPDA and reduced amplitude but without slowing of alpha rhythm on the side of tumor were recorded with a tumor localized in posterior temporal lobe. Epileptiform discharges were found in slow growing tumors which cause epilepsy. Subtle nonepileptiform abnormalities, mostly slowing and reduced amplitude of alpha

rhythm, or discrete background slowing were uncovered in huge meningiomas. EEGs recorded after surgery demonstrated a conspicuous breach rhythm overlying bone defect. **Conclusion:** Location, type and speed of growth of the neoplasm determine the type of EEG abnormalities.

**29. Occipital EEG Alpha Power After Sleep Deprivation Greater Among the Idiopathic Generalized Epilepsies - N. Rajsic<sup>1</sup>, Z. Sundric, M. Tomovic<sup>1</sup>, J. Marinkovic<sup>2</sup> (1Military Medical Academy and 2Institute of Medical Statistics and Informatics, Belgrade, Serbia)**

**Purpose:** to find some EEG indicators that could differ idiopathic generalized epilepsies (IGE) from partial ones and controls. **Methods:** The alpha attenuation test (AAT) was applied to the sample of 117 patients with at least one episode of loss of consciousness and 34 controls. All patients underwent EEG recording after one night sleep deprivation. AAT was performed before sleep onset. According to the later established diagnosis, three patients groups were established: 27 with IGE, 34 with partial epilepsy and 56 with unknown cause of loss of consciousness. A total of 36 logarithmic transformed variables underwent the parametric statistical analysis: six relative and six absolute alpha powers from each of the two channels (O2-A1 and O1-A2) after eyes-open (EO) and eyes-closed (EC) conditions, as well as six alpha attenuation coefficients (AAC). **Results:** We have found significantly greater absolute AACs (F from 4,439 to 4,72), slightly lower relative AAC (F from 4,9 to 5,46) and greater absolute and relative alpha power after EC and EO conditions in the group of IGE in comparison with other groups. **Conclusions:** Greater alpha power after EC and EO during the state of decreased vigilance before sleep onset among the patients with IGE may have some diagnostic value.

**30. Importance of EEG in diagnosis of metabolic disorders in infancy - Ružica Kravljanac, Maja Đorđević, Milena Đurić, Borisav Janković (Institute for mother and child health of Serbia, Belgrade)**

**Purpose:** To present importance of EEG in diagnosis of metabolic disease in children during neonatal and infantile period of life. **Method:** Serial video EEGs were performed in two cases with non-ketotic hyperglycinemia and two newborns with maple syrup urine disease (MSUD). Metabolic investigation of blood, urine and CSF, including genetic analyses were performed. **Results:** All patients performed neurological abnormalities during the neonatal period. Both cases with non-ketotic hyperglycinemia were extremely hypotonic with respiratory distress and different types of seizures including the early appearance of infantile spasms and status epilepticus. Video EEG showed evolution of infantile spasms, myoclonic and other types of seizures. Prolonged persistence of periodic epileptic discharges was noticed in both cases. Somnolence, feeding difficulties and periodic tonic crises were present in the first days of life in the newborns with MSUD. Semiperiodic EEG with pathognomonic comb-like rhythms in these cases suggested urgent investigation for MSUD and after receiving results haemodiafiltration was done successfully. **Conclusion:** Clinical features of metabolic disorders in early age are nonspecific and could mimic sepsis, hypoxic ischemic encephalopathy or other disorders. Differential diagnosis is very difficult and EEG is important to determine further metabolic investigation.

**31. Presentation of multiple rhythmic movement disorders in a single patient - S. Janković, D. Sokić, N. Vojvodić, A. Ristić, Lj. Zović (Institute of Neurology, Clinical Center of Serbia, Belgrade, Serbia)**

Rhythmic movement disorders (RMDs) refer to a group of behaviors characterized by stereotypic rhythmic movements of the body (body rocking), head (head banging), or limbs (leg rolling) appearing in relation to sleep. We present a 16-year-old young man with four different types of RMDs. At the age of 2.5 years symptoms spontaneously appeared as repetitive, rhythmic, stereotypic, sleep-related rhythmic movements of forward and backward swaying of the trunk (body rocking). After four years of age the movements transformed to head banging against a pillow appearing in quiet wakefulness or superficial sleep. From the age of 7 years he had body rolling and head rolling as pre-sleep behavior. Head banging, body or leg rolling appeared in random succession, in different combinations or independently as isolated symptom on a particular night. Patient never hurt himself, claimed to be amnesic for the events with daily activities unaffected. PSG with sleep architecture, neurologic, psychiatric, cardiologic, ophthalmologic, and hematologic examinations, with laboratory and brain MRI were normal. We observed head banging virtually every night mainly during quiet wakefulness or non-REM-stage 1 sleep. Low dose of clonazepam induced complete disappearance of all RMDs during the 5-month of follow-up.

**32. Brain Death - Ljiljana Beslac Bumbasirevic (Department of Emergency Neurology, Institute of neurology, Clinical Centre of Serbia, Belgrade, Serbia)**

Brain death (BD) is defined as the absence of all brain functions with the complete cessation of brain function, profound coma of known cause, complete absence of brain stem reflexes, and positive apnea test. All evaluations are done by experienced neurologist or neurosurgeons. Before a patient can be certified brain dead, a certain set of preconditions must be met:

- Irremediable structural brain damage must be demonstrated (CT brain)
- The ruling out of complicated medical conditions that may confound the clinical assessment has to be done: particularly severe electrolyte, acid–base, or endocrine disturbances; the absence of severe hypothermia (defined as a core temperature of 32°C or lower); hypotension; and the absence of evidence of drug intoxication, poisoning, or neuromuscular blocking agents.

**33. Importance of EEG in brain death diagnosis - Marko Ercegovac (Department of Emergency Neurology, Institute of Neurology, Clinical Centre of Serbia, Belgrade, Serbia)**

Brain death (BD) is defined as irreversible loss of critical functions in the entire brain, including the brainstem. It is claimed that without the brain functions, the body functions will disintegrate. BD exams must show complete absence of brain function and must include two isoelectric (flat-line) EEGs, 24 hours apart. Although in certain countries EEG is not considered BD confirmatory test, since it cannot test brainstem function, majority of neurologists would not diagnose BD until the EEG is isoelectric. Therefore, EEG is necessary for confirmation of brain death in most countries, including Serbia. The major problem in BD concept is in the fact that brain functions may continue in many brain-dead brains. In our study out of 133 BD patients, 20

had persistent 24h brain function in EEG, therefore more than 2 repeated EEG-s were necessary. Furthermore, in 6 patients electrocortical activity persisted for more than 24h enabling final BD diagnosis. There are growing evidences in favor of EEG application, not only as a confirmatory test, but the one which considerably facilitates BD diagnosis. After a known precipitating event, BD can be identified by EEG with absolute certainty within just a few, rather than the previously recommended 24h or more.

**34. Transcranial Doppler sonography for confirming diagnosis of brain death - D. R. Jovanović, O. Savić (Department of Emergency Neurology, Institute of Neurology, Clinical Center of Serbia, Belgrade, Serbia)**

The cerebral circulatory arrest (CCA) is the final step that leads to the irreversible loss of all brain functions and ultimately to the brain death. In contrast to the cerebral angiography, Transcranial Doppler sonography (TCD) is a noninvasive method that can detect CCA and can be easily performed at the bedside. In patients who have received sedatives, those with metabolic derangements or who are hypothermic TCD is more reliable than electroencephalography. Waveform abnormalities documented by the TCD occur when intracranial pressure increases above the mean arterial pressure and are indicative of CCA. The TCD criteria for CCA include the presence one of the following patterns: (1) biphasic oscillating flow (“to and fro” movement), (2) systolic spikes of low velocity without a flow signal during the diastolic phase, or (3) the lack of signal of the basal cerebral arteries detected in previous TCD recording. Such flow patterns should be present in three arteries of different territories and confirmed in the second TCD evaluation with at least a 30 minute interval. Specificity of TCD to detect brain death is 99-100%; sensitivity is up to 95% and increases with repeated examinations. TCD may shorten the time to declaration of brain death.

**35. Isoelectric electroencephalogram can not be equated with brain death - M. Knežević-Pogančev, Pavlović M, Redžek-Mudrinić T. (Institute of Child and Youth Health Care of Vojvodina, Novi Sad, Serbia)**

The electroencephalography is by far the most used confirmatory test in the brain-dead (BD) diagnosis. Isoelectric electroencephalogram in conformance with clinical findings is strongly suggestive of brain death. In clinical practice, isoelectric electroencephalogram (EEG) in not-brain-dead patients is rarely seen. In period from 1999 to 2009, 36 patients (aged 1 to 18 years) with Glasgow comma score <3 of unknown etiology were subjected to electroencephalography. Initial EEG was isoelectric for all of them. They all had compromised spontaneous breathing and have been intubated. Cerebral blood flow on single photon emission computed tomography scan was not performed, but the electroencephalogram was isoelectric for all. We present isoelectric EEG in 5 non-brain-dead patient. We present 5 children with isoelectric EEG: 1-Boy aged 14 with adult respiratory syndrome, 2-Boy aged 4 with malignant brain edema, 3-Boy aged 16 with severe barbiturate intoxication, 4-Girl aged 4, and girl aged 3 with brain empyema) survived this condition. These cases demonstrate that isoelectric electroencephalogram can not be equated with brain death. In global cerebral hypoxia/ischemia, cardiopulmonary shock, hyperpyrexia, hypothermia, hypoglycemia, metabolic disturbances, metabolic encephalopathy, as



well as in intoxication (sedative-hypnotic drugs) and in children with brain empyema an isoelectric EEG may not indicate irreversible brain damage.

**36. Isoelectric electroencephalogram in hypoxic-ischemic perinatal brain injury - Knezević-Pogačev M., Doronjski-Bregun A, Pavlović M, Redžek-Mudrinić T. (Institute of Child and Youth Health Care of Vojvodina, Novi Sad, Serbia)**

Perinatal hypoxic-ischemic brain injury remains an often devastating event that results in death, or impaired survival despite extensive resuscitative efforts at birth. Presence of an isoelectric electroencephalogram (EEG) appear in more diverse clinical situations in the neonate with hypoxic-ischemic encephalopathy. We present 20 neonates identified with a severe hypoxic-ischemic encephalopathy (HIE), in a 10-year period (1999-2009), subjected to electroencephalography. They all had isoelectric EEG during first 24 to 48h of life. Thirteen of 20 neonates also had electroencephalographic or other evidence of clinical seizures in first 72h of life. Serial EEGs (every 24h) helped assess the severity of a neonatal encephalopathy, but also may correlate with chronic and acute neurologic insults. Although electroencephalographic activity reemerged in 16 of these infants, significant clinical improvement was seen in only 5 patients. Four children died in first 72h of life, had continuous isoelectric EEG. Eleven children survived with severe sequela, had isoelectric EEG during period of at least 72h of life. Only 5 children survived with minor neurology sequelae had isoelectric brain activity for less than 48h of life. An isoelectric EEG obtained in the neonate with partially preserved brain function and, therefore is not a reliable confirmatory test of neonatal brain death.

**37. Causes of brain death patients in Emergency Neurology - Višnja Bogosavljević (Department of Emergency Neurology, Institute of neurology, Clinical Centre of Serbia, Belgrade)**

Objective of our study was to define the causes of BD of patients who were candidates for organ donation and to define the reasons why some of them didn't become brain-death donors. This retrospective study included patients that were treated at the Emergency department of the Clinical center of Serbia in the period from January 2004. until October 2008. The clinical diagnosis of brain death was confirmed in 133 patients. Considering the aetiology of BD the majority of cases (69.9%) included spontaneous hemorrhages (subarachnoidal and/or intracranial ones), and head injuries (10.5%). The organ transplantation was performed only in 24 cases (18.0%). In 69.9% cases the transplantation wasn't performed because of the refusal by the family (in 2004. 80%, in 2005. 80%, in 2006. 73.1%, in 2007. 64.3% and in 2008. in 62.5 % of cases). Our study has shown that the most important cause of loss of donors is the refusal by the family. Despite the fact that some progress has been made since the percentage of refusals decreases in years, it is still necessary to improve the existing education of population.

**38. Neurophysiological improvement in profoundly deaf children achieved by cochlear implantation - B. Mikić, D. Mirić, S. Ostojić, M. Asanović, M. Mikić (Clinic of Ear, Nose and Throat and Maxillofacial Surgery, Clinical Centre of Serbia, Belgrade)**

**Purpose::** To assess neurophysiologic improvement in audiological performance and short-term auditory memory of profoundly deaf children following cochlear implantation. **Material and methods:** Experimental group consisted of 30 profoundly deaf children with cochlear implants, aged 3-12 years. Control group had 30 profoundly deaf children with hearing aids of the same age. Ling 6 Sounds Test and Test of immediate verbal memory were used. **Results:** Cochlear implanted children have shown considerably better results in both tests. Majority of cochlear implanted children have sown maximum score on the Ling 6 Sounds test, whereas only a few of profoundly deaf children with hearing aids could achieve that. Short-term auditory memory was much better in CI children. Considerable differences were observed regarding age at implantation and duration of postoperative rehabilitation. **Conclusion:** Cochlear implantation is far better solution for profoundly deaf children than hearing aids. Superior auditory performance, listening skills and short-term auditory memory is achieved by direct electrical stimulation inducing maturation of central auditory system. Better auditory perception, speech and language development is observed in children implanted early due to central nervous system plasticity.

### **39. Otoacoustic emissions - M. Sente (Health Centre “Sente”, Subotica, Serbia)**

Otoacoustic emissions are acoustic signals generated by cochlea's outer hair cells. They can be detected in the ear canal of a person with normal outer hair cell function. During the last decade, the detection of otoacoustic emissions has become a well established method of neonatal hearing screening. Besides that, they have become a inevitable tool in the hearing-impairment diagnostic procedure. In this presentation, the Transient Evoked Otoacoustic Emission (TEOAE) measurement is described. Three cases of hearing impairment are demonstrated in which the TEOAE measurement had a significant contribution to the diagnosis. A case with tinnitus and normal pure tone audiometry, a case with vestibular neurinoma suspicion, and a case with industrial noise hearing impairment are described.

### **40. The vestibular function in newborn - T. Adamović<sup>1</sup>, K. Ribarić-Jankes<sup>2</sup>, M. Sovilj<sup>1</sup>, A. Ljubić<sup>3</sup>, O. Antonović<sup>1</sup> (Institute for Experimental Phonetics and Speech Pathology, <sup>2</sup>Institute of Neurology and <sup>3</sup>Institute for Obstetrics and Gynecology of Clinical Center, Belgrade, Serbia**

Neonatal hearing screening is a well established diagnostic method. In contrast, function of the vestibular apparatus and its central pathways is hardly being examined in newborns. The aim of this research was to examine functioning of the vestibular apparatus and its pathways in newborns. In N=100 healthy full-term newborns from regular pregnancies, we performed the following clinical examinations: observation of ocular alignment in the awake state (OAA), testing of the vestibulo-ocular reflex (VOR) and testing of the Moro reflex (MOR). The results were scored, and recorded by means of a digital camera. In 87% of babies eyes were in the midline, whereas in 13% of babies one or both eyes were in exotropia or endotropia. VOR was absent in 5% of newborns, present to both sides in 38%. In remaining 57% VOR was present only to one side, or it was incompletely expressed. MOR was absent in 2%, but present in 52%

of newborns. In 46% it was only incompletely performed by the newborn. If the newborn's eyes are positioned in the midline, if VOR and MOR are present, we can conclude that the vestibular function and the vestibular pathways are normal during the first days after child's birth.

**41. The vestibulospinal pathways - K. Ribarić-Jankes<sup>1</sup>, L. Svirtlih<sup>2</sup>, S. Cobeljić<sup>2</sup>, I. Berisavac<sup>1</sup> (1Institut of Neurology, Clinical Centre, 2Institute for Rehabilitation "Miroslav Zotović", Beograd, Serbia)**

The goal of this study was to investigate the usefulness of the vestibular stimulation in rehabilitation of patients after Spinal Cord Injury (SCI). The activation of vestibulospinal pathways can be achieved by galvanic stimulation applied to the mastoid. It causes hypotonia of the extensor muscles on the anodal side. In 9 chronic SCI patients (aged 21 to 41), a repeated galvanic stimulation was applied on the left, and after that, on the right mastoid. Two of the patients were grade A according to American Spinal Injury Association (ASIA) Impairment Scale (AIS), 5 grade B, and two grade C. The intensity of the stimulation was 3-5 mA, the duration 1 second. Each stimulus was repeated 10 times. The spasticity of lower limbs was tested previous and after galvanic stimulation. Two experienced physicians performed the testing according to the Ashfort scale. In 5 out of 9 patients, a diminution of the spasticity on the stimulated side was present. In 3 of them, the change lasted less than 5 minutes, in 2 patients more than 5 minutes. The change in lower limb spasticity after galvanic vestibular stimulation in chronic SCI patients was discussed.

**42. Subjective visual vertical perception in patient after acute ischemic brain attack - S. S. Jovanović<sup>1</sup>, N. Šternić-Čovičković<sup>2</sup>, M. Kukolj<sup>3</sup>, K. Ribarić-Jankes<sup>2</sup>, M. Savić<sup>4</sup> (1Higher Nursery School, 2Institute of Neurology, Clinical Centre, 3Faculty of Sport and Physical Education, 4Hospital for Cerebrovascular Diseases "Sveti Sava", Belgrade, Serbia)**

The ability of the perception of verticality can be tested by the Subjective Visual Vertical (SVV) test. We present the results of testing of 48 patients (age 45-73) immediately after acute ischemic brain attack. A control group of healthy subjects of the same age was tested as well. The neurological examination as well as the brain computerized tomography was performed in all patients. According to these examinations, three groups of patients were formatted: ischemic attack in the anterior cerebral fossa, ischemic attack in the posterior fossa and diffuse lacunar ischemic changes of the brain. The testing was performed by means of the modified Brandt and coworkers SVV test. Static and dynamic SVV test was applied. The statistical analysis by means of Student's test and Mann-Whitney test, showed much bigger inaccuracy in judging of verticality in the group of patients, compared to the group of healthy subjects. Greatest inaccuracy was in the group of patient with ischemic attack in the posterior cranial fossa. We are discussing the relationship between the results of the tests and lesion of vestibular pathways, as well as usefulness of such testing during the process of rehabilitation after acute ischemic attack.

**43. Interictal EEG in pharmaco-resistant and in well-controlled partial epilepsies - N. Buder, M. Jovanović, M. Milovanović, P. Simonović, R. Djokić, Ž. Martinović<sup>1,2</sup>**

**(<sup>1</sup>Belgrade University Medical School; <sup>2</sup>Institute of Mental Health, Department of Epilepsy and Clinical Neurophysiology, Belgrade, Serbia)**

**Purpose:** to determine the frequency, type and location of interictal EEG abnormalities in patients with pharmacoresistant epilepsy (PRE). **Method:** From 80 randomly chosen patients with partial epilepsy, age 18-60 years, follow-up period at least 4 years, we formed two groups of 40 patients, one with PRE and one with controlled seizures (CE). **Results:** The occurrence of abnormal records with either epileptiform activity or slow activity was not significantly different in two groups. Comparing the type of slow activity (theta vs delta) in two groups, a highly statistically difference emerged ( $\chi^2 = 25.5$ ,  $p < 0.001$ ). In PRE group, lateralization of focal activity was left-sided in 25, right-sided in 11, and generalized in 4 subjects. Neuroimaging of the brain was abnormal more often in PRE (n=23) than in CE group (n=16) but the difference was not statistically significant. **Conclusion:** Slow interictal activity in PRE group had significantly different characteristics in comparison with CE group.

**44. Acute confusional state in patients with non-convulsive status epilepticus - R. Sujic, S. Kostic, V. Dedic, V. Nikolic, V. Cvijanovic, D. Vranjes (CHC Zvezdara, Belgrade, Serbia)**

**Purpose:** to present non-convulsive status epilepticus in elderly patients who also manifested acute confusional state, which was properly diagnosed only after a few days of different diagnostic explorations. **Method:** this retrospective study included 4500 outpatients recorded in EEG laboratory of CHC Zvezdara from 2006-2008. **Results:** During three year-period, we have found eight cases of non-convulsive status epilepticus. Three patients had epilepsy, two of them were *de novo* cases (EEG recorded five days after referral to EEG laboratory), one patients with leukemia (EEG was performed three days after referral to EEG laboratory by neurologist), one patient each with stroke, alcoholism and Wernicke - Korsakoff syndrome (EEG performed 3 weeks after referral to EEG laboratory by neurologist), three patients with neuroinfections (EEG performed two days after referral to EEG laboratory by neurologist). **Conclusions:** Acute confused state in neurological patients is commonly caused by particular organic condition in brain which is often thought of more frequently than non-convulsive status epilepticus. Therefore, diagnostic difficulties are common and clinicians should consider the non-convulsive status epilepticus, because it is potentially reversible.

**44. Infantile masturbation- video EEG case study - M. Pavlović (Institute of Children and Adolescents Health Care of Vojvodina, Novi Sad, Serbia)**

**Purpose:** to present the clinical course and the crucial diagnostic video EEG record of a female infant subsequently diagnosed to have infantile masturbation. **Method:** Patient medical records and video-EEG analysis. **Case:** A female infant aged 8 months presented with recurrent episodes of serial stiff flexor movements in hips and legs, followed by grunting, lasted 1-15 min. Sometimes she looked like absent, with face flushing and sweating. After the episodes ended she seemed to be exhausted. Interictal EEG showed only slight irregularities of phasic sleep phenomena. Neurological, laboratory findings and brain CT: normal. Personal history: unremarkable. Her father suffered from epilepsy since childhood. Patient was started on valproate without success in the following 5 months. In the next hospitalization, video - EEG

record was managed to be done: stereotypical movements with no loss of consciousness and no specific EEG finding recorded. Diazepam application had no effect. All possible potential irritative causes of genito-anal region was ruled out. Clear precipitated factors for the episodes could not be found. The parents were surprised by diagnosis, valproate therapy was discontinued. **Conclusion:** Self stimulated behavior can mimic seizure disorder, especially without an ictal EEG or video recording. It could lead to unnecessary diagnostics and therapy.

#### **45. Efficacy and tolerability of topiramate as add-on therapy in patients with refractory epilepsy - A. Ilic (Health Center Studenica, Kraljevo, Serbia)**

**Purpose:** topiramate (TPM) is a new antiepileptic drug (AED) with proven efficacy and safety. We investigated long-term efficacy and tolerability of TPM as add-on therapy in patients with refractory epilepsy. **Method:** prospective study, which included 30 patients with refractory epilepsy, aged between 20-45 years. 12 patients had generalised epilepsy and 18 patients had foocal epilepsy. All patients had treatment resistant epilepsy and two or more failed AEDs. All patients had physical and neurological examinations, routine laboratory investigations, EEG, every 3 months during 3 years study period, between May 2006. and May 2009. We compared the mean seizure frequency for a 6-month period prior and 3 years after introduction of TPM. **Results:** Mean daily dosage of TPM was 250mg (range 100 mg-1000 mg). 4 patients (13.3%) became seizure free. 20 patients (66.6%) had seizure reduction by 50% or greater. 4 patients (13.3%) discontinued TPM treatment because of lack of efficacy. 2 patients (6.7%) had side effects. Adverse events (AE) occurred in 18% of patients during the follow up period, but significant AE developed in 2 patients (6.7%). Most common AEs were gastrointestinal symptoms, weight loss and cognitive dysfunction. **Conclusion:** TPM was effective and well-tolerated by the majority of our patients.

#### **46. Anxiety and epilepsy - Simonović P.<sup>1</sup>, Milovanović M.<sup>1</sup>, Buder N.<sup>1</sup>, Jovanović M.<sup>1</sup>, Đokić R.<sup>1</sup>, Martinović Ž.<sup>1,2</sup> (<sup>1</sup>Institute of Mental Health and <sup>2</sup>Belgrade University Medical School; Belgrade, Serbia)**

**Purpose:** Quantitative analysis of anxiety level in patient groups with generalized and focal, temporal or extratemporal epilepsy. **Material and method:** Ninety patients (30 with generalized epilepsy, 30 with temporal and 30 with extratemporal epilepsy), and age-matched healthy control subjects were investigated. Anxiety level in all subjects was assessed with Beck Anxiety Inventory. Sheehan Disability Scale was used to determine the functional disability level. Patients with comorbid major depression, schizophrenia or bipolar disorder, progressive neurological disease, alcoholism, and epilepsy associated with mental retardation were excluded. **Results:** The investigation demonstrated a significantly higher anxiety level and significantly more varied anxiety symptoms in epilepsy patients in relation to the anxiety level in control group. Anxiety level in the group of patients with focal epilepsy was higher than in the group of patients with generalized epilepsy. Also, anxiety level in temporal lobe epilepsy was higher than in epilepsy of extratemporal location. Patients with epilepsy associated with very high anxiety level also demonstrated a significantly higher functional disability level. **Conclusion:** Anxiety is an emotion significantly associated with epilepsy. Pronounced anxiety in epilepsy patients lead to a worse quality of life in professional, social and family milieu.

**47. Freezing of gait (FOG) in Parkinson's disease patients: time analysis - Mirjana B. Popovic<sup>1,2</sup>, Milica Djuric<sup>1</sup>, Igor Petrovic<sup>3</sup>, Saša Radovanovic<sup>4</sup>, Vladimir Kostic<sup>3</sup> (<sup>1</sup>Belgrade University; <sup>2</sup>Department of Health Science and Technology, Aalborg University, Denmark; <sup>3</sup>Clinical Center of Serbia; <sup>4</sup>Institute for Medical Research, Belgrade)**

**Purpose:** We present a simple method in the time domain for evaluating episodes of freezing of gait (FOG) in Parkinson's disease (PD) patients by using ground reaction forces. **Methods:** Three sources were applied to study gait: video, force sensitive resistors (FSR) attached to one foot, and accelerometers in pairs attached to the foot, shank and thigh. Task included walking through the corridor, doorway pass, U-turn and approaching the destination. We analyzed 24 FOG episodes from 9 PD patients in "on" state. In addition to common methods for time analysis based on video, ground reaction forces and accelerations, we computed Pearson's correlation coefficient (Pcc) between a "regular/normal" step and the complete record from FSR. **Results** show that Pcc oscillates between  $\pm 1$  for "normal" locomotion, while during freezing episodes Pcc peaks are reduced to narrower range. Timing of FOG episodes from Pcc analysis is in agreement with times estimated from video and accelerations. Here we propose that Pcc may be used alone for the detection of FOG. Further, we suggest graphical presentation of FOG episodes as the area between Pcc peaks and  $\pm 1$ . **Conclusion:** This simple instrument, if added to other ambulatory methods, may provide a tool for better understanding of freezing.

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**48. Paroxysmal dystonia and epilepsy- one differential diagnostic aspect - D.Momčilović-Kostadinović, Clinic for child neurology and psychiatry, Belgrade, Serbia**

Paroxysmal nocturnal dystonia (PND) and autosomal - dominant nocturnal frontal lobe epilepsy (ADNFLE) are rare and similar childhood - onset diseases, characterized by brief nocturnal attacks that arise abruptly, several times per night in NREM stage of sleep. Clinical characteristics of PND closely resemble partial seizures, with dystonic postures and actions, but without loss of consciousness and with normal EEG, even during an attack. There are opposite opinions in the literature from the attitude that these are the same diseases to the opinion that PND is an entity „per se“. In spite of similarities, special electrophysiological characteristics and different gene loci suggest separate disease entities. We present 19 year-old boy who has been suffering from paroxysmal nocturnal attacks of painful dystonic postures involving one hand, neck and eyes, for several years. The consciousness is always preserved, standard day-time EEG examinations are normal. Initial therapeutic response to carbamazepine was effective. During the clinical course, and disease aggravation, ictal sleep EEG suggested epileptic frontal lobe discharges. Although PND and ADNFLE are very similar diseases, their electrophysiological differences suggest the most important role of EEG in establishing the final, correct diagnosis of some neurological diseases.

**49. Detection of the “will to move” for an ambulatory system for tremor suppression based on functional electrical stimulation - A. Savic<sup>1</sup>, M. B. Popovic<sup>1,2,3</sup>, D. B. Popovic<sup>1,3</sup> (<sup>1</sup>School of Electrical Engineering, Belgrade University; <sup>2</sup>Institut for Multidisciplinary Research, Belgrade, Serbia; <sup>3</sup>Center for Sensory Motor Interaction (SMI), Department of Health Science and Technology, Aalborg University, Denmark**

**Purpose:** An ambulatory system that applies functional electrical stimulation (FES) for tremor attenuation relies on the information when the movement will start. Brain computer interface (BCI) is at disposal to drive the system. We propose the computing method for the evaluation of various arm movements in order to detect intention to move prior to the movement. Method relies on the fact that Bereitschaftspotential (BP) is a measure of activity in the brain that is related to the planning of movement. The database was created for the Tremor project (FP7) and contains signals from standard EEG recordings. **Method:** We developed the method for tracking changes of power spectral densities in various frequency bands that correspond to different EEG rhythms. Algorithm uses fast Fourier transform (FFT) and autoregressive (AR) model based spectral estimation methods. **Results:** Signals from 5 patients with tremor (PD-Parkinson disease and ET-essential tremor) were analyzed. We successfully detected the changes in frequency content of the data prior to the movement. Algorithm is sensitive to all movements tested. **Conclusion:** Proposed method is suitable for the detection of movement initiation. If applied on-line, this algorithm may be used to drive an ambulatory system for the suppression of tremor by FES.

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**50. Presentation of multiple rhythmic movement disorders in a single patient - S. Janković, D. Sokić, N. Vojvodić, A. Ristić, Lj. Zović (Institute of Neurology, Clinical Center of Serbia, Belgrade, Serbia)**

Rhythmic movement disorders (RMDs) refer to a group of behaviors characterized by stereotypic rhythmic movements of the body (body rocking), head (head banging), or limbs (leg rolling) appearing in relation to sleep. We present a 16-year-old young man with four different types of RMDs. At the age of 2.5 years symptoms spontaneously appeared as repetitive, rhythmic, stereotypic, sleep-related rhythmic movements of forward and backward swaying of the trunk (body rocking). After four years of age the movements transformed to head banging against a pillow appearing in quiet wakefulness or superficial sleep. From the age of 7 years he had body rolling and head rolling as pre-sleep behavior. Head banging, body or leg rolling appeared in random succession, in different combinations or independently as isolated symptom on a particular night. Patient never hurt himself, claimed to be amnesic for the events with daily activities unaffected. PSG with sleep architecture, neurologic, psychiatric, cardiologic, ophthalmologic, and hematologic examinations, with laboratory and brain MRI were normal. We observed head banging virtually every night mainly during quiet wakefulness or non-REM-stage 1 sleep. Low dose of clonazepam induced complete disappearance of all RMDs during the 5-month of follow-up.

**51. Quality of sleeping evaluation in patients with Thoracic Outlet Syndrome - D. Filipović<sup>1</sup>, N. Milenović<sup>2</sup>, B. Popović<sup>1</sup> (Faculty of Medicine, University of Novi Sad, Serbia<sup>1</sup>; Special Hospital for Rheumatic Diseases “Jodna Banja”, Novi Sad, Serbia<sup>2</sup>)**

**Introduction:** Thoracic Outlet Syndrome (TOS) compromised circulation in the cervical region. The **aim** of the study was to evaluate the quality of sleeping in these patients. **Methods:** 90 patients (20 males and 70 females) aged 52.4 (28-76) filled a sleep questionnaire. **Results:** 57.78% of patients evaluated their state of health as mediocre, 82.22% evaluated their pain as moderate, 68.89% described their life as dynamic and 55.56% as caused by stress. The average duration of sleep was 6.42 hours. 85.44% had some problems with sleeping. 51.11% evaluated their sleep as good, 73.3% had some problems while waking up, 80% had an urge to sleep in the afternoon. 37.78% had hot flushes in arms, which interrupted their sleep during the night. Correlation between the evaluation of sleep and the length of sleep was statistically significant ( $r = -0.4455$ ;  $p = 0.002$ ). Waking up during the night caused by hot flushes statistically significantly correlates ( $r = 0.6145$ ;  $p = 0.003$ ) with problems while waking up in the morning. **Conclusion:** Clinical manifestations of TOS affected more the quality and duration of sleep than the way of living.

**52. Somatosensory evoked potentials in patients with cervical disc herniation - M Lazarević<sup>1</sup>, M. Jolić<sup>1</sup>, S. Djurić<sup>1</sup>, D. Lukić<sup>1</sup>, B. Cvetko<sup>2</sup> (<sup>1</sup>Clinic of Neurology Clinical Centre Niš, Serbia; <sup>2</sup>Department of neurology, Military Hospital Niš, Serbia)**

**Purpose:** Estimation of changes and value of somatosensory evoked potentials (SEPs) in patients with cervical disc herniation. **Methods:** We included 48 patients with NMR confirmed cervical disc herniation. Cervical spine cord compression was found in 21 pat., and a narrowing of spinal channel in the rest. SEPs were elicited by stimulation of tibial nerves and wave P40 parameters and central conduction time were analyzed. **Results:** Abnormal SEPs were registered in 6 of 21 pat. (28.57%) with spinal cord compression, and in 6 of 27 pat. (22.22%) with spinal channel narrowing. Low amplitude and shape changes were present in 11 patients, while P40 latency and central conduction time lengthening were found in only one patient. Six patients with abnormal SEPs (three with spinal cord compression) had some non-radicular neurological signs. Three patients (25%) with abnormal SEPs were without any clinical or radiological signs of spinal cord compression. **Conclusion:** Tibial SEPs changes, predominantly low amplitude and P40 wave morphology abnormalities, found in patients with cervical disc herniation, were not in clear association with radiological and clinical status. Our results suggest a possible usefulness of tibial SEPs in estimation of long sensitive pathways function in some asymptomatic and patients with spinal channel narrowing.

**53. Unusual course of Miller-Fisher syndrome (S. Kostić<sup>1</sup>, Z. Stević<sup>2</sup>, R. Sujic<sup>1</sup>, V. Cvijanović<sup>1</sup>, J. Malović<sup>1</sup>, T. Smiljković<sup>1</sup>, V. Nikolić<sup>1</sup>, A. Stanić<sup>1</sup>, J. Potić<sup>1</sup>, D. Vranjes<sup>1</sup> (<sup>1</sup>Clinical Hospital Centre Zvezdara; <sup>2</sup>Clinical Centre of Serbia, Belgrade, Serbia)**



**Background:** Guillain-Barre` syndrome (GBS ) and Miller-Fisher syndrome are variant forms of acute demyelinating polyradiculoneuropathy. Lack of multiple relapses have differentiated it from the chronic form. **Case report:** We present a case of 61 year old man with painless diplopia and dizziness started two weeks after an upper respiratory infection. Neurological examination revealed mild bilateral ptosis, limitation of right eye adduction, dysarthria, areflexia in all four limbs and a broad-based gait without muscle weakness. Plantar responses were flexor. CSF analysis and EMNG findings supported the clinical diagnosis of GBS. Other investigations (ESR, blood sugar, CPK, renal, liver and thyroid function tests, serological tests, tumor`s markers, brain MRI and MR angiography, chest X-ray, ultrasound imaging of abdomen) were normal. He was treated with a 5 day course of IVIG with rapid but transient improvement over the following ten days so he was started then a 5 day course corticosteroids with rapid but incomplete recovery. Two weeks later, his symptoms recurred. Over the following three months his clinical course was characterized by three increasingly severe deteriorations, the last one to quadriplegia, ophthalmoplegia, and severe bulbar dysfunction requiring PEG placement. **Conclusion:** we discuss about unusual course of our case which manifests overlaps both disorders.

#### **54. General electroexpectogram parameters in recreational and sedentary subjects - J. Pluncevic Gligoroska, S. Mancevska, E. Sivevska, L. Bozinovska (Institute of Physiology, Medical Faculty, UKIM, Skopje, R Macedonia)**

The object of this investigation are mental processes of expectation, attention, and learning, related to the level of physical activity. The experimental part of this work is carried out on 50 subjects, divided by amount of physical activity into 2 groups: sedentary and recreational. All subjects were included in electrophysiological testing with electroexpectogram (EXG) paradigm. EXG paradigm is dynamic extension of classical contingent negative variation (CNV) paradigm. The S1-S2 pair is applied until the CNV rises up to a certain threshold. After that, S2 is turned off, until the CNV falls below the threshold level. Sedentary group, consists of 25 subjects, mean age 20.57 years, mean duration of education  $12.32 \pm 1.21$  shows next EXG parameters: number of formed EXG cycles  $2.27 \pm 1.42$ ; maximal CNV =  $9.61\mu\text{V} \pm 3.23$ ; minimal CNV =  $-0.77\mu\text{V} \pm 3.01$ ; RT= $168.18 \pm 36.86$  msec. Recreational group, consists of 25 subjects, mean age 20.39 years, mean duration of education  $13.0 \pm 1.48$  shows next EXG parameters: number of formed EXG cycles  $2.83 \pm 1.53$ ; maximal CNV =  $9.71\mu\text{V} \pm 3.23$ ; minimal CNV =  $0.07\mu\text{V} \pm 2.03$ ; RT= $171.74 \pm 31.72$  msec. Electrophysiological parameters generated during EXG paradigm showed higher values in subjects with mild level of physical activity comparing with sedentary subjects.

#### **55. The effect of pain on cognitive abilities of patients with rheumatoid arthritis - Tomasevic-Todorović S. <sup>1</sup>, Filipovic D. <sup>2</sup>, Boskovic K. <sup>1</sup> (<sup>1</sup>Clinic for medical rehabilitation, KCV, Novi Sad; <sup>2</sup>Department of Physiology, Faculty of Medicine, Novi Sad)**

The aim was to examine the impact of the pain on the cognitive abilities in the patients with rheumatoid arthritis (RA). Material and methods: we investigated 60 patients with RA and 30 healthy subjects. The intensity of pain was determined by VAS, cognitive abilities by the Wechsler memory scale, functional ability by HAQ questionnaire, and disease activity by

DAS28 score. Results: In the patients with RA the memory coefficients were significantly worse than in the healthy subjects, showing positive relationship with the pain intensity, but gender differences were not found. Conclusion: The pain may affect the cognitive abilities of the patients with RA.

**56. Anxiety in the patients with rheumatoid arthritis - Tomasevic-Todorović S. <sup>1</sup>, Boskovic K. <sup>1</sup>, Filipovic D. <sup>2</sup>, Naumović N.<sup>2</sup>, Pantelinac S. <sup>1</sup> (<sup>1</sup>Clinic for medical rehabilitation, KCV, Novi Sad; <sup>2</sup>Department of Physiology, Faculty of Medicine, Novi Sad, Serbia)**

The aim was to identify the frequency and level of anxiety in the patients with rheumatoid arthritis (RA). In 60 patients with RA, aged  $49.87 \pm 7.56$  yrs., we evaluated: disease activity by DAS28 score, functional ability by the HAQ, and anxiety by Spielberger test (state and trait anxiety). Results: The duration of RA was  $9.28 \pm 7.96$  yrs., DAS28 score was  $4.93 \pm 0.85$ , and HAQ value  $0.88 \pm 0.67$ . Scores of anxiety were: state  $49.45 \pm 6.81$ , and trait  $53.42 \pm 5.55$ . Forty eight (80.00%) patients showed high state anxiety, and 58 (96.67%) high trait anxiety. Conclusion: The anxiety is often present, particularly in the patients with the active form and longer duration of RA.

**57. Possible prenatal causes for clinical expression of autism - B. Popovic<sup>1</sup>, M. Sekularac<sup>2</sup>, L. Marjanovic<sup>2</sup> (Faculty of Medicine, University of Novi Sad; SPSE "Milan Petrović", Novi Sad, Serbia<sup>2</sup>)**

Autism is severe developmental disorder with onset around age of three years. Main characteristics of autistic children are problems with social interaction, emotional correspondence and difficulty with verbal and nonverbal communication. One of the most intriguing questions is the possible reasons causing the expression of autism. **Aim** of this study was to evaluate the possible prenatal causes for clinical expression of autism. **Methods:** Data from medical histories of 30 patients with autism were used. No significant genetic component was found in their history data. **Results:** we have found stress situation during period from 18<sup>th</sup> to 28<sup>th</sup> weeks of gestation, a period important for the development of cerebellum. During this period, 23 mothers of autistic patients reported the existence of big stress situation. They specially emphasized on situations like loss of close person, loss of job or changing place of living. Thirty mothers of children without any developmental problems were also included in the study. They were unable to identify bug stressors, which was contrary to the experiences of mother children with autism. **Conclusion:** Existence of the big stress situations in period from 18 till 28 week of gestation can be one of significant prenatal causes for expression of autism.

**58. Development of cognitive ability of children aged 2-3 years applying the "doll mother" model - B. Popovic<sup>1</sup>, J. Milenovic<sup>2</sup>, S. Ciprovac<sup>2</sup>, S. Golubovic<sup>3</sup> (Faculty of Medicine, University of Novi Sad, Serbia (<sup>1</sup>Kindergarden "Happy childhood",**

Novi Sad, Serbia; <sup>2</sup>Faculty of Special Education and Rehabilitation, University of Belgrade, Serbia<sup>3</sup>

**Introduction:** In the development of children's cognitive abilities making doll models plays an important role. **Aim:** Aim of this work was to develop children's cognitive ability through visual art. **Material and methods:** In making a "doll mother" 35 children between the age of 2-3 years have been involved. We have used different packaging materials and pieces of cloth, yarn and buttons. **Results:** The children made the "doll mother" in a collage technique. A special aspect of making a "doll mother" model was to develop a body scheme - differentiation between head and body achieved using different colors and type of materials. We insisted in developing a facial scheme. In the first step (two dimensional work) children drew on a piece of paper a circle as a face and identified the proper places for the eyes, nose and mouth. In the second step (three dimensional work) they covered a cardboard cylinder with a piece of cloth with a skin color and glued on them two buttons as eyes and one different button as a mouth and yarns as hair. **Conclusion:** The activities were very pleasing and entertaining for children, stimulated their natural curiosity, which brought them new perception and experiences.