

Autonomic nervous system  
Clinical neurophysiology  
Critical care

P 2121

**Myocardial 123I-metaiodobenzylguanidine (MIBG) Scintigraphy for the assessment of cardiac sympathetic nervous dysfunction in diabetic patients**

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**Purpose** Although diabetic autonomic neuropathy constitutes serious complications, there are few methods for early detection of abnormalities. In this study, we conducted 123I-MIBG myocardial scintigraphy, which is currently applied as a test of cardiac sympathetic nerve function, on diabetic patients, and assessed its usefulness by comparing with the results of sympathetic skin response (SSR), which is a method for evaluating peripheral sympathetic nerve activity.

**Subjects** We examined 29 cases of type 2 diabetes that did not present autonomic dysfunctions (11 males and 8 females). The average age of the subjects was 64.9 years and the mean duration of diabetes was 13 years.

**Methods** MIBG uptake was quantified by calculation of the heart - mediastinum ratio (H/M ratio) that was calculated by average count per pixel in the regions of interest over heart and mediastinum on the planar anterior image of the chest. In addition, the washout rate (WR) was also calculated. SSR was performed followed by determination of amplitude and latency.

**Results** According to the results of 123I-MIBG myocardial scintigraphy, abnormalities in H/M ratio and WR were observed in 10 cases. Decreased amplitude was observed in 9 cases in SSR. H/M ratio and WR did not correlate with symptoms of diabetic peripheral neuropathy, and there was no correlation observed with the results of SSR as well.

**Discussion** 123I-MIBG myocardial scintigraphy, along with SSR, is a simple and objective evaluation method, and is considered to be a useful method for assessing early diabetic autonomic neuropathy.

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**Sympathetic skin response and foot ulceration in diabetes**

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**Background-Aims** This study examined the relationship between sympathetic skin response (SSR) as a reliable test of autonomic nervous system function and foot ulceration (FU) in diabetes.

**Materials and Methods** 64 patients with either type 1 or type 2 diabetes were studied. Diagnosis of peripheral sensory neuropathy (PN) was based on clinical symptoms, signs and vibration perception threshold. DS were divided in 3 groups: without

PN (DN- n=31), with PN (DN+ n=15), with neuropathic FU (DFU, n=18). SSR was performed at the dorsal aspect of the right foot after a surpamaximal electrical stimulation of the median nerve over the wrist of the right arm.

**Results** SSR was absent in all but 2 DS with DFU, in 6 out of 15 DS in the DN+ group and in 10 out of 31 DS in the DN-group. Statistical analysis using Fisher's exact test revealed a strong difference among the DS patients with or without FU ( $p < 0.0002$ ) while less strong but still significant among them with or without PN ( $p < 0.0118$ ), concerning the presence of the SSR response.

**Conclusions** There is an "all or none" correlation of SSR and FU and PN signs, as well, stronger for the first of them.

## P 2123

### Nerve conduction study in patients with diabetic neuropathy treated with alfa-lipoic acid

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It has been reported that diabetic polyneuropathy treatment with alfa-lipoic acid may improve the subjective complains of limbs pain and paresthesias. However, it is controversial if the objective neurological symptoms of the polyneuropathy are improved. Although the electroneurography is a more precise method for diagnosis and follow up of the polyneuropathies, the published results regarding alfa-lipoic acid are also controversial.

The aim of this examination was to evaluate the efficiency of alfa-lipoic acid treatment of diabetic polyneuropathies using electroneurographic examination.

Thirty patients with clinical data for symmetric distal diabetic neuropathy were examined. The motor conduction velocities and M-wave amplitudes after fibular and tibial nerve electro stimulations were examined. The sensory nerve action potentials after sural and median nerve stimulations were also examined. The electroneurographic examination was performed before and after treatment. The alfa-lipoic acid was applied as a 600 mg daily intravenous infusion for 15 days, followed by 90 days oral intake of 600 mg daily.

The distal motor latencies of the tibial and fibular nerves were shortened significantly after the treatment, while no changes in M-wave amplitudes or motor conduction velocities were found. The distal latencies and the amplitudes of the sensory nerve action potentials were not significantly different after treatment.

In conclusion, our results revealed that high doses alfa-lipoic acid might improve the peripheral nerves function in patients with diabetic neuropathy. The small number of patients and the short treatment duration probably caused the controversial results.

## P 2124

### Screening dysarthria test for detection of dysarthria types in different neurological diseases.

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**Background** The assessment of dysarthria types in the neurological clinical population is difficult. The current study proposes the simple screening test for detection and characterisation of dysarthria features in different neurological diseases.

**Material and methods** The study was performed in 78 dysarthric patients diagnosed with various neurological diseases in the Department of Neurology in Cracow during the year 2000–2001. The presence of dysarthria and its characteristic were assessed by means of a semi quantitative method, as is the "screening dysarthria test" (SDT) which is based on short-time assessment of dysarthria features as: respiratory control, articulation, phonation and prosody. The results were scored in a 4-points scale and compared with the results of Robertson's Dysarthria Profile Test (DPT) and clinical sings.

**Results** Mild shortening of respiratory cycle (92.9%), disturbances of phonation (92.9%), and well preserved prosody occurred in patients with spastic dysarthria (14 out of 78 patients). Pronounced shortening of respiratory cycle (70.6%), abnormalities of phonation (58.8%) were typical for patients with flaccid dysarthria (17/78). Dysprosody (86.7%) occurred predominantly in patients with ataxic dysarthria (15/78). The abnormalities of phonation (86.7%) and dysprosody (80%) were dominant in patients with hypokinetic dysarthria (15/78). The significant loss of respiratory control (100%) and dysprosody (75%) occurred in patients with hyperkinetic dysarthria (4/78) while phonation was merely preserved. All of dysarthria features measured were abnormal in patients with mixed dysarthria (13/78).

**Conclusion** Our results demonstrate the practical usefulness of SDT in detection and classification of dysarthria types that occur in different neurological diseases.

## P 2125

### Intramuscular olanzapine: efficacy and safety in acutely agitated patients with dementia

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**Objective** To investigate the efficacy and safety of rapid-acting intramuscular olanzapine in treatment of agitation in patients with dementia.

**Methods** Patients were randomised to receive up to 3 intramuscular injections within 24 hours: 2.5-mg olanzapine (Olz2.5, n=71), 5.0-mg olanzapine (Olz5.0, n=66), 1.0-mg lorazepam (Lzp, n=68), or placebo (n=67).

**Results** Two hours after injection, olanzapine and lorazepam improved scores significantly more than placebo on the PANSS Excited Component subscale (PANSS-EC) and Agitation-Calmness Evaluation Scale (ACES). Olz5.0 and Lzp also improved scores more on the Cohen-Mansfield Agitation Inventory. At 24 hours, both Olz groups continued to show statistical superiority over placebo on the PANSS-EC, but Lzp did not. Simpson-Angus and MMSE scores did not change significantly from baseline. Sedation (ACES  $\geq 8$ ), adverse events, and laboratory analytes were not different from placebo for any treatment. QTc interval changes were not significantly different from placebo for any of the active treatments. No clinically and statistically significant changes were seen in any other vital signs, including orthostasis.

**Conclusion** These results suggest that rapid-acting intramuscular injection of olanzapine may provide substantial benefit in treating dementia-related agitation.

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## P 2126

### Combined event-related fMRI and intracerebral ERP study of auditory oddball task

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**Introduction** Event-related fMRI (efMRI) was repeatedly used to seek the neural sources of endogenous event-related potentials (ERP). Significant discrepancies between the efMRI data and the results of previously published intracranial ERP studies of oddball task were revealed.

**Methods** To evaluate the capacity of efMRI to define the sources of the P3 component of ERP within the human brain, both efMRI and intracerebral ERP recordings were performed in three patients with intractable epilepsy (two males and one female) during their preoperative invasive video-EEG monitoring. An identical auditory oddball task with frequent and target stimuli was completed in two sessions. A total of 237 intracerebral sites were electrophysiologically investigated by means of depth electrodes.

**Results** In accordance with the finding of multiple intracerebral generators of P3 potential, the target stimuli evoked MRI signal increase in multiple brain regions. However, regions with evident hemodynamic and electrophysiological responses overlapped only partially. A P3 generator was always found within a hemodynamic-active site, if this site was investigated by means of depth electrodes. On the other hand, unequivocal local sources of P3 potential were apparently also located outside the regions with a significant hemodynamic response (typically in mesiotemporal regions).

**Conclusion** Both methods should be viewed as mutually complementary in investigations of the spatial distribution of cortical and subcortical activation during oddball task.

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## P 2127

### Effects of ecstasy in human EEG

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**Aim** of the study was the detection of special EEG features in Ecstasy users, which might reflect the often-reported cognitive disturbances, essentially in mnemonic and attentional performance.

**Methods** 105 female and male polyvalent users with Ecstasy in former times as well as 41 matched persons with a comparable drug history and 11 drug abstinentes were included. Besides qualitative EEG measurements, power spectra had been formed and evaluated by SPSS package.

**Results** Ecstasy users with medium and high cumulated doses of Ecstasy revealed more often an increasing in Theta- (3.5–5.0; 5.0–7.5 Hz), lower Alpha- (7.5–9.0 Hz) and Beta-sub bands

(13.5–20.0–22.0 Hz), an slowing of dominant frequency, finally an increased power of slow frequencies in the early situation (first 2 minutes) of EEG-derivation. However, female Ecstasy users showed more pronounced dose-depending effects. For covariate calculations, the relationship remained significant after controlling for covariant medication.

**Conclusion** Because of the neurotoxic effects of Ecstasy and its substantial compounds like MDMA or MDE predominantly for 5-HT-specific neurons the results with significant increases even in the 5- and 20-Hz-frequencies reflect dysbalances of serotonergic projections within the subcortical vigilance-regulating systems of the human CNS, indicating neuropathophysiological basic mechanisms of the frequently observed mnemonic and attentional deficiencies in Ecstasy users.

## P 2128

### Impact on cortical excitability during unilateral electroconvulsive therapy: a pilot study

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**Introduction** Paired pulse transcranial magnetic stimulation (ppTMS) is a non-invasive, painless and safe diagnostic method to analyse the phenomena of intracortical, transsynaptic inhibition and facilitation. The aim of this pilot study was to investigate the effects of the electroconvulsive therapy (ECT) on motor excitability as measured by ppTMS.

**Methods** In three, drug-free, right-handed remitted depressive patients undergoing maintenance unilateral ECT (over the right hemisphere) ppTMS was performed before and after the stimulation session.

**Results and conclusion** The results revealed predominantly left-sided marked changes of the inhibition and facilitation intracortical activities in two patients after the ECT; thereby a significant increased excitability and important decreased intracortical inhibition could be observed indicating a contra lateral disinhibition effect of ECT. This mechanism of action could be analysed only in the two patients revealing a good clinical outcome; thus, marked changes of cortical excitability may be correlate to the efficacy of ECT.

## P 2129

### Treatment for dystonia of the autonomic nervous system

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The InfraR method has been used to treat dystonia of the autonomic nervous system (DANS). All the subjects were divided into 3 groups: 1) healthy volunteers, 2) people suffering from DANS (caused by neuroses and acute and chronic stress), and 3) people with DANS who were not to be given treatment by the InfraR method. The DANS patients had both permanent and paroxysmal manifestations as panic attacks. To assess the effectiveness of the therapy we monitored: the functional status of the ANS using the Guillaume–Wein table and the Aschner-Dagnini and postural tests, and the psychoemotional state of the subjects using the Spielberger anxiety inventory.

Analysis of the data for the group 2 patients revealed that the use of the InfraR method normalizes the functional status of the ANS. An investigation into the autonomic support of activity prior to treatment detected a rise in heart rate; a postural test did

not bring about a significant decrease in heart rate and the heart rate did not return to the initial values. On day 10 of treatment an examination of heart rate and blood pressure in this group revealed normal responses. The Spielberger anxiety inventory showed a perceptible diminution in the anxiety levels.

In-group 3 the treatment gave rise to little change in the functional status of the ANS. Thus, the treatment by the InfraR method has a relaxing effect on the psycho autonomic system and can be used as an adequate nonpharmaceutical treatment for DANS.

P 2130

**Supine-standing-supine test in diabetic autonomic neuropathy diagnostics: a contribution to the assessment of vagal activity with the use of short-term spectral analysis of heart rate variability**

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**Introduction** The purpose of this study was to prepare a simple procedure for diagnosing autonomic neuropathy (AN) in routine clinical practice. It was based on shifts in sympatho-vagal balance induced by body position changes during the carrying out of the supine1-standing-supine2 test.

**Methods** The study was conducted on 39 Type 1 and 13 Type 2 diabetic patients (DP) (mean age of 37.8 and 55.0 years, respectively). The autonomic activity was assessed using spectral analysis of heart rate variability. In short-term recordings, the values of the spectral power (SP) of the low-frequency component (LF, 0.05–0.15 Hz), high-frequency component (HF, 0.15–0.50 Hz) and total spectral power (LF+HF) in all body positions – i.e. in supine1-standing-supine2 test – were registered. The vagal activity (SP of HF component) was compared in supine1 and supine2 positions.

**Results** The mean values of SP of HF component were found in subjects without peripheral and AN (n=6) in supine1 and supine2 positions 1426.4 and 2164.9 ms<sup>2</sup>, respectively. The mean values of SP of HF component in DP with early AN (n=10) were in the same positions 91.4 and 292.8 ms<sup>2</sup>. The DP with definite parasympathetic AN (n=10) expressed the corresponding values of 80.2 and 146.9 ms<sup>2</sup>.

**Conclusion** In all three subgroups of DP in the repeated supine position (supine2), the higher values of SP of HF component were registered, reflecting the overshoot of vagal activity after orthostatic load in the preceding standing position. Thus, in the supine2 position, a reserve of full vagal activity could be revealed.

P 2131

**Assessment of dysautonomia in various myopathies**

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Dysautonomia is rarely of clinical significance in myopathies excepting the Emery-Dreyfuss progressive muscular dystrophy. We used two non-invasive electrophysiological tests: the R-R interval variation (RRIV) and sympathetic skin response (SSR) to verify their usefulness in the assessment of dysautonomia in myopathies of different aetiology. RRIV and SSR were studied in a group of 25 myopathic patients (13 children and 12 adults) with Duchenne, Becker and Emery-Dreyfuss progressive muscular dystrophies, myotonia congenita, paramyotonia congenita, myotonic dystrophy, mitochondrial myopathy and polymyositis.

Clinical symptoms of dysautonomia were evaluated using Autonomic Symptoms Questionnaire (Low). Such symptoms were found in 13 patients whereas the RRIV and/or SSR were abnormal in 6. The RRIV abnormalities (decreased R-R variability) were observed in 3 adult patients; the SSR abnormalities (delay in latency) in 1 child and 5 adults. The clinical symptoms of dysautonomia as well as the RRIV and SSR abnormalities were less frequent and less severe in children with myopathies if compared with adult patients. Our study has revealed that RRIV and SSR were rarely abnormal in myopathies, especially in children and that those methods although non-invasive are not very sensitive and useful for the detection of discrete autonomic imbalance in patients with myopathies.

P 2132

**Autonomic disorders are associated more often with an akinetic-rigid component in Parkinson's disease**

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**Introduction** Autonomic disorders are common complications in Parkinson's disease (PD). For most patients dysautonomias are overshadowed by the more prominent motor dysfunction. However, a significant minority of PD patients experiences severe and disabling autonomic impairment. The pattern of autonomic disorders was studied depending on the PD form.

**Methods** 32 patients were subjected to this study, with mean age 56 (ranging 36–75), split into three groups depending on the PD form, and 14 healthy people (control group). The motility was tested by UPDRS. Cardiovascular tests were used as autonomic tests (deep slow breathing test, 30/15 test, Valsava test, orthostatic test, isometric test).

**Results** 8 patients with akinetic-rigid form were included into the first group, 11 with tremor into the second group, and 13 with a mixed form - into the third group. Mean age by group – 52.3, 61.4 and 54.3 years respectively. In the three groups, total UPDRS score was 62, 48 and 89 points respectively. Duration of PD course in three groups was 4.1, 6.3 and 6.1 years. Clinical autonomic disorders (constipation, sexual problems) – 6 (75%), 2 (18.1%), and 8 (61.5%) respectively. Abnormal autonomic values were registered in 6 patients (75%), 3 (27.2%), and 9 (69.2%) in the three groups respectively.

**Conclusion** Autonomic disorders are more often associated with akinetic-rigid PD form and are not related to the patient's age, length of disease or use of dopaminergic drugs. The cause is abstruse and possibly depends on the selectively impaired structures in one or another form of the disease.

P 2133

**Physiological asymmetry of peripheral vasomotor reaction: telethermographic study with fist cricoactivation**

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The **aim** of the study is to find out if the asymmetry of vasomotor reaction, following fist cricoactivation, was related to the hand preference of the examinee.

**Methods** 90 healthy examinees 20–50 years old, 47 females, 43 males with right hand preference, according to The Annet Handedness Questionnaire, have been screened. Telethermographic pictures of hand dorsum were taken with computerized AGA Thermovision 782 infrared camera, prior and upon cricoactivation /12 times – sampling 1 minute/. Cricactivation was

obtained by 1 minute emerging randomly selected hand in 5 litre of cooled water  $\pm 4$  C°. The same procedure was repeated 4 hours later with another hand under equal exterior conditions. Hand dorsum temperature taken 1 minute upon reactivation and time required for restitution back to the pre-activation temperature, were statistically analysed by Wilcoxon signed ranks test.

**Results** There was stronger vasoconstriction on dominant right fist /median 23.8 C° min. 13.3, max. 33.1 vs. median 24.9 C°, min. 15.3, max. 30.1;  $p < 0.01$ / 60 examinees have reached hand dorsum temperature restitution in 12 minutes. There was faster restitution of dominant right fist /median 8 minutes, min. 5, max. 12 vs. median 9.5 minutes, min. 8, max. 11;  $p < 0.001$ .

**Conclusion** Presented results show that the reaction of autonomic nervous system, as main vasomotor reaction control system, is more efficient on the side of the dominant hand. Further investigation is needed for confirmation of this physiological method as possible hand preference screening procedure.

#### P 2134

##### Evaluation of the cardiovascular autonomic functions in diabetic patients

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Diabetes mellitus is known to be associated with peripheral nerve lesions where sensory and motor disturbances are the most frequent and the autonomic disturbances are more rare.

The aim of our study was to evaluate the changes in some cardiovascular autonomic tests in 40 diabetic patients aged 32 to 57 years. Twenty of the patients had non-insulin dependent diabetes mellitus (NIDDM) and another 20-insulin dependent diabetes mellitus (IDDM); all of them had diabetic polyneuropathy with sensory or motor signs and conduction disturbances.

The RR variations during deep breathing, the Valsalva manoeuvre, tilt and active standing were recorded and the heart rate response to deep breathing (HRdb), the Valsalva ratio (VR) and the 30:15 ratio were calculated. Also, the beat-to-beat blood pressure response to standing was measured with a non-invasive instrument (Colin 7000, Medical Instruments Group, USA). The data obtained were compared with a control group of 40 healthy subjects in the same age group.

Our results reveal abnormal cardiovascular responses with significant decrease of the HRdb response, the VR and of the 30:15 ratio in the patients in comparison to the controls. Orthostatic hypotension was found in 25%. The abnormalities were asymptomatic in 15% of the patients. They were more pronounced in the subgroup with NIDDM. Their frequency correlated with longer duration of the diabetic disease.

Conclusion is drawn for the clinical significance of the autonomic testing of the diabetic patients.

#### P 2135

##### Effect of hyperventilation on visual evoked potential

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We compared the effect of hyperventilation on pattern-shift visual evoked potential in 32 patients with definite multiple sclerosis and 30 normal subjects. There was a significant reduc-

tion in p100 latency in patients with multiple sclerosis and optic neuritis compared with normal subjects. It seems that there is an improved impulse transmission in demyelinated fibers that may be due to alkalosis and changes in ionised calcium level due to hyperventilation.

#### P 2136

##### Changes in motor and sensory nerve conduction parameters with temperature in normal subjects and patients with multiple sclerosis

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The effects of temperature on motor and sensory nerve conduction parameters were studied in 13 patients with multiple sclerosis and in 13 age- and gender-matched controls.

The motor and sensory conduction velocities, the distal and proximal latencies, the amplitude, duration and area of the compound muscle action and sensory nerve potentials of the median nerve were correlated with skin temperature gradually changed from 20 to 40°C. The differences in these parameters between the control and MS groups were also evaluated. Multiple regression statistical analysis was performed.

The latency, amplitude, duration and area of the motor and sensory potentials were increased, the conduction velocity decreased in lower temperatures. We found significant differences between the two groups in the values of the distal and proximal motor latencies and in the latency, amplitude and area of the sensory potentials. The distal ( $p = 0.00021$ ) and proximal ( $p = 0.00016$ ) motor and sensory latencies ( $p = 0.0097$ ) were significantly longer in the MS patients, than in the controls, and the increase of the latencies were most prominent in the lower temperatures (20–25°C) compared with controls. The sensory amplitude ( $p = 0.0047$ ) and area ( $p = 0.0067$ ) were significantly less in the MS patients, but these differences didn't change with the alteration of temperature.

The elevation of temperature may produce clinical worsening of multiple sclerosis. It is very interesting, that we found a more prominent increase of motor latencies in MS patients in lower temperatures, since it reflects more severe dysfunction of neuromuscular transmission in colder circumstances.

#### P 2137

##### Brain bioelectric activity in Belarussian children irradiated in utero as a result of Chernobyl accident

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**Objective** The study examined the formation of bioelectric activity (BEA) of the brain in 250 children at 10–12 years of age from regions highly contaminated by Chernobyl fallout, who were irradiated in the prenatal period at the time of the Chernobyl accident in 1986. These children were compared to a control group of 250 children of the same age from non-contaminated areas of Belarus.

**Methods** The examination included visual and computerized analysis of electroencephalography (EEG) as well as psychoneurological examination and assessment of intellectual level.

**Results** In both groups of children at the age of 10–12 the dominants were the variants of age norms (54.4% vs. 52.8%;  $p = 0.719$ ) and synchronized (borderline) EEG (28.8% vs. 34.4%;  $p = 0.178$ ). Quite noticeable was the relevant frequency

of the slow type of EEG (11.6% vs. 7.2%;  $p=0.092$ ) as well as paroxysmal activity (5.2% vs. 6.0%;  $p=0.698$ ) in both groups. The correlation analysis showed that the intellectual level of children (IQ) estimated by Wechsler Intelligence Scale (WISC-III) was in direct proportion to spectral power of  $\alpha$ -dipason in frontal lobes of the brain ( $r=0.38$  in both groups).

**Conclusions** The revealed changes of BEA of the brain show distinct age dependency. Their frequency in children exposed to antenatal irradiation does not have any relevant differences from that in the control group.

P 2138

**Normative values and intra-individual variability of thermal threshold testing**

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**Introduction** The thermal threshold testing method (TTT) is a quantitative sensory test based on the psycho physiological principles of thermal threshold and the relation between the supra-limbar stimulus and its response. There is a paucity of data referring to the influence of physiological variables upon the normal limits and to the intra-individual variability of this psycho physiological test. The objective of this study was to establish normative values and to assess trial-to-trial variability of threshold values.

**Methods** A thermal threshold for cold and warm sensation was established in a group of 50 healthy volunteers in two locations (the thenar of the hand and the dorsum of the foot) using a Medoc Thermal Sensory Analyser software. All individuals were examined with 3 different algorithms: two reaction-time inclusive methods (RTI-Limits I and II) and one reaction time-exclusive method (RTE-random variant of Levels). All tests were repeated for 30 individuals within 1 week to assess the intra-individual variability.

**Results** The values for the cold threshold decreased significantly and those of warm threshold increased with age, in men, and when using the RTI methods. Trial-to-trial variability of threshold values expressed as the mean day-to-day variation coefficient varied between 19 and 49% independent of algorithm type employed, of the tested region, age or sex.

**Conclusions** Normal limits for different age and sex groups are needed. The intra-individual variability of the threshold values is acceptable with respect to the psychophysical character of the test and comparable with other quantitative sensory tests.

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P 2139

**Suprasegmental muscular pareses in patients with lumbar spine discal hernias**

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**Introduction** The discal hernias arising from the given spinal segment cause destruction of the nerve roots and pareses of the muscles innervated by segment where "discal-root conflict" occurs. But question is, if it is always true?

**Methods** In 41 patients, in whom the MRI studies revealed discal hernias of L4/L5 and L5/S1 with the compression of the L5 and lower located nerve roots, the isometric tests of the thigh quadriceps strength in both legs (innervated by the L2 to L4 nerve roots). In 14 patients, additional bilateral electromyographic tests of these muscles were carried out.

**Results** The dynamometric tests of the knee extensor muscles carried out in standard conditions with identical force arm, revealed, at the side of the root syndrome the average force of 104.4 N, and at the contra-lateral side on average 156.8 N. The average strength deficit at the side of the root syndrome of 52.4 N corresponds to 33.3% deficit in comparison to the contra-lateral side.

The EMG studies of the quadriceps muscle provided normal results in 5 (35.7%) patients and in 9 (64.3%) there were signs of neurogenic muscle damage found.

**Conclusion** The results of the studies indicate, that in the patients with discal hernias there are pareses found not only in the segmental muscles of the "discal-root conflict" but also in the muscle innervated by the nerve roots located above it. Regardless of the mechanism leading to these pareses, (vascular lesions?) their presence has to be considered in planned rehabilitation and management.

P 2140

**Subclinical nerve conduction abnormalities in children with diabetes type I**

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**Introduction** Diabetic peripheral polyneuropathy, which is often seen in adult patients with diabetes type II, is characterized by distal symmetric sensorimotor disturbances. Focal nerve and proximal motor (amyotrophy) impairments are not as common though and have a putative inflammatory, vasculitic or autoimmune origin. Autonomic nervous system disorders are also frequently seen in adult diabetics.

**Methods** We performed nerve conduction studies (NCS) in 52 children 6–16 year-old (25 males) with diabetes type I, without any clinical sign of neuropathy. NCS included testing of median, ulnar, peroneal and tibial motor nerve conduction velocities (MNCVs) and M-response amplitudes bilaterally by medicor type MG440 electromyograph. A control group included 20 healthy children 6–16 yrs. old.

**Results** In a first group of 30 children (6–10 y) with disease duration <5 y. whose metabolic control was clinically well compensated, we revealed near normal NCS features comparable with those of age-matched controls. ( $P<0.001$ ). In a second group of 22 children (11–16 y) with disease duration >5 y, and poor metabolic control, we found abnormally slow MNCVs and considerably prolonged distal latencies, with significantly decreased M-response amplitudes in all above nerves. All abnormalities were symmetric ( $P<0.001$ ). Autonomic nervous system tests did not reveal any disturbances. Children remained clinically asymptomatic for a <2.5 y follow up.

**Conclusion** In children with poorly compensated diabetes type I NCS may reveal subclinical abnormalities that are suggestive of symmetrical distal polyneuropathy.

P 2141

**Effect of chronic hypoxia on the nervous system: visual and auditory brainstem evoked potentials in patients with chronic obstructive pulmonary disease**

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**Objectives** We aimed at studying the effect of chronic hypoxia associated with chronic obstructive pulmonary disease (COPD) on the nervous system.

**Background** Several recent neurophysiological studies had shown the deleterious effect of chronic hypoxia associated with COPD on the peripheral as well as the central nervous system. However, no correlation was found between hypoxia and any of the neurophysiological abnormalities.

**Design and methods** Participants consisted of 22 patients with moderate-severe COPD male patients aged 60–72 years (mean  $\pm$  s.d. =  $67 \pm 4.42$ ). Twenty age-matched non-smoking healthy male controls were also recruited. We performed pulmonary function tests, arterial blood gas analysis, audiogram, auditory brainstem evoked responses (ABR) and visual evoked potentials (VEP) for all patients and controls.

**Results** ABR were abnormal in 18 (81.82%) of the 22 COPD patients. Most prominent ABR abnormalities were prolonged wave I peak latency ( $2.5 \pm 0.54$  msec), wave V peak latency ( $7.54 \pm 1.94$  msec) and I–V interpeak latency ( $5.05 \pm 1.49$  msec). There were significant negative correlations between PaO<sub>2</sub> and wave I peak latency ( $p < 0.05$ ). There were also significant positive correlations between PaCO<sub>2</sub> and wave V peak latency, I–V and III–V interpeak latencies ( $P < 0.01$ ). Lastly, there was a significant correlation between the Forced Expiratory Flow 25–75% and all ABR abnormalities. VEP study showed that the P100 was mildly but insignificantly delayed in COPD patients.

**Conclusions** The degree of affection of the nervous system in COPD patients is significantly correlated with the stage of the disease and the degree of hypoxia and hypercapnea.

#### P 2142

##### **Contributions of microneurography to the study of the pathophysiology of neuropathic pain**

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Patients with peripheral neuropathy commonly express positive sensory symptoms, such as tactile paresthesias, dysesthesias and pains. As opposed to negative sensory phenomena whose electrophysiological correlate can be readily measured through conventional laboratory methods, the study of positive sensory phenomena relies largely on quantitative psychophysical tests. In animals, possible electrophysiological correlates of positive sensory phenomena have been documented in traumatic neuromas and in demyelinated nerve fibers. In experimental human volunteers, ectopic nerve impulses generated in single myelinated sensory fibers have been correlated with post-ischemic and post-tetanic paresthesias. In patients, abnormal nerve impulse activity in afferent fibers has occasionally been recorded in polyneuropathy, amputation neuroma, and Spurling and Tinel's signs. In all cases, such activity was either spontaneous or elicited by mechanical stimuli applied at injured midaxon level. In addition to spontaneous ectopic activity, generation of abnormal nerve impulses in hyperexcitable myelinated fibers in patients with peripheral neuropathy and positive sensory symptoms has also been recorded.

Recent microneurographic techniques permit recording from individual unmyelinated C fibers and allow their segregation into different functional classes having discrete electrophysiological properties of their membranes. Particularly important for the study of physiological and neuropathic pain is the recording from mechano-sensitive as well as mechano-insensitive, or silent, nociceptors. Recent findings will be presented and their pathophysiological implications for the study of neuropathic pain will be discussed.

#### P 2143

##### **Pain related laser evoked potentials in multiple sclerosis patients**

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Pain Related Laser Evoked Potentials are being used to examine the thin nerve fibers carrying the pain and temperature sensation and the processing of this data at the Central Nervous System (CNS). Multiple Sclerosis (MS) is a disease mainly affecting the CNS. To investigate MS, the evoked potentials are widely used for years in order to determine the extension of the disease in CNS. Visual, sensorial and brain stem auditory evoked potentials are well known procedures. With these methods, the myelinated nerve fibers of the sensory system can be examined but the pain and temperature carrying system cannot.

In this study, 8 MS patients with spinal involvement and 9 healthy subjects were stimulated with diode laser on 8 different body area covered with hairy skin. The data were recorded from the scalp with 30 electrodes using Neuroscan. The amplitude brain maps were examined to understand the processing of pain in CNS and compared with the normal subjects. In some of the patients, there was no response or the latencies and the amplitudes were different from the control group and these were correlated with the lesions. In some other patients, examining the brain maps, the spatiotemporal development of the potentials in the CNS was found to be different and these were also thought to be correlated with the lesion distribution.

As a conclusion Laser Evoked Potentials using diode laser and brain mapping technique, are useful in determining the involvement of CNS and understanding the plastic changes in pain processing.

#### P 2144

##### **Motor Evoked Potentials (MEP) for intraoperative, sensorimotor differentiation of nerve fascicles without histochemical laboratory: an experimental study on sheep**

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**Ratio and aim** Since microsurgery has been introduced in nerve reconstruction, surgeons have been seeking for a simple method to differentiate sensory from motor fibres in order to place nerve grafts on (functionally) corresponding fascicles on the cross-section of the nerve. Staining methods are time consuming and require an experienced laboratory staff. Since MEP is said to exclusively stimulate the motor cortex, we hypothesized that an evoked motor nerve action potential would exclusively follow the motor fascicles on the way to its target muscle.

Assumed that there is no functional exchange between sensory and motor fascicles along a peripheral nerve, the recording of nerve action potential from a nerve's surface subsequent to an MEP-stimulus would identify the very nerve to be a motor nerve. The goal of this study was to verify this hypothesis.

**Methods** 10 sheep were enrolled in this experimental study. Animal's ulnar nerves were exposed and the most distal bifurcation of the nerve into the last sensory and motor branch dissected. Electrical stimulation of both branches confirmed their functional identity, as did the post-mortem cross-sectional staining. Next MEP was performed and the evoked motor nerve action potentials simultaneously recorded from both remnant branches. (2 channel preamplifier, Viking-Quest-portable electromyograph).

**Results** In all ten sheep, recordings occurred on the motor branches alone.

**Conclusion** Intraoperative MEP is an effective tool to differentiate between motor and sensory nerve branches. Further studies are necessary to enable this technique on intact nerve trunks in order reach clinical applicability, where separation of fascicles is impossible.

P 2145

**Intraoperative electroneuro-diagnostics with transcutaneous, electrical stimulation of the spinal roots in routine peripheral nerve surgery: results of a prospective study on 110 nerves**

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**Ratio and aim** Frequently, plastic surgeons have to face controversial NCV-studies, and often-exposed nerves do not show any pathological aspect. The goal of this prospective study was to investigate the possible benefit of the routine application of intraoperative electroneuro-diagnostics (IOE) in peripheral nerve surgery. Specifically, how frequently the intraoperative determination of the site and proximal extent of nerve lesions provides information leading to a change of the initial surgical concept?

**Patient and methods** 110 peripheral nerves from 95 patients suffering from various types of lesions have been measured during surgery. Following exposure, the surgical concept was decided without implementing IOE. Subsequently, patients were fully relaxed and spinal roots of the damaged nerves transcutaneously stimulated with surface electrodes placed paravertebrally on the ipsilateral side over the respective nerve segments (Digitimer D185, monophasic square wave pulse, 50 µsec duration, 300–1000 volts, according to the security standards of the EC-maximum load/stimulus: 330 millijoule). Nerve compound action potentials were recorded with a bipolar electrode moved proximally and distally along the surface of the nerve.

**Results** In 21 cases (19%) the recording lead to important changes of the initial surgical concept or provided crucial information otherwise not obtained, in 8 cases the measurements confirmed the solely clinically based surgical indication despite controversial preoperative NCV studies.

**Conclusion** IOE is a valid, simple, reliable and effective tool to detect the exact site and proximal extent of nerve lesions. The routine implementation of IOE can be recommended.

P 2146

**Biphasic stimulation: a new technique to reduce the stimulus artefact during motor evoked potentials in brachial plexus surgery**

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**Ratio and aim** Since 1990, Motor Evoked Potentials (MEP) have been implemented during brachial plexus surgery to detect intradural avulsions of anterior motor roots. However, difficulties to record the evoked potential from the exposed spinal nerves hindered the wide application of the method. The reason for this problem are the commonly available electrical stimulators which provide a *monophasic* electrical pulse: every rising edge of a pulse leads to a charging current, and every falling edge to a discharging current: both spread within the tissue as a resulting current after the second (falling) edge. This spreading can last few milliseconds, and if the expected recording appears within this time period, the signal to be recorded is out of measuring. The aim of this study was to find a way to stimulate the central cortex (MEP) with sufficiently low artefact to enable reliable recordings of short latencies.

**Material and methods** We developed an electronic device able to deliver a biphasic stimulation pulse, which consists of a first rising, a second falling and a third (again) rising edge. This approach should reduce the amount of spreading current by adding another, but reversibly charged current after the end of the falling edge of the first pulse. This method has been applied to five healthy spinal nerves during brachial plexus surgery.

**Results and conclusion** In all cases, the length of the trigger artefact could be kept around 1 ms. Measurements with monophasic stimulation technique showed trigger artefacts with distinctly higher amplitudes and longer durations. The biphasic technique enables recordings that are more reliable.

P 2147

**Comparison of percutaneous endoscopic gastrostomy and nasogastric tube feeding in patients with dysphagia in a neurological department**

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**Objectives** The use of percutaneous endoscopic gastrostomy [PEG] tube feeding is now more frequent and the indication is not restricted only to patients with more than 6 weeks lasting dysphagia. The aim of the retrospective study was to compare the range of indications for PEG or nasogastric tube [NGT] insertion, to state the complications, to evaluate the advantages and disadvantages of both enteral feeding methods.

**Patients and methods** Group A: 62 patients with PEG tube hospitalised in neurological department [ward and ICU] from 1. 7. 1997 till 31. 12. 2001, average age 72.4+/-14.3 years, 31 women and 31 men. PEG was inserted in 56 patients with acute neurological disorders with an interval of 24.8+/-15.6 days since the event. Chronic progressive neurological diseases were in 6 patients.

Group B: 72 patients with NGT were hospitalised during one year [2001] at neurological ICU, average age 75.6+/-11.1 years. 37 women and 35 men.



**Results** NGT was inserted more frequently in patients with bad life prognosis, in more patients with cerebral haemorrhages, brain tumours and epileptic states than was PEG. The complication rate was nearly the same in both groups [25.8% vers. 25%]. Special indications for an earlier PEG tube insertion: patients with tracheostomy, confused and non-compliant patients with NGT irritation, aphasic patients with a need of logopaedic therapy.

**Conclusion** PEG is a safe method of tube feeding and after nearly 5-years experience; we have found the earlier and specific indication in patients with acute neurological disorders.

P 2148

**Evaluation of compound muscle action potential shape**

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