

Hinweise für Autoren

NEUROLOGIE & REHABILITATION veröffentlicht Originalarbeiten aus den Gebieten der rehabilitativen Neurologie, der Neuropsychologie, Physikalischen Medizin und Neurologischen Psychosomatik. Die Arbeiten können in Form eines Übersichtsartikels, einer Mitteilung von Forschungsergebnissen, eines Kommentars sowie als Einzelfalldarstellungen eingereicht werden. Die Beiträge müssen druckreif sein und sollten einen Umfang von 15 DIN-A4-Seiten in Maschinenschrift und insgesamt 10 Abbildungen und Tabellen nicht überschreiten.

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Die Beiträge sollten wie folgt gegliedert sein:

1. Titel, Autoren und Institutionen
2. Zusammenfassung und 3–4 Schlüsselwörter in deutscher und englischer Sprache
3. Einleitung
4. Patienten (Material) und Methoden
5. Ergebnisse
6. Diskussion
7. Literaturverzeichnis
8. Tabellen, Abbildungen
9. Legenden

Abbildungen und Tabellen:

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Zeitschriftenzitat:

Straub H: Letale Komplikation der Fibrinolyse. Mü med Wschr 1982; 124: 17-19

Buchzitat:

Pillsbury DM: In: Muller H (ed): A manual of dermatology. WB Saunders and company, Philadelphia 1971, 173-175

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Die Schreibweise richtet sich nach dem Kompromissvorschlag der Deutschen Akademie für Sprache und Dichtung zur Reform der deutschen Rechtschreibung. Dies betrifft auch die medizinischen Fachausdrücke. Eingedeutschte Fachausdrücke werden nach deutscher Schreibweise mit »z« und »k« (z. B. »zerebral«, »kortikal«) geschrieben, lateinische Fachtermini behalten ihre Schreibweise (z. B. »cerebralis«, »corticalis«).

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Liebe Leserinnen und Leser,

vom 30. September bis zum 2. Oktober 2004 fand in Zürich der dritte gemeinsame Kongress der Schweizerischen, Deutschen und Österreichischen Gesellschaft für Neurorehabilitation statt. Des Kongress war gleichzeitig auch das erste Regionaltreffen der World Federation of NeuroRehabilitation und die 17. Jahrestagung der Deutschen Medizinischen Gesellschaft für Paraplegie (DMGP).

Mit dem Schwerpunkt »Evidence-Based Medicine in Brain and Spinal Cord Lesions« wurde ein aktuelles Thema der Neurorehabilitation diskutiert, welches das gesamte Rehabilitationsteam betrifft und letztendlich dazu beitragen soll, den Rehabilitationsprozess befriedigender und effektiver zu gestalten.

Unsere medizinischen und rehabilitativen Verfahrensweisen müssen zunehmend wissenschaftlich untermauert werden mit dem Ziel, die Behandlung zu optimieren. Um dies zu erreichen, müssen sowohl die neurologischen Defizite als auch die verbliebenen Funktionen und deren Entwicklung während des Rehabilitationsverlaufs objektiv nachvollziehbar dokumentiert werden. Das gesamte Vorgehen muss darauf ausgerichtet sein, objektive Kriterien für die Evaluati-

on der Prozess- und Ergebnisqualität schaffen, um auf dieser Basis neue, effektive Behandlungsmethoden zu etablieren und deren Wirksamkeit zu belegen.

Einer der Hauptschwerpunkte des Kongresses lag auf den Perspektiven in der Behandlung von Verletzungen des Gehirns und des Rückenmarks. Dieser Themenbereich wurde gemeinsam mit der Deutschen Medizinischen Gesellschaft für Paraplegie (DMGP) organisiert. International ausgewiesene Experten waren mit Vorträgen über den »state of the art« auf dem Gebiet der Plastizität des Nervensystems vertreten. Einen gleichermaßen wichtigen Themenschwerpunkt bildeten die heute oder in naher Zukunft vorhandenen Möglichkeiten, eine partielle Regeneration verletzter Bereiche des Rückenmarks zu erzielen. Beide Themenkomplexe haben große Bedeutung für die Entwicklung zukünftiger Behandlungsansätze.

In dieser Ausgabe von Neurologie & Rehabilitation werden die Ergebnisse dieses aktuellen und anspruchsvollen Programms präsentiert.

Prof. Dr. V. Dietz FRCP

TAGUNGEN & KONGRESSE

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3rd Joint Congress of the Swiss Society of Neurorehabilitation, Austrian Society of Neurorehabilitation, German Society for Neurological Rehabilitation and 1st Regional Meeting of the World Federation for NeuroRehabilitation (WFNR) in association with the German Speaking Medical Society for Paraplegia (DMGP)
Zurich, 30th September – 2nd October 2004

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Evidence-Based Medicine in Neurorehabilitation

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Abstracts Faculty

F1 REGENERATION | BS*
ADAPTING THE INJURED CNS HARDWARE FOR FUNCTIONAL REPAIR

M.E. Schwab (Zurich, CH)

Spinal cord injuries with very extensive destruction of ascending and descending fiber tracts lead to paralysis without or with only minimal functional recovery (ASIA A,B). In contrast, smaller lesions which spare parts of the white matter can be followed by substantial functional recovery. Extensive rehabilitative training is required to reach an optimal, well adapted level of function. The neuroanatomical basis for this recovery process is not known. Animal experiments show that injured fiber tracts in spinal cord or brain show a spontaneous but small regeneration response. In the case of the pyramidal tract of the adult rat, transected hindlimb fibers sprout into the cervical spinal cord and form new contacts with spared propriospinal axons running from the cervical to the lumbar cord. In this way a new, indirect circuit is formed which allows to transmit information from the motor cortex to the hindlimbs through a cervical relay pathway. This spontaneous nerve fiber growth is limited in distance to about 1 mm, however.

Specific proteins were discovered in the adult spinal cord and brain that inhibit nerve fiber growth in the adult organism. A major factor is found in the myelin sheath of the fiber tracts and is called Nogo-A. The growth-inhibitory effect of Nogo-A can be neutralized by specific antibodies in vitro and in vivo. Infusion of Nogo neutralizing antibodies into the CSF of adult spinal cord injured rats or macaque monkeys leads to a massive enhancement of regenerative fiber growth. Extensive tests of locomotor behavior (rats) and skilled hand movements (monkeys) show a high degree of restoration of function. These findings indicate that adult spinal cord fibers can be stimulated in their regenerative ability, and that these growing fibers are able to form new circuits that mediate functional recovery in the absence of malfunctions. These results in animals form the basis for the development of a new therapeutic approach in spinal cord injured patients

F2 REGENERATION | BS
AXON REGENERATION AND PLASTICITY: WHY ARE THEY SO LIMITED IN THE ADULT CNS AND HOW CAN THEY BE STIMULATED?

J.-W. Fawcett (Cambridge, UK)

Recovery from spinal cord injury can be achieved through the regeneration of cut axons, or through enhancing plasticity so that the surviving axons in partial lesions take over additional functions.

Axon regeneration in the spinal cord and other parts of the CNS is prevented by the poor regenerative response of most CNS axons, and by the inhibitory terrain through which they have to grow in the damaged adult CNS. The inhibitory terrain is due to the existence of inhibitory molecules such as NogoA and MAG on oligodendrocytes, and due to the production of inhibitory chondroitin sulphate proteoglycans (CSPGs) by the glial scar tissue that forms at sites of injury. There are at least five inhibitory CSPGs made by astrocytes and oligodendrocyte precursor cells. They are upregulated after injury, and in addition the amount of glycan sugar chain on the molecules is increased, increasing their inhibitory properties. The glycan chains can be digested away by the enzyme chondroitinase. This treatment has been applied to brain and spinal cord injuries, promoting axon regeneration and functional recovery.

The brain and spinal cord are highly plastic early in life during the “critical periods”. These terminate in humans at around 5 years old. CSPGs play a part in the turning off of plasticity at the end of the critical period in the brain, and probably also in the spinal cord. Digesting the CSPGs with chondroitinase can restart plasticity. This treatment should be able to help patients with both acute and chronic spinal injuries, in whom greater degrees of plasticity should aid recovery of function.

There are no treatments in development at present that have the potential to stimulate a complete repair of a spinal cord injury. However, there are a number of treatments that can promote plasticity and regeneration, and which should be able to bring about a significant improvement in the function of patients with spinal cord injury

F3 PLASTICITY | BS
RELEARNING POSTURE AND LOCOMOTION AFTER SPINAL CORD INJURY

V.R. Edgerton (Los Angeles, USA)

There is little issue that the neuromotor system has considerable potential for plasticity with enables significant levels of functional motor recovery following traumatic insults to the nervous system. At the same time, it is remarkable how little we know about the mechanisms that underlie these recoveries. Much progress has been made in understanding the extent that spinal cord plasticity plays in mediating the recovery of load bearing, functional stepping and standing following severe spinal cord injury. In addition, the importance of integration of spinal and supraspinal circuitries is becoming more apparent. In this lecture, the role of activity dependent plasticity will be discussed. Evidence that the spinal cord can learn to step and stand and maintain equilibrium will be

presented. Some of the neurotransmitter systems involved in the loss of motor control and its recovery will also be discussed. Given the ability of the neuromotor system to make significant adaptations that can result in improved motor function, the challenge for the immediate future is to identify those mechanisms that can be used in the clinic, which type of patients can take advantage of this information and finally, how much gain of function can be expected for a given patient over some time period.

F4 STROKE | C*
HUMAN BRAIN PLASTICITY AND IMPLICATIONS FOR STROKE THERAPY

M. Hallett (Bethesda, USA)

Brain injury, such as stroke, may lead to significant disability. Many patients improve spontaneously, at least to some extent, and after the acute period the principal mechanism appears to be brain plasticity, the capability of the brain to undergo change. There are a number of principles that underlie plastic processes. One is that there is continuous competition between body parts for representation in the central nervous system. A second one is that use of a body part enhances its representation and disuse leads to loss of representation. These principles have been demonstrated in humans most clearly with deafferentation and motor learning. They have begun to be applied in understanding spontaneous recovery from brain injury and in rehabilitation. Spontaneous recovery after stroke leads to plastic changes in both the damaged hemisphere and the undamaged hemisphere (ipsilateral to the weakened body part). Generally, better improvement will result with plasticity of the damaged hemisphere. The undamaged hemisphere seems to play a role early after stroke and achieves an important role if the damaged hemisphere does not recovery well. Physical therapy should help if there is attention to the weakened extremity, and this has been demonstrated by constraint-induced movement therapy. Physiological studies show enhancement of function in the damaged hemisphere after such interventions. Other techniques likely use the same principle such as neuromuscular electrical stimulation, robot-enhanced training and virtual reality training. Sensory stimulation enhances plasticity and can be delivered in a number of ways, from passive movement to cutaneous stimulation with transcutaneous electrical nerve stimulation and even acupuncture. Another principle is that reduction of inhibition enhances plasticity; this has been shown to be relevant with the deafferentation model. Our group has now demonstrated that this can be efficacious in stroke patients. We studied patients with weak hands and more preserved proximal arm function, with a goal of taking over some of the proximal representation in the brain for use by the hand. We coupled anesthesia of the proximal arm with exercise of the hand and showed that this increases hand function more than exercise alone.

F5 MOTOR REHABILITATION | C
ÜBEN – ABER WIE? STRATEGIES IN MOTOR REHABILITATION

H. Hummelsheim (Leipzig-Bennewitz, D)

In recent years, our understanding of motor learning, neuroplasticity and functional recovery after brain lesion has grown significantly. New findings in basic neuroscience provided stimuli for research in motor rehabilitation. Repetitive movement execution and motor activity in a real world environment have been identified in several prospective studies as favorable for motor recovery in stroke patients. EMG initiated electrical muscle stimulation and simultaneous voluntary and electrical muscle activation improves motor function of centrally paretic muscle groups. Furthermore, specific features within training procedures have been identified that render the interventions more efficacious. In particular, the

influence of a training close to the patients' individual limit of motor performance, the role of shaping elements and of repeated motor practice will be discussed.

F6 STROKE | C
PROBABILITY OF REGAINING DEXTERITY IN THE FLACCID UPPER LIMB: IMPACT OF SEVERITY OF PARESIS AND TIME POST ONSET IN ACUTE STROKE

G. Kwakkel (Amsterdam, NL)

Background and Purpose: To improve the accuracy of early post onset prediction of motor recovery in the flaccid hemiplegic arm, the effects of change in motor function over time on the accuracy of prediction were evaluated, and a prediction model for the probability of regaining dexterity at 6 months was developed.

Methods: In 102 stroke patients, dexterity and paresis were measured with the Action Research Arm Test, Motricity Index, and Fugl-Meyer motor evaluation. For model development, 23 candidate determinants were selected. Logistic regression analysis was used for prognostic factors and model development.

*Results-*At 6 months, some dexterity in the paretic arm was found in 38%, and complete functional recovery was seen in 11.6% of the patients. Total anterior circulation infarcts, right hemisphere strokes, homonymous hemianopia, visual gaze deficit, visual inattention, and paresis were statistically significant related to a poor arm function. Motricity Index leg scores of at least 25 points in the first week and Fugl-Meyer arm scores of 11 points in the second week increasing to 19 points in the fourth week raised the probability of developing some dexterity (Action Research Arm Test =10 points) from 74% (positive predictive value [PPV], 0.74; 95% confidence interval [CI], 0.63 to 0.86) to 94% (PPV, 0.83; 95% CI, 0.76 to 0.91) at 6 months. No change in probabilities of prediction dexterity was found after 4 weeks.

Conclusions: Based on the Fugl-Meyer scores of the flaccid arm, optimal prediction of arm function outcome at 6 months can be made within 4 weeks after onset. Lack of voluntary motor control of the leg in the first week with no emergence of arm synergies at 4 weeks is associated with poor outcome at 6 months.

F7 C
CHANGE OF ACTIVATION PATTERNS IN THE HUMAN SENSORIMOTOR CORTEX BEFORE AND AFTER SUBSENSORY WHOLE-HAND AFFERENT ELECTRICAL STIMULATION

S.M. Golaszewski, K.M. Stephan, C.M. Siedentopf, F. Koppelstätter, F.M. Mottaghy, S.R. Felber, F. Gerstenbrand, R. Seitz, V. Hömberg (Meerbusch, Düsseldorf, Ulm, D; Innsbruck, Vienna, A)

Introduction: Stimulation of proprioceptive pathways using whole-hand electrical stimulation with a mesh-glove has been shown to improve motor performances of stroke patients with chronic neurological deficits. The aim of the study was to elaborate, whether changes in the motorcortex activation patterns can be demonstrated after electrical stimulation of the hand in normal volunteers.

Material and methods: All experiments were performed on a 1.5 Tesla MR-scanner in 10 healthy subjects. The motor-paradigm was self-paced finger-to-thumb-tapping of the left hand. Firstly, a baseline fMRI-examination and secondly subthreshold electrical stimulation with 0.9 mA was applied for 20 minutes outside the magnet to the left hand using a mesh-glove. Thirdly, an identical fMRI run to the baseline and the second run 12 hours post stimulation was performed. Post processing was done with SPM99.

Results: Group-analysis of fMRI-data showed: 1. Baseline fMRI-examinations revealed brain activation of the primary and

secondary sensorimotor cortex as previously described. 2. After electrical stimulation of the left hand, there was an increase of activated pixels in these areas. 3. In addition, there was activation of regions not visible on the baseline studies. These involved the ipsilateral inferior parietal lobule, the pre- and postcentral gyrus and the superior parietal lobule. 4. These changes disappeared twelve hours post stimulation.

Conclusions: fMRI reflects an increased BOLD-response due to an increase of local-field-potentials within the sensorimotor cortex due to electrical stimulation. Thus, local-field-potentials can be successfully influenced by subsensory stimulation of afferent pathways. This holds promise for the application of fMRI in the planning of neurorehabilitation strategies.

F8 FITNESS TO DRIVE WITH NEUROLOGICAL DISABILITIES

J. Kesselring (Valens, CH)

To restore the ability to drive is one aim of the rehabilitation of patients with neurological disabilities. In some instances, an evaluation is required in order to judge a patient's fitness to drive in today's traffic. Forty-three patients of the neurorehabilitation unit of the Valens Clinic were assessed by a standard traffic psychological test protocol and a control drive. In 88% there was agreement between the judgments based on each procedure. In 12% the judgements diverged. Four patients had failed either the psychological tests or the control drive but not both. A telephone interview two years after discharge showed that 3 of 4 patients drove anyway. One patient drove unevenly but 2 patients who had failed the psychological tests had committed several minor traffic offences, one of them in addition a car crash while passing another car. Six patients had failed the psychological test and the control drive. Two drove nevertheless, one reportedly without problems, one having caused a traffic accident without person injury. Three stopped driving and one was lost to follow-up. The traffic psychological tests and control drive yield complementary information on the fitness to drive. However, the assessments need to be improved. New generations of driving simulators may refine the fitness to drive evaluation.

F9 TRAUMATIC HEAD INJURY | C WHIPLASH INJURY AND POSTCONCUSSION SYNDROME – FACT OR FICTION?

M. Keidel (Bayreuth, D)

Whiplash injury (WI) is followed by a posttraumatic syndrome (PTS) [1] which is comparable with the postconcussion syndrome (PCS) after mild traumatic brain injury (MTBI). The PCS describes a constellation of cognitive (e. g. poor memory, attention and concentration), emotional (e. g. irritability, sleep disturbance, nervousness, depressive mood, fatigue or anxiety) and physical (e. g. headache, neck pain, dizziness, vertigo or blurred vision) complaints. The persistent PCS is a major problem in litigation [2]. The factors causing chronicity of the PCS are a major matter of discussion.

Because subjective experiences and expectations, a maladaptive response to pain and stress, personal traits, malingering and a variety of psychosocial or cultural factors may influence the PTS in whiplash injury, one is tempted to consider it as a "fiction" without any necessity of compensation for litigants.

On the other hand evidence from quantitative EEG and MRI studies suggest a diffuse gray matter dysfunction correlated with neuropsychological deficits in PCS after MTBI.

With respect to WI objective "facts" of the "subjective" PTS will be presented (i) regarding electrophysiological correlates [3] and quantification of posttraumatic pain [4] and of vegetative disturbances, (ii) regarding quantification of neuropsychological deficits and of changes in mood, (iii) regarding posttraumatic changes in the (general) pain threshold and (iv) regarding the identification of risk factors for developing a chronic PTS.

Finally practical recommendations [5] will be given to prevent the development of a chronic PTS in WI and to avoid the need for such a multitude of legal expert opinions in this way. For insurance companies [5] and medicolegal purposes [6] in WI it turns out to be of more benefit to act as a preventive doctor rather than as a forensic expert.

References:

1. Keidel M: In: Brandt T et al. (eds.) 2nd edition, Academic Press, Elsevier Science, New York 2003, pp 83-94
2. Keidel M: In: Rauschelbach, H.-H. et al. (eds.) 4th edition; chapter 34. Thieme, Stuttgart, New York 2000, pp 408-421
3. Keidel M et al. Pain 2001; 92: 319-326
4. Nebel K et al. Cephalalgia: in press
5. Strelbel HM et al. Schweiz Med Forum 2002; 47: 1119-1125
6. Keidel M: In: Hierholzer G, Peters D (eds.) Springer, Stuttgart, New York 2001, pp 51 -64

F10 RECOVERING FROM APHASIA: CONVERGING DATA FROM FUNCTIONAL IMAGING AND NEUROPSYCHOLOGY

C. Price (London, UK)

In this talk, I will highlight the different inferences that can be drawn from functional neuroimaging and neuropsychological studies of aphasia. Functional neuroimaging of neurologically normal subjects indicates that bilateral posterior and anterior regions of the superior temporal gyri are engaged during auditory speech comprehension.

Although damage to this system often impairs speech perception (e.g. patients with classic Wernicke's aphasia), comprehension deficits are not consistent across patients. Indeed, damage to many areas of the normal system does not impair speech comprehension. Such resilience suggests that multiple neuronal systems might underlie speech comprehension. These systems might be expressed within the normal population or following neuronal reorganisation in patients. I will illustrate how multiple speech comprehension systems can be dissociated using functional imaging studies of patients who have recovered from aphasia.

F11 PLASTICITY | C POSTLESIONAL PLASTICITY IN AUDITION

A. Bellmann Thiran, M. Adriani, S. Clarke (Sion, Lausanne, CH)

A sound that we hear in natural setting allows us to identify the sound source and localise it in space. The two aspects are processed in anatomically distinct cortical networks, as demonstrated with fMRI in normal subjects. Middle temporal gyrus and precuneus bilaterally and posterior left inferior frontal gyrus were more activated in recognition than localisation; lower inferior parietal lobule and posterior middle and inferior frontal gyri were more activated (bilaterally) in sound localisation than recognition (Maeder et al. 2001). Relatively large unilateral right or left lesions of either of these networks were shown to result, in the chronic stage, in selective deficits of sound recognition or sound localisation (Clarke et al. 2000; 2002).

Three observations suggest that major reorganisation takes place within these networks following lesions. First, the correlation

between deficit and lesion site is not the same in the acute stage, where we investigated the effects of predominantly small lesions; deficient performance in sound recognition and/or sound localisation was not always associated with the lesion of the corresponding network and, conversely, lesions of specific networks were not always associated with specific deficits (Adriani et al. 2003). The loss of specificity observed in the acute stage disappeared by the early chronic stage (Rey et al. 2004). Second, processing within the intact hemisphere is disturbed by the contralateral lesion, suggesting a key role of interhemispheric connections in the coordination of bilateral networks. This was demonstrated with psychophysical evaluation and fMRI paradigm in patients with unilateral right (Adriani et al. 2003) or left lesions. A decrease in activation in the intact hemisphere contralateral to the lesion was present independently of performance level, while loss of parallel processing within specialised networks correlated with deficient performance. Third, unilateral or bilateral lesions of the ascending auditory pathway at the level of the inferior colliculus or the acoustic radiation were shown to disturb parallel processing within specialised networks, with subsequent reorganisation that was accompanied by functional recovery.

F12 STROKE | C
INSIGHTS INTO THE MECHANISMS OF RECOVERY FROM IMAGING STUDIES AFTER STROKE

C. Weiller (Hamburg, D)

Recovery of functions of the brain after localised lesions is related to a reorganisation of the brain, which can be influenced by behavioural and pharmacological treatment. A recent study using fMRI, diffusion tensor imaging and transcranial magnetic stimulation suggests two mechanisms of brain activation may be related to recovery of motor function after stroke. Improvement of function is found while activity during fMRI increases in primary areas or with a u-shaped development of activity over time. The latter pattern seems to be more related to normal relearning, reflected by a decreasing stimulation threshold, the former seems to represent a pathological compensatory mechanism, reflected in an increased threshold. The selection between both seems being made in dependency of the connecting tracts.

In recovery from aphasia activation of both, the remaining left hemispheric language related structures as right hemisphere "counterparts" have been put in relation to recovery. In a longitudinal design we found rapidly changing activation patterns in a language task during the first couple of days or weeks of recovery after stroke.

F13 LOCOMOTION | C
EFFICIENCY OF LOKOMAT TRAINING IN STROKE PATIENTS

L. Saltuari (Hochzirl, A)

Treadmill training has become an important strategy in locomotion rehabilitation in patients with spinal and supraspinal lesions affecting central motor pathways. The authors present a prospective blinded randomised controlled study of gait rehabilitation in stroke patients using a new driven gait orthosis, Lokomat. Sixteen patients (6 men, 10 women, mean age 60.8, years range 25–86, with ischemic or hemorrhagic stroke) were separated in two groups and underwent 9-weeks treatment in an ABA (group I) or BAB (group II) design (A=3 weeks Lokomat training, B=3 weeks conventional physiotherapy). The outcome of locomotion training was assessed with seven scales (EU-walking scale, Rivermead Motor Assessment scale (RMA), 10-m Time Walking Test (10-m TWT), 6-min Time Walking Test (6-min TWT), Motricity Index (MI) for

the lower extremities, Oxford scale and Ashworth scale). Results of the EU-Walking scale, RMA, 6-min TWT, Oxford scale, and Ashworth scale demonstrated the superiority of the Lokomat training to conventional physiotherapy on a significant level ($p < 0.05$ Wilcoxon and Mann-Whitney-U-Test). Both 10-m TWT and MI showed a trend towards improvement in both groups following the phase of Lokomat intervention. Patients walked more symmetrically at higher velocity with improved ankle dorsiflexion during the swing phase, demonstrated a stable stance phase with less spasticity, and developed adequate equilibrium reactions. Improvement was smaller in group I than in group II, indicating a beneficial effect of the Lokomat over conventional therapy, which was proven by pooling 9 weeks of phase A (Lokomat) versus 9 weeks of phase B (conventional physiotherapy).

This driven gait orthosis provides superior possibilities for executing and training physiological gait patterns on a treadmill, and replaces unphysiological work effort on the part of the physiotherapist.

F14 SWALLOWING DISTURBANCES | BS
SCHLUCKSTÖRUNGEN: FUNKTIONSORIENTIERTE THERAPIE

H. Schröter-Morasch, (München, D)

Schlucken bedeutet die Aufnahme und Beförderung von Nahrung und Flüssigkeit von den Lippen bis zum Magen, aber auch den Abtransport von Speichel und Sekret aus Mundhöhle und Rachen. Dafür sind mehrere sensomotorische Funktionskomponenten wesentlich: (1) die Wahrnehmung der entsprechenden Substanzen (Geruch, Geschmack, Beschaffenheit, Konsistenz, Temperatur und Menge) zur Auslösung reflektorischer Funktionen (Speichelfluss, Schluckreflex) (2) kontraktile und propulsive Muskelbewegungen zur Erzeugung der entsprechenden Schubkräfte sowie (3) zeitgerechte Klappenfunktionen für die Einhaltung des korrekten Passageweges. Da sich Luft- und Speisewege im Rachen überkreuzen, ist insbesondere der adäquate Verschluss des Kehlkopfes während des Schluckvorganges essentiell.

Schluckstörungen treten bei einer Vielzahl von neurologischen Erkrankungen auf, am häufigsten nach Schlaganfall (initial >40%), Schädel-Hirn-Trauma, Tumoren und nach Langzeitintensivbehandlung. Stehen in der Akutphase die Sicherstellung von Atmung und Ernährung im Vordergrund (Schröter-Morasch 2003), muss in der Rehabilitation darüber hinaus nach klinischer und instrumenteller Diagnostik eine störungsspezifische funktionelle Therapie erfolgen (Bartolome et al. 1999). Sie lässt sich in 3 Hauptkategorien unterteilen:

- (1) Die restituierenden Methoden beinhalten krankengymnastische Techniken, übertragen auf den speziellen oropharyngealen Bereich. Dazu gehören Stimuli (z. B. die taktil-thermale Stimulation der vorderen Gaumenbögen zur Verbesserung der Schluckreflexauslösung), sowie ein sensomotorisches Training am Schlucken beteiligter Muskeln wie Zunge, Mundboden, Gaumensegel, Rachen und Kehlkopf durch gezielte schluckverwandte Einzelbewegungen oder Bewegungssequenzen (Bartolome 2004). Die Therapie kann durch Biofeedbacktherapie mittels Oberflächen-EMG ergänzt werden. Da diese Therapieverfahren außerhalb des Schluckablaufes zur Anwendung kommen, werden sie auch als „indirekte Therapie“ bezeichnet.
- (2) Kompensatorische Verfahren umfassen willkürlich initiierte Verhaltensänderungen während des Schluckablaufs (daher auch „direkte Therapie“ benannt), d. h. der reflektorische Schluckvorgang wird durch willkürliche erlernte Bewegungen modifiziert. Sie betreffen Haltungsänderungen und spezielle Schlucktechniken, welche zum Ziel haben, trotz defizitärer

Wahrnehmung und/oder Muskelfunktion sicheres aspirationsfreies effektives Schlucken zu ermöglichen. So führt eine Kopfdrehung zur kranken Seite zur Verengung des paretischen Rachenraumes und der Speisebolus kann über die gesunde Seite abgeschluckt werden. Die wichtigsten Schlucktechniken sind kräftiges Schlucken, das sog. supraglottische und super-supraglottische Schlucken (zum willkürlichen Verschluss des Kehlkopfes) und das Mendelsohn-Manöver, das durch verlängerte Kehlkopfhebung eine verbesserte Öffnung des Speiseröhreinganges ermöglichen soll.

- (3) Adaptive Verfahren umfassen die diätetische Anpassung sowie spezielle Ess- und Trinkhilfen. Eine individuell angepasste Dysphagiekost muss als wichtigste Kriterien die Bolusgröße und die Nahrungskonsistenz (flüssig, breiig, fest) berücksichtigen, welche effektives, sicheres Abschlucken ermöglichen, wozu auch die Applikationsform beitragen kann (z. B. spezielle Löffel, Tassen).

Zur Kontrolle der Effektivität der gewählten Therapiemethoden sind instrumentelle Untersuchungsverfahren wie Videoendoskopie und Videofluoroskopie unverzichtbar (Kuhlemeier et al. 2001).

Randomisierte doppelblinde Kontrollstudien zur Wirksamkeit der funktionellen Dysphagietherapie lassen sich aus ethischen Gründen nicht durchführen. Plastische Modulationen des menschlichen Schluckkortex sind im Spontanverlauf nach Schlaganfall mit kortikaler Läsion nachgewiesen (Hamdy et al. 1998), die Wirksamkeit elektrischer Stimulation des Pharynx wurde 2002 von Fraser et al. belegt. Weiterhin existieren inzwischen zahlreiche Studien zur Wirksamkeit einzelner spezielle Übungen und Therapieverfahren. Die Wiedererlangung einer ausreichend effektiven und sicheren oralen Nahrungsaufnahme bedeutet eine Vermeidung von lebensbedrohlichen Folgekomplikationen, eine verkürzte stationäre Verweildauer mit entsprechender Kostensenkung sowie eine nicht hoch genug einzuschätzende Verbesserung der Lebensqualität des Patienten.

Literatur:

1. Bartolome G: Neurogene Dysphagie. Tectum Verlag, Marburg 2004
2. Bartolome G, Buchholz D, Feussner H, Hannig C, Neumann S, Prosiel M, Schröter-Morasch H, Wuttge-Hannig A: Schluckstörungen – Diagnostik und Rehabilitation. Urban & Fischer, München 1999
3. Fraser C, Power M, Hamdy S, Rothwell JC, Hobday D et al.: Driving plasticity in human adult motor cortex is associated with improved motor function after brain injury. *Neuron* 2002; 34: 831-840
4. Hamdy S, Aziz Q, Rothwell JC, Power M, Singh KD, et al.: Recovery of swallowing after dysphagic stroke relates to functional reorganization in the intact motor cortex. *Gastroenterology* 1998; 115: 1104-1112
5. Kuhlemeier KV, Palmer JB, Rosenberg D: Effect of liquid bolus consistency and delivery method on aspiration and pharyngeal retention in dysphagia patients. *Dysphagia* 2001; 16: 119-122
6. Schröter-Morasch H: Medizinische Basisversorgung bei Dysphagie. In: Grohfeldt M (Hrsg.) *Lehrbuch der Sprachheilpädagogik und Logopädie*, Bd. 4. Kohlhammer, Stuttgart 2003

F15 COGNITIVE REHABILITATION | C FRONTO-TEMPORAL INTERACTIONS IN THE RECOVERY OF APHASIA

R. Wise (London, UK)

It is known from studies on primate neuroanatomy that there are multiple reciprocal connections between the temporal lobe and prefrontal cortex. It is now suggested, from studies that combine auditory physiology with anatomy, that there are two or more “streams” of auditory processing in the rhesus macaque, and that these separate “streams” have different targets in their connections with prefrontal cortex. Functional neuroimaging studies, in both normal and aphasic subjects, are indicating that there are also several streams of auditory verbal processing in the human brain. In

particular, there is considerable evidence that intelligible speech is processed in rostral temporal lobe regions, in the superior temporal sulcus, temporal pole and inferotemporal cortex; and that their connections are with ventrolateral and rostral prefrontal cortex via the uncinate fasciculus. Activity in the caudal superior temporal gyrus and sulcus is more closely associated with dorsolateral prefrontal cortex via the superior longitudinal fasciculus. I suggest there is evidence that one function of a caudal-dorsal stream of auditory verbal processing is to support speech rehearsal (repetition). Mimicry is a critical skill for the acquisition of language, and one not possessed by non-human primates. Rostral and caudal streams of auditory processing are likely to be intimately connected, and it is known that there are strong anatomical interconnections along the length of the superior temporal sulcus. The role of rostral and inferotemporal cortex in language comprehension is becoming evident from studies on the temporal variant of frontotemporal dementia (semantic dementia), and disorders of speech production and repetition with caudal temporal lobe lesions are well recognised from the stroke literature. Although the study of pharmacotherapy in the treatment of aphasia is, to date, very limited and unconvincing, it is becoming apparent that changing monoaminergic function of the prefrontal cortex, especially in elderly subjects, may influence skill at language tasks even in the absence of brain pathology. Recognising the different anatomical and functional connections between the rostral-caudal and dorsal-ventral extent of the human temporal lobe and the ventrolateral, dorsolateral and rostral regions of prefrontal cortex will inform both behavioural and pharmacological interventions in chronic aphasic stroke.

F16 COGNITIVE REHABILITATION | C TOP-DOWN AND BOTTOM-UP APPROACHES IN REHABILITATION OF NEGLECT

G. Rode (Lyon, F)

Neglect is a neurological deficit for perception, attention, representation, and/or performing action within the contralesional space. This space-oriented behaviour disorder is predominantly consecutive to a damage of the right hemisphere syndrome, particularly the inferior parietal lobule (BA 39 and 40). Other areas, as BA 6, 8 and 44 and superior temporal sulcus are also involved¹¹. The inferior parietal lobule constitutes a sensori-motor interface between space representation and action, involving two levels of representation: a sensorimotor and a cognitive level with interactions between them. According to level of representation primarily implied, two theoretical tracks may be distinguished in rehabilitation of neglect: a “top-down” approach including visual scanning training, cueing or sustained attention training, and a “bottom-up” approach including the sensory manipulations, eye patching method and prism adaptation. For the last method, improvement of neglect in visuomotor tasks may be explained by the sensori-motor post-effect consecutive to adaptation. Several results also suggest a high level cognitive post-effect as demonstrated the reduction after prism adaptation of representational neglect, number mental representation bias, dichotic listening and tactile extinction, underlying the bottom-up track of prism adaptation. Moreover in two recent studies, these two tracks were associated: visual scanning training with posterior neck muscles vibration or trunk rotation with a long-term improvement of neglect and disability. Lastly following a lesion of the right cerebral hemisphere, the different damaged cognitive processes: deficit of attention, intention, global-local processing, spatial memory and mental representation can all contribute to the clinical picture of neglect as well as the motor or sensory deficits. All these must be integrated in reha-

bilitation which has to be considered as a rehabilitation of spatial cognition disorders rather than rehabilitation of a focal deficit.

F17 COGNITIVE REHABILITATION | C
REHABILITATION OF MEMORY DISORDERS

A. Schnider (Geneve, CH)

Much like other cognitive failures, the rehabilitation of memory disorders starts with the understanding of their mechanisms. Although most cases of memory disorder reflect an inability to store enough information (true amnesia), others reflect a disorganized memory (frontal memory failure) or even inadequate suppression (filtering) of memories (spontaneous confabulation). In this lecture, diverse approaches to the rehabilitation of memory disorders will be discussed. Amnesic patients profit from internal strategies that also improve memory in healthy subjects: deep encoding, vanishing cues, visual imagery, or errorless learning. In more severe amnesia, such strategies are insufficient and compensatory strategies have to be employed, such as, taking notes and developing strict everyday habits. An external memory aid with proven efficacy, both for insufficient storage and disorganized memory, is the use of a pager system. Future systems are likely to be much more practical and versatile. No controlled study has been done on the rehabilitation of spontaneous confabulation, a profound confusion of ongoing reality based on a deficient early filtering mechanism, which normally adapts thought to ongoing reality even before the content of an upcoming memory becomes conscious. This disorder probably requires limitation of sensory stimulation in order to prevent the provocation of false memories. Dopamine antagonists (neuroleptics) may be helpful.

F18 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C
FINANCING NEUROREHABILITATION

M. Weinrich (Bethesda, USA)

The idiomatic phrase for predictions of impending disaster is “gloom and doom”. I think that the outlook for neurorehabilitation is more accurately captured by the phrase “gloom and boom”. Many of us, both in the clinical and research arenas, are experiencing little growth or even declines in the real funds available. Modest growth in national economies coupled with rapidly increasing expenditures for medical goods and services have strained the health care budgets for most of the industrialized world. We are poised on the threshold of an exciting new era in medicine, an era in which the promise of biotechnology is fulfilled with advances ranging from “designer” chemotherapy to tissue engineered replacement parts. These exciting developments, especially in acute care, inevitably compete for resources devoted to rehabilitation. So, there is little doubt that in the short-term, investigators in neurorehabilitation will face increased difficulties in securing research grants, and that clinicians providing rehabilitative care will face increased pressure from both public and private payers to curtail services and reduce costs.

However, there are a number of powerful forces working that I believe will ultimately expand neurorehabilitation greatly. The population in the industrialized world is aging rapidly. This means that there will be an increased emphasis on maintaining a productive, older workforce, and that there will be an advantage for health systems that can develop strategies to reduce disabilities, maintain individuals’ function and control costs. Many of us believe that neurorehabilitation interventions can accomplish these ends. It is now time for us to prove that they can and to ruthlessly eliminate those interventions that do not.

While there is increased competition for resources from other disciplines, neurorehabilitation has a new set of tools that can begin to create the kind of scientific excitement and major clinical

advances that we have seen in other fields. These include functional imaging, gene therapies, tissue engineering, biomechanical modeling, to name just a few. We also are seeing a new generation of investigators and clinicians emerging that are taking on the challenge of developing effective treatments for stroke, brain injury and spinal cord injury.

There will continue to be major stresses on this field. Perhaps the largest stress will be cultural. Science is rapidly moving away from the “cottage industry” of the individual investigator working in an isolated laboratory to the collaborative, multidisciplinary model of “big science”. Medicine has embraced the concept of “evidence-based” practice, yet at the same time that the U.S. public spends as much on alternative medicine as it does on out-of-pocket expenditures for traditional medical treatment. To survive, neurorehabilitation must maintain the pace of scientific and clinical innovation while also retaining the essential elements of successful clinical interaction. I believe that we can do this by focusing on the traditional values of rehabilitation: patient centered, outcomes oriented, and self-critical. These values are not necessarily aligned with professional self-interest.

Neurorehabilitation will “boom” in the coming years, but not all of our current practices, and perhaps not all of our current professions, will survive. There will be no substitute for developing the evidence on which to base clinical practice, and there will be no denying the evidence.

F19 COGNITIVE REHABILITATION | C
EVIDENCED-BASED REHABILITATION OF COGNITIVE FUNCTIONS

S. Cappa (Milan, I)

The burden associated with cognitive dysfunction due to neurological disorders is enormous. Even limiting our consideration to the consequences of focal brain damage in adults, the impact of cognitive disorder on long-term functional prognosis is well-known. Cognitive rehabilitation has a long-standing clinical tradition in some areas of intervention (for example aphasia), and a more recent story in others (such as unilateral neglect or memory disorders following to closed head injury). The last decades have been characterised by an increased sophistication of research in the theoretical background of cognitive rehabilitation, and, to a lesser degree, in the neurological underpinnings of recovery. However, the basic issue of effectiveness remains highly controversial. In the recently published guidelines of the task force on cognitive rehabilitation established by the EFNS, a group of experts from different European countries have provided a critical evaluation of the available evidence, and have considered the specific methodological difficulties associated with evidence-based reviews in this area of clinical medicine. These include the problems associated with the organization of randomised clinical trials of rehabilitation of cognitive disorders, as well as the possible additional contribution of other weaker sources of evidence, such as single case studies.

F20 ROBOTICS | C
INTERACTIVE ROBOTIC THERAPY: CLINICAL EXPERIENCE WITH UPPER-EXTREMITY NEUROREHABILITATION

N. Hogan (Cambridge, USA)

This presentation will review a decade of work focused on creating novel interactive robots to treat and understand motor impairment and disability. An initial pilot study of acute-phase in-patients recovering from stroke was successful and prompted (1) a larger study which showed that these results could be replicated and (2) a follow-up study which showed that the benefits were durable.

Subsequent studies demonstrated that similar and durable benefits could be obtained with chronic-phase stroke victims. Because interactive robotic treatment was administered to these stroke victims long after the period when recovery is usually considered to be complete, this is a striking and promising result. Equally important, interactive robotic therapy evoked a significant reduction of chronic pain which also proved to be durable.

Robotic tools also facilitate fundamental studies of neurorecovery. Kinematic studies of the recovery process showed that, similar to the development of motor behavior in infants, it begins with stereotyped submovements and proceeds by progressively merging these to approach unimpaired motor performance.

Exploration of the likely biology of recovery suggested a way to improve robotic treatment: performance-based progressive robotic therapy is aimed at accelerating a process akin to motor learning postulated to underlie recovery. Initial studies of this new treatment method showed a dramatic improvement over the previous successes.

Initial efforts to extend interactive robotic therapy to a wider range of upper-extremity functions will be reviewed.

F21

MOTOR REHABILITATIONS | BS

THE ROBOT APPLICATION IN THE REHABILITATION OF STROKE PATIENTS

J. Dewald, M.D. Ellis, B.G. Holubar, T. Sukal, A.M. Acosta (Chicago, USA)

Disturbances in movement coordination are the least well understood but often the most debilitating with respect to functional recovery following stroke. These deficits in coordination are expressed in the form of abnormal muscle synergies and result in limited and stereotypic movement patterns that are functionally disabling. The result of these constraints in muscle synergies is an abnormal coupling between shoulder abduction and elbow flexion, which significantly reduces a stroke survivor's reaching space when he/she lifts the weight of the impaired arm against gravity. Whether or not abnormal muscle co-activation and associated joint torque patterns are responsive to intervention is an important issue for stroke rehabilitation given their detrimental impact on the workspace of the impaired arm in individuals with chronic severe impairment. We attempted to reduce abnormal elbow/shoulder joint torque coupling and enhance functional torque pattern production by implementing an isometric protocol that trained individuals to generate complex elbow and shoulder joint torque patterns away from the constraining patterns. Following only 8 weeks (3 sessions per week) of the multi-DOF (degree of freedom) protocol, subjects demonstrated a significant reduction in abnormal elbow flexion torque coupling during maximum shoulder abduction and a subsequent significant increase in ability to generate torque patterns away from the abnormal elbow/shoulder-coupling pattern. Based on these encouraging results we are currently implementing the testing of an Arm Coordination Training 3-D device (ACT 3D) for the measurement and rehabilitation of stroke-induced movement discoordination. The device is designed to deliver novel interventions that train individuals with a broad spectrum of upper extremity reaching impairment to progressively overcome the negative effects of gravity during 3-D reaching and retrieval movements. The ACT 3D also provides high-resolution measurements of physiological (strength and coordination) and functional performance (reaching workspace) evaluating the effectiveness of rehabilitation interventions. Therefore, quantitative outcome measures will be obtained and may be used to evaluate patient progress. Potential underlying neural mechanisms and clinical implications of our approach will be discussed.

F22

ROBOTICS | C

TREADMILL TRAINING WITH THE ROBOTIC ORTHOSIS "LOKOMAT"

R. Riener, G. Colombo (Zurich, CH)

Background: Manually assisted treadmill training has been used for many years in rehabilitation. It could be shown that this training improves walking capabilities in patients with different neurological diseases. The success of locomotor training seems to be dependent on an appropriate afferent stimulation of neuronal centres within the central nervous system.

Objectives: The Lokomat was developed too improve the possibilities of the locomotor training and to reduce workload of the therapists that are assisting the leg movements during manually assisted training. This device allows automatic movements of the legs of non-ambulatory patients during locomotion therapy. In addition the instrumented robot has the possibility to assess different motor functions of the patients during training.

Methods: With the Lokomat several performance variables can be determined in order to assess the motor function and biomechanical status of the patient. The measured variables will range from gait performance, spasticity and range of motion to voluntary motor control. The outcome measures obtained will be validated against standard clinical and functional measurement methods. It is expected, that the accuracy of this kind of measurements will be higher than standard manual measurements.

Also "patient-cooperative" techniques were developed, where the technical system considers the patient intention and efforts rather than imposing any predefined movement. It is hypothesized that cooperative approaches have the potential to improve the therapeutic outcome as they motivate the patient to actively contribute to the leg movement.

Findings: It has been shown that the Lokomat can be applied to different patient groups and there is already some evidence for functional improvements with some patient groups. Lokomat-based motor assessment techniques could successfully be implemented and are currently being evaluated in a clinical study. Cooperative control strategies have also been implemented and were tested on single subjects.

Conclusion: More intensive treadmill training in terms of duration and load can be performed in certain neurological patients with considerably less workload for the therapists. The induced gait pattern is more physiologic than in manually assisted therapy and the functional benefit for some patient groups could clearly be shown. The Lokomat has the potential to assess motor functions and to better incorporate patient activity.

F23

PEDIATRIC REHABILITATION | C

POSSIBILITIES FOR INTERVENTION IN YOUNG CHILDREN WITH DEVELOPMENTAL MOTOR DISORDERS

M. Hadders-Algra (Groningen, NL)

Early intervention in infants with neurological dysfunction aims at 1) promotion of social, emotional, intellectual, motor and physical development, 2) prevention of secondary problems and 3) support of the family. However, no consensus exists about the best way to achieve these goals. This holds true for young infants being taken care of in the hospital, for instance in the neonatal intensive care unit (NICU), but also for older infants cared for at home.

In the NICU environment intervention varies between stress reducing programmes such as Kangaroo Care and Newborn Individualized Developmental Care and Intervention Program (NIDCAP), stimulation and developmental programmes, including NeuroDevelopmental Treatment (NDT), and programmes consisting of a mix of stimulation and stress reduction. The effect of these programs is heterogeneous, with the NIDCAP intervention having

the best documented results. Evidence suggests that NIDCAP has a positive effect on the infant's cognitive development, but not on motor development.

Programs for management of infants with neurological dysfunction in the home environment vary between infant stimulation programs such as the Portage Program and physiotherapeutical programs such as NDT or Vojta. The principle of the infant stimulation programs is that a trained paraprofessional home visitor uses an individual assessment of the infant to develop short- and long-term objectives for developmentally sequenced behaviours in six areas: infant stimulation, cognition, language, self-help, motor and socialization. Various studies indicated that infant stimulation programs have a beneficial effect on infant development. However, up till now it could not be demonstrated that NDT or Vojta have a positive effect on infant motor development. The absence of effect is remarkable as animal research suggests that intervention in early life can have a positive developmental effect. Possibly the absence of beneficial effect of early NDT and Vojta are due to the contents of these therapies, which aims at normalization of motor behaviour and reflex inhibition. Novel concepts on normal and abnormal motor development, such as the neuronal group selection theory suggest that keywords in early intervention in motor disorders might be variation and stimulation, whilst disregarding the aspect of normality of motor behaviour. Current research aims at testing the efficacy of this approach.

F24 PEDIATRIC REHABILITATION | C **PEDIATRIC REHABILITATION – EVIDENCE OF ABSENCE**

D.A. Johnson (Edinburgh, UK)

The concept of evidence-based medicine in pediatric neurorehabilitation carries a number of assumptions:

1. A complete recovery does not occur after injury to the developing brain
2. Clinical prognosis is accurate and meaningful
3. Rehabilitation services exist in hospital, school and community sectors.
4. Longitudinal follow-up continues into adulthood.

Unfortunately, the present state of knowledge offers little support for those assumptions. Essential evidence is sadly lacking for both evidence-based practice and, more fundamentally, pediatric rehabilitation generally.

Whilst the meta-analytic approach of evidence-based medicine may be appropriate for adult neurorehabilitation, the problem for pediatrics is the absence of interaction between scientists and clinicians, in the context of persistent misunderstanding and ignorance.

This presentation will consider the problems underlying these assumptions. Further, the ethical, moral and legal perspectives of continued professional and scientific neglect will be discussed in relation to an ageing population.

F25 COGNITIVE REHABILITATION | C **TECHNOLOGICAL AIDS FOR PEOPLE WITH MEMORY DEFICITS**

J. Evans (Glasgow, UK)

Technology has great potential for enabling people with memory impairments to compensate for their deficits, but to date has been under-utilised. In this paper I will review the range of “off-the-shelf” technological aids that are available, the evidence for their effectiveness with people with memory impairment and discuss their limitations. Adaptations of available technology offer greater promise of meeting the needs of people with memory impairment and two examples of such adaptations will be presented. NeuroP-

age, a paging based reminding system, is the only technological memory aid evaluated in a large scale randomised controlled trial, and is now available as a national reminding service in the UK. MemoJog, which is based on a Personal Digital Assistant platform, uses a new interface designed around the specific needs of people with memory impairment. Finally applications of alerting technology for improving prospective memory and “goal management” in patients with deficits in executive functioning will be discussed.

F26 COGNITIVE REHABILITATION | C **REHABILITATION OF ATTENTIONAL DEFICITS**

A. Dove, T. Manly (Cambridge, UK)

Executive functions refer to a range of high-level abilities that includes planning, using goals to guide our behaviour in everyday life, and the control of attention. These capacities are thought to be particularly dependent on the integrity of the frontal lobes – structures that are rather vulnerable in traumatic brain injury. Deficits in executive function can be subtle and difficult to measure using standard neuropsychological tests and yet have disastrous consequences for everyday functioning. Such difficulties may also undermine the effective use of other capacities that may be relatively intact. As the very functions that may support recovery and adaptation to injury (e.g. mental flexibility, insight) are compromised, rehabilitation in this area is inherently challenging.

One way to look at executive functioning deficits is not that these capacities are completely absent, rather that they are used unreliably or too intermittently. In a series of ongoing studies we have used environmental and technological manipulations to see whether we can increase the frequency of patients' “executive moments”. Beginning with a computerised measure – that, for example, can be used in brain scanning studies – we have examined in detail the effect of periodic environmental cues for patients to maintain their attention. We have subsequently extrapolated these effects to more complex, life-like measures and shown that the performance of patients can be effectively normalised by such manipulations. Such effects are useful in assessing the level at which patients are experiencing difficulty and in suggesting useful rehabilitative techniques. Our current work is examining whether these effects can be reliably extended into patients' everyday lives.

F27 COGNITIVE REHABILITATION | C **COMPUTER-BASED TREATMENT FOR ANOMIA IN APHASIA**

M. Laganaro (Geneva, CH)

Among the factors predicting the outcome of therapy for aphasia, the treatment intensity seems to be an important predictor (*Basso & Caporali, 2001; Bhogal, Teasell, & Speechley, 2003; Denes, Perazzolo, Piani, & Piccione, 1996*). Intensity can be conceived either in terms of number of therapy sessions over a given period of time, or in terms of intensity of task and item repetition during therapy. Both issues of intensity can be addressed by the introduction of computer assisted treatment (CAT) in therapy for aphasia. Studies on computer assisted therapy (CAT) have shown encouraging outcome with chronic aphasic speakers, especially when the CAT programs focus on specific aphasic impairments, anomia for example (*Pedersen et al. 2001, Fink, Brecher, Schwartz and Robey, 2002*). In a preliminary study (*Laganaro, Di Pietro and Schnider, 2003*) we showed that individually adapted CAT can be effective as an adjunct to clinical therapy for anomia, not only with chronic aphasic out-patients but also in acute in-patients. In that study CAT proved to be a useful means to increase the number of therapy sessions. In a further study (*Laganaro, Di Pietro and*

Schnider, subm.) we directly addressed the question of intensity in CAT for anomia. Our results suggested that the effect of therapy for anomia also depended on the number of treated items. This is probably linked to the fact that the speed of recovery depends on the linguistic properties of the treated items and can vary according to the anomia type. Perspectives on the introduction of CAT in order to increase treatment intensity and number of items in therapy for anomia are discussed.

F28 LEGAL ISSUES | BS
THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH (ICF): HISTORY, BACKGROUND AND PHILOSOPHY

J. Hollenweger (Zurich, CH)

In 1980, the World Health Organisation (WHO) published a new framework to clarify the nature of disabilities. Just one year later – the International Year of Persons with Disabilities – the ICIDH (International Classification of Impairments, Disabilities and Handicaps) provoked criticism, mainly from consumer and advocacy groups – the emerging voice of persons with disabilities themselves. The initial ICIDH model will be described along with the successive criticisms mainly by disability advocates. This eventually led to its revision.

The first version of the revised classification which was widely circulated was the Beta-1 version of the ICIDH-2. A Beta-2 version followed with some conceptualisations altered and improved. International field trials were carried out and the results analysed. Particular attention was accorded to the distinction between the conceptualisation of activities and participation. These considerations led to encompassing these two dimensions into a single domain. This development and the guiding principles that underpinned the revision process will be explored.

As a result of these efforts, the ICIDH-2 was approved in 2001 by the World Health Assembly in 2001 and renamed “International Classification of Functioning, Disability and Health”. The philosophy of the ICF along with its purposes and limitations will be explored in this paper.

F29 LEGAL ISSUES | BS
ICF: BASIC STRUCTURE

K. Theodoroff (Hermagor, A)

The “International Classification of Functioning, Disability and Health” (ICF) provides a description of situations with regard to human functioning and its restrictions. It may serve as a framework to organize this information. It structures the information in a meaningful, interrelated and easily accessible way.

ICF organizes information in two parts. Part 1 deals with Functioning and Disability, Part 2 covers Contextual Factors. Each part has two components.

Part 1: Functioning and Disability: The Body component comprises 2 classifications: one for functions of body systems and one for body structures. The chapters in both classifications are organized according to the body systems.

The Activities and Participation component covers the complete range of domains denoting aspects of functioning from both an individual and a societal perspective (i.e. activity and participation).

Part 2: Contextual Factors: A list of Environmental Factors is the first component of Contextual Factors. Environmental factors have an impact on all components of functioning and disability. Personal Factors are also component of Contextual Factors but they are not classified in ICF because of the large social and cultural variance associated with them.

The components of Functioning and Disability can be expressed in two ways. On the one hand they can indicate nonproblematic (i.e. neutral) aspects of health-related states summarized under the umbrella term “functioning”; on the other hand they can be used to indicate problems (e.g. impairment, activity limitation or participation restriction) summarized under the umbrella term “disability”.

A person’s functioning and disability is conceived as a dynamic interaction between health conditions (diseases, disorders, injuries, etc.) and contextual factors (including both personal and environmental factors). The basic construct of the Environmental Factors component is the facilitating or impeding impact of features of the physical, social and attitudinal world.

All components classified in ICF are quantified using the same generic scale (qualifying terms: 0=none, -1=mild, -2=moderate, -3=severe, -4=complete). Having a problem may mean an impairment, activity limitation, participation restriction or barrier depending on the construct. For quantification to be used in a specific manner, assessment procedures need to be developed.

F30 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C
ICF IN CLINICAL NEUROREHABILITATION: GOAL SETTINGS AND EVALUATION

P. Frommelt (Schauffling, D)

This presentation will focus on the use of the ICF in clinical neurorehabilitation. It will outline our own approach in incorporating the ICF into goal-setting and as a tool for assessing work-related disabilities in persons with neurological disorders. As others have noted the introduction of the ICF in daily practice is neither easy nor is the benefit immediately evident for those who are expected to use this classification. One of the pioneering work has been presented by Rensch and his team from Luzern.

Why is it useful to introduce the ICF into clinical practice? The main gain is the theoretical construct on which the ICF is based. It shifts the focus from a medical model of rehabilitation towards a social perspective in which person and social context interact. The inclusion of the component of context transforms the traditional individualised perspective of disease. In a way the ICF facilitates a movement towards an community based rehabilitation. The social model of chronic diseases as outlined by the ICF and operationalised in the component of participation has not been the dominant disease-model in professional training at least not in Germany. Training staff in the philosophy of ICF can be used to form a new common paradigm of neurorehabilitation and establish basic concepts shared by different professions. In practical application the goal setting based on the ICF changes the process from a symptom- to a participation-orientation. In a bottom-down approach the long-term goals referring to preferred social roles are defined and then in a deductive process the lower level functional goals which lead towards the participation goals. The workshop will provide practical examples for the goal-setting process. While the framework of ICF is finding increasing support by large professional organization e.g. the American Psychological Association, there are different obstacles which impeded the use of the item-list and its coding. The volume with over 1100 items makes it nearly impossible to include the total catalogue into busy clinical practice. In addition, the terminology is often different from traditional professional language. A further obstacle is the lack of operationalization of the coding-system. At the present time we would prefer to regard the item-list of the ICF as a tool box from which one selects items as needed for special questions. We will illustrate the way of selecting appropriate items.

F31 MOTOR REHABILITATION | C
IMPAIRMENT-ORIENTED TRAINING FOR ARM PARESIS AFTER STROKE: A SINGLE BLIND, RANDOMISED, CONTROLLED MULTICENTRE TRIAL

T. Platz, C. Eickhof, S. van Kaick, U. Engel, C. Pinkowski, S. Kalok, M. Pause (Berlin, Bad Segeberg, Magdeburg, D)

Background: The effects of intensified arm rehabilitation as either Bobath therapy or the impairment-oriented training (Arm BASIS training) in subacute stroke patients were investigated by a single blind randomised controlled multicentre trial.

Methods: Sixty-two anterior circulation ischemic stroke patients were randomly assigned to either (a.) no additional therapy, or 20 units of additional arm therapy as either (b.) Bobath therapy or (c.) Arm BASIS training. Main outcome measure was the Fugl-Meyer arm motor score, secondary measure the Action Research Arm test (ARA). Ancillary measures were the Fugl-Meyer arm sensation and joint motion/pain scores and the Ashworth scale (elbow flexors). Analyses were primarily efficacy analyses.

Findings: After 4 weeks the group who received the Arm BASIS training (n=20) had higher gains with the Fugl-Meyer score than the group receiving Bobath therapy (n=20) (mean [95% CI] of change scores: Bobath 7.2, 2.6–11.8; BASIS 12.6, 8.4–16.8; P=0.0432). Passive joint motion/pain deteriorated less in the group who received BASIS training (mean [95% CI] of change scores: Bobath -3.2, -5.2--1.1; BASIS 0.1, -1.8–2.0; P=0.0090). Neither the ability to handle objects (ARA), nor sensation or resistance to passive movement (Ashworth) were affected by intensity or either therapeutic strategy.

Interpretation: The intensified arm rehabilitation with the impairment-oriented training (Arm BASIS training) enhanced motor recovery. Recovery scores were increased by the training by more than 50% on average. Specificity of training seemed more important for motor recovery than intensity.

F32 COGNITIVE REHABILITATION | C
VISUO-MOTOR DEFICITS AND THEIR REHABILITATION

R. Müri (Bern, CH)

Visuo-motor deficits are often the consequence of acquired brain damage, especially in patients with traumatic brain injury. Central visual disturbances and eye movement disorders are found in 20 to 40% of patients with brain damage, and up to 50% of patients with traumatic brain injury have visuo-motor deficits. Furthermore, many outcome studies demonstrated that patients with additional visuo-motor deficits have a poorer outcome and that a longer rehabilitation is needed compared to patients without visuo-motor deficits. The reason for visual and visuo-motor disturbances may be localized at several levels involving ophthalmologists, neurologists, or psychologists. To improve the quality of neurorehabilitation, a systematic evaluation of visuo-motor function in such patients is important and needs an interdisciplinary approach. The early diagnosis of visuo-motor disturbances is mandatory for an appropriate treatment and rehabilitation of the deficit. The aim of this talk is to give an overview of the most relevant visuo-motor disturbances in acquired brain damage with the diagnostic evaluation and procedures, and their rehabilitation.

F33 BS
ENTWICKLUNG VON LEITLINIEN FÜR DIE SCHLAGANFALLREHABILITATION: ERGEBNISSE DER KTL-DATENANALYSE

P.W. Schönle, R. Kattein, S. Rose, H. Klosterhuis (Magdeburg, Berlin, D)

Im Rahmen des von der BfA initiierten Leitlinienprogramms, das auf die Entwicklung von evidenzbasierten Leitlinien in der

Rehabilitation abzielt, wurden in der vorliegenden Untersuchung 8 evidenzbasierte Therapiemodule (ETM) auf der Grundlage einer systematischen Recherche und Analyse der wissenschaftlichen Literatur der Jahre 1988 bis 2002 gebildet. Sie wurden um 5 praxisbasierte Module (PTM), für die keine wissenschaftliche Evidenz eruiert werden konnte, ergänzt, um die gesamte Breite der neurologischen Rehabilitation der Patienten mit Schlaganfällen erfassen zu können. Den Therapiemodulen wurden die KTL-dokumentierten Leistungseinheiten der Schlaganfallrehabilitation bei BfA-Patienten zugeordnet. Insgesamt wurden die Datensätze von 8.876 AHB-Patienten der BfA aus den Jahren 2001 und 2002 mit 142.951 Leistungen und 1.071.885 Terminen ausgewertet, bei denen die Diagnose Schlaganfall gestellt und mit I60, I61, I62, I63, I64 oder G45 bzw. G81 codiert worden war. Letztere wurden einbezogen, wenn einer der I-Codes in einem der restlichen Diagnosefelder zusätzlich vorkam.

Es zeigte sich, dass für die Schlaganfallrehabilitation in den untersuchten Kliniken ein komplexes multimodulares Behandlungskonzept angeboten wird und in fast allen Kliniken in der ganzen Breite der verschiedenen Therapiemodule zur Anwendung kommt. So nehmen die Patienten an Leistungen aus durchschnittlich 7,3 verschiedenen Therapiemodulen teil. Im Vordergrund stehen dabei die „motorischen Module“, die in der AHB-Phase, der akuten Phase der Rehabilitation, in allen Kliniken die größte Bedeutung haben. Hirnleistungstraining, Sprachtherapie und insbesondere ETM 7 (Kompetenztraining/Steigerung der psychischen Leistungsfähigkeit) kommen hingegen weniger zur Anwendung und bilden möglicherweise erst in späteren Phasen der Rehabilitation Behandlungsschwerpunkte.

Eine sehr große Variabilität zeigte sich zwischen den einzelnen Kliniken 1) hinsichtlich der Anzahl der Patienten, die ein Therapiemodul in Anspruch nahmen (ETM 5 und 6 variierten beispielsweise zwischen 18% und 100%); 2) hinsichtlich der Therapieintensität und der Therapiedauer. Die Therapieintensität (alle Termine aller Module pro Patient pro Woche) schwankte zwischen 15 und 52,2 Terminen pro Patient und pro Woche bei einem Mittelwert von 23,5 Terminen über alle Kliniken hinweg. Die mittlere Therapiedauer lag in der Gesamtstichprobe aller Kliniken bei 12,4 Stunden und schwankte zwischen 8,8 und 31,2 Stunden pro Patient pro Woche. Für die Interpretation der relativ großen interklinischen Unterschiede können verschiedene Ursachen herangezogen werden. Intrinsisch könnten krankheits- und „organ“-spezifische Faktoren eine Rolle spielen, insofern als beim Schlaganfall sowohl hinsichtlich des Funktionsstörungsprofils als auch hinsichtlich des Schweregrads der einzelnen Funktionsstörung und des Gesamtschweregrads der kombinierten Funktionsstörungen erhebliche Unterschiede zwischen den Patienten zu beobachten sind. Ferner könnte die Belastbarkeit, die schnelle körperlich und/oder geistige Erschöpfung von Bedeutung sein. Andererseits könnten extrinsische Faktoren, wie z. B. Personalmangel in bestimmten Bereichen oder organisatorische Aspekte eine gewisse Rolle spielen.

Diese Ergebnisse unterstreichen die Notwendigkeit einer Optimierung der Schlaganfallrehabilitation im Sinne der Leitlinienvorgabe und -implementierung. Gleichzeitig wird aber deutlich, dass bei der Entwicklung der Leitlinien die Ursachen der hohen Variabilität zu berücksichtigen sind.

Darüber hinaus zeigen die Ergebnisse der Untersuchung die Bereiche der Rehabilitation auf, in denen dringender Forschungsbedarf gegeben ist, und besitzen dementsprechend eine förderpolitische Relevanz.

Oral communications

01 COGNITIVE REHABILITATION | C THE INFLUENCE OF LEFT HAND MOVEMENT USING NEUROMUSCULAR ELECTRICAL STIMULATION ON UNILATERAL VISUO-SPATIAL NEGLECT FOLLOWING RIGHT-SIDED STROKE

R. Etherington, J. Burridge, P.N. Taylor (Southampton, UK)

Research shows active and passive movements of the left upper limb in left space can reduce the effects of unilateral visuo-spatial neglect following stroke [1]. Following stroke there is often little or no movement in the affected arm, limiting the limb activation technique. Passive movements rely on the presence of a therapist. Neuromuscular electrical stimulation (NMES) may be considered as an alternative intervention as it elicits movement where there is none or it is ineffectual. NMES is used to improve voluntary control using cyclical stimulation (passive). The effect of NMES may also be enhanced by using the electromyogram (EMG) signal from the target muscle to trigger stimulation (voluntarily activated) [2]. There are no previous research studies on the effects of voluntary activated NMES on neglect, though sensory stimulation and cyclic NMES have some effect [3].

The objective of this study was to measure the effect of voluntary activated NMES, cyclic NMES, sensory stimulation and active movements on a test of neglect, compared to a no movement control condition. Eight participants with left neglect following stroke were recruited and stratified into group A (some hand activity, n=3) and group B (no hand activity, n=5). Participants conducted the star cancellation test (SCT) eight times on two days, with four administrations of the test under each experimental condition in a randomised order.

Results showed improvement in two participants in 1) voluntary activated NMES and 2) sensory and cyclic stimulation, but this was not statistically significant. No statistically significant difference was found between conditions. Confounding variables such as other attentional factors and fatigue were thought to affect the performance of the SCT.

There is little evidence from this study that NMES has an effect on UVN, though the small size of the study sample may have resulted in a type II error. The greatest improvement was seen in one participant with EMG-triggered stimulation suggesting that the combination of NMES with voluntary activation was effective in this one case. Future studies should consider studying a larger sample, increasing the dosage of NMES, or using an alternative test for neglect. NMES may reduce neglect for certain cases and single subject case studies may be an appropriate design for future research.

References:

1. Robertson IH and Hawkins K: Limb activation and unilateral neglect, *Neurocase* 1999; 5: 153-60
2. Francisco G, Chae J, Chawla H, Kirshblum S, Zorowitz R, Lewis J, Pang S: Electromyogram-triggered neuromuscular stimulation for improving the arm function of acute stroke survivors: a randomised pilot study, *Archives of Physical Medicine and Rehabilitation* 1998; 79: 570-75
3. Eskes GA, Butler B, McDonald A, Harrison ER, Phillips SJ: Limb activation effects in hemiparetic neglect, *Archives of Physical Medicine and Rehabilitation* 2003; 84: 323-328

02 COGNITIVE REHABILITATION | C A THREE YEAR FOLLOW-UP OF THE COGNITIVE DEVELOPMENT OF STROKE AND TBI PATIENTS WITH EXECUTIVE IMPAIRMENTS

B. Stemmer, T. Leim, S. Lacher, P.W. Schönle, (Montreal, CAN; Magdeburg, D)

The cognitive development of 90 patients with executive impairments (30 traumatic brain injury (TBI) and 60 non-aphasic stroke patients) and 40 non-aphasic stroke patients without executive impairments were followed up from time of admission to three years after discharge from neurological rehabilitation. The patients were submitted to a series of neuropsychological tests and behavioral scales at the time of admission and 6, 12 and 36 months after discharge.

At the time of admission TBI and non-aphasic stroke patients were impaired to a similar degree in their executive abilities, that is to reason, plan ahead, sequence actions and in mental flexibility. They showed additional impairments across a broad spectrum of memory and attention functions. The most pronounced difference between the two groups was the strong attenuation of processing speed in the TBI patients compared to the stroke patients and the inadequacy of the TBI patients to judge their own cognitive abilities. All three patient groups showed emotional impairments which were, however, more pronounced in the two groups with executive impairment. In the stroke group emotional impairment showed as depressive symptoms whereas the TBI patients were more impaired in their affective behavior. The strongest improvement across the entire impairment spectrum occurred in the first 6 months after discharge from neurological rehabilitation. Compared to the executively impaired stroke patients, the TBI group recovered more steeply and reached a similar level of cognitive functions. However, the two groups were still significantly impaired compared to the stroke patients without executive impairment.

One year after discharge the three groups were well integrated socially – no difference was found between the groups. As to cognitive development, not much had changed except that now the TBI group had slightly surpassed the executively impaired stroke group although both groups continued to be more cognitively impaired than the non-executively impaired stroke group.

Three years after discharge from neurological rehabilitation depressive symptoms, physical status, attention and processing speed showed to be the most important factors influencing quality of life in the stroke patients. Data concerning other cognitive functions at three years after discharge are currently being analyzed and will also be presented.

03 FUNCTIONAL IMAGING | C ACTIVATION OF THE BILATERAL PREFRONTAL CORTEX IN PATIENTS WITH FRONTAL LOBE LESIONS AFTER SEMANTIC COGNITIVE TRAINING

E. Miotto, C.R. Savage, B.A. Wilson, J.J. Evans, M.G.M. Martins, P.H. Pires de Aguiar, S. Iaki, E. Amaro Jun. (Sao Paulo, BRA; Kansas City, USA; Cambridge, UK)

Objectives: Semantic organizational strategy performs an important role in learning and memory. It is supported by distinct regions of the prefrontal cortex (PFC) including, inferior prefrontal cortex (IPFC) and dorsolateral prefrontal cortex (DLPFC). However, there has been no investigation of which specific areas in the PFC are engaged after cognitive training using semantic organizational strategies in patients with frontal lobe lesions. The aim of the present study was to investigate the effects of semantic strategic training on brain activity and behavioral performance using fMRI and its implications for patients with PFC lesions.

Methods: 23 patients, 12 with left frontal (LF), 11 with bifrontal (BF) lesions and 15 right handed normal control subjects were

included, using a fMRI block design (GRE EPI TR: 2s /TE: 40ms/ 15 axial slices/3.125 x 3.125 x 7.7 mm voxels) in a 1.5 T magnet. Subjects were studied during the encoding of word lists visually presented in 3 conditions: unrelated, related non-structured and related structured. Statistical inference was based in a non-parametric approach and the comparisons were performed using ROI analyses and cluster based ANOVA tests.

Results: A significant bilateral DLPFC activation was found for both, the patients and the controls, after cognitive training. Signal changes were also found in the right orbital frontal cortex (OFC) and IPFC for the LF and left IPFC for the BF group. In addition, there was a significant improvement in word list recall and increased use of semantic organizational strategy after training.

Conclusions: This study demonstrated that training-induced changes in strategic semantic episodic memory performance were related to increased bilateral prefrontal cortical activation. These behavioral and signal changes observed may reflect the recruitment of a network of areas, each area playing a specialized role in one or more aspects of the strategic semantic operations.

04 COGNITIVE REHABILITATION | C NEUROPSYCHOLOGISCHE TELE-REHABILITATION BEI KORTIKALER BLINDHEIT

W. Widdig, D. Wagner, B. Pleger, J. Schmitz, J.-P. Malin, M. Tegenthoff (Bochum, D)

In Tier-Experimenten konnte gezeigt werden, dass periläsionell zu okzipitalen Läsionen liegende Neurone inhibitorische Stoffwechsel-Prozesse verringern zugunsten von exzitatorischer neuraler Aktivität. Diese Neurone erwiesen sich bei spezifischer repetitiver visueller Stimulation als in hohem Maße und auf Dauer lernfähig. Dieses hohe plastische Potenzial ermutigte uns zur Entwicklung einer repetitiven visuellen Stimulationstherapie für Patienten, die unter kortikaler Blindheit leiden. Dabei gingen wir von der Hypothese aus, dass gezielte visuelle Stimulation die Verarbeitungsfähigkeit nicht geschädigter und potentiell funktionsfähiger Neurone des visuellen Systems erhöht, so dass sich das Ausmaß der kortikalen Blindheit mit der Zeit merklich reduziert.

In Einzelfallstudien konnten wir, abhängig von Art und Ausmaß der neuronalen Läsion, die Effizienz der von uns entwickelten Stimulationsmethode belegen, wobei fMRI-Studien eine vor Therapiebeginn reduzierte neurale Aktivität des okzipitalen Kortex zeigten, nach Therapieende aber eine Aktivitäts-Steigerung als auch eine Vergrößerung des okzipitalen Aktivitäts-Areals erkennen ließen, parallel zur Verbesserung der visuellen Performanz.

Die Möglichkeit, diese Therapie über das Internet durchführen zu können, bedeutet einen erheblichen Fortschritt, werden doch über mehrere Monate dauernde Klinikaufenthalte unnötig. Nach einer initial stationären Diagnostik von nur wenigen Tagen, wo der Status der visuellen Wahrnehmungsfähigkeit getestet und der Patient anschließend in die für ihn speziell angepasste Therapiemethode eingewiesen wird, kann nach Vergabe eines Passworts die Therapie zu Hause fortgesetzt werden. Der Therapieverlauf wird kontinuierlich kontrolliert und der Patientenleistung, wenn nötig, täglich angepasst. Über ein spezielles telemedizinisches Kontrollsystem, zu dessen Administratoren-Programm nur der behandelnde Neuropsychologe Zugang hat, kann der individuelle Leistungsstand insgesamt, aber auch sofort nach jeder Therapiesitzung abgefragt werden. Zwischen Patient und Therapeut besteht so eine permanente Interaktivität, die ein Höchstmaß an therapeutischer Nähe und Flexibilität erlaubt. Virtueller ist der begleitende Neuropsychologe bei jeder einzelnen Therapiesitzung als kontrollierende und steuernde Instanz dabei.

05 MOTOR REHABILITATION | C EFFECTS OF DYNAMIC HIGH-INTENSITY RESISTANCE TRAINING ON UPPER-EXTREMITY MOTOR FUNCTION AND POWER IN POST-STROKE HEMIPARESIS

C. Patten, D. Kothari, E.G. Condliffe, Ch. Dairaghi, P.S. Lum (Palo Alto, USA)

We conducted a randomized clinical trial investigating task-specific upper-extremity motor relearning (FMRT) and FMRT combined with high-intensity resistance training (STR) to better understand the mechanisms of therapeutically-induced gains in upper-extremity motor function. Twenty persons with chronic post-stroke hemiparesis (mean age: 69±9yrs, mean time since CVA: 13±3.9mos, mean baseline upper-extremity Fugl-Meyer: 40.2±12.2), participated in a cross-over design involving 4 weeks each of FMRT and STR, in random order, separated by a 4 week washout. FMRT was structured according to principles of motor relearning while STR involved FMRT combined with isokinetic resistance training of 4 reciprocal upper extremity joint/muscle actions: shoulder flex/ext, shoulder abd/add, shoulder ext/int rotation and transverse plane elbow flex/ext. All actions were trained using 3 sets of 10 repetitions at two isokinetic speeds which were systematically advanced with each week of treatment. At baseline, following each treatment and at 6 month follow up, torques were measured in 5 key actions: shoulder flex, abd and ext rotation and transverse plane elbow flex and ext at three criterion speeds: 30, 75 and 120 deg/s. EMG was sampled concurrently from 8 muscles: biceps brachii, triceps brachii, anterior, middle and posterior deltoid, infraspinatus, brachioradialis and pectoralis major and normalized to muscle specific isometric maximum. STR produced greater effects on impairment (Fugl-Meyer shoulder-elbow score, 2.44±.47), function (Wolf Motor Function Test, FAS .41±.10), and disability (FIM, 3.72±.7) as compared to FMRT (Fugl-Meyer 1.46±.56; FAS .07±.10; FIM, 2.45±.74), $p < .05$ for all indicators. Ashworth scores were unchanged following either therapy indicating that spasticity was not exacerbated following high-exertion activity ($p > .10$). Composite isometric torques and agonist muscle EMG increased following STR. Initially, many subjects were unable to produce torque at higher criterion speeds. Isokinetic torques were evaluated by deriving power (torque X velocity) at a fixed range of motion for each action. Power was markedly increased (27–30%) in response to STR, but not FMRT (0%) ($p = .01$). These data indicate that a hybrid therapy including high-intensity resistance training is safe and more effective than FMRT for upper-extremity rehabilitation in post-stroke hemiparesis. Improved power, torque production in a moving joint, underlies functional gains.

06 EPILEPSY | C AGE OF ONSET, COGNITION AND NEURAL PLASTICITY IN TEMPORAL LOBE EPILEPSY

M. Sitskoorn, S. Ebisch, C. van Veelen, P. van Rijen (Utrecht, NL)

Introduction: According to the Kennard principle, consequences of brain lesions in infancy might be less severe than those of similar injuries in adulthood. Hebb stated that early injury might prevent the development of some intellectual capacities (especially those that require a large amount of tissue for their first establishment), that would not have been destroyed by a similar injury in adulthood.

Purpose: To investigate the influence of the age of onset of temporal lobe epilepsy on general intellectual functioning and specific hippocampus dependent learning. On the basis of the Kennard and Hebb principles we expect that general intelligence might be disrupted by an early age of onset while specific hippocampus

learning might not. The reverse might be true for late age of onset. **Methods:** We investigated intellectual functioning (WAIS IQ) and verbal associative memory (a task for hippocampus dependent learning) in 29 patients with temporal lobe epilepsy and 20 healthy controls. Patients were tested prior to an amygdala-hippocampotomy. The patients were subdivided in a group with an early age of onset (<5 years, N=7) and a late onset group (>5 years, N=22). **Results:** Kruskal Wallis test showed a significant difference between the three groups ($\chi^2=8.453$, $p<.015$) on verbal associative memory. Post-hoc comparisons, Bonferroni corrected, revealed an impaired recall in the late onset group ($Z=-2.43$, $p<.015$) relatively to the control group. The early onset group did not differ significantly from the control group. Also no significant difference was found between the early and the late onset group. With respect to general intellectual functioning the early onset group (N=6) performed significantly worse than the late onset group (N=21) on both verbal IQ ($Z=-2.191$, $p<.05$) and perform IQ ($Z=-2.105$, $p<.05$).

Conclusion: Our data suggest that an early age of onset of temporal lobe epilepsy interferes with general intellectual development but not with specific hippocampus dependent learning. The data are discussed in terms of brain plasticity principles.

07 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C REHABILITATION OF PATIENTS WITH CNS INJURIES: HOW MUCH OUTCOME FOR HOW MUCH TREATMENT EFFORT?

J. Sönke, P. Zanger (Bellikon, CH)

At its core neurorehabilitation acts to improve the outcome after damage to the CNS. Two major goals are to optimise the individuals' quality of life (qol) and to minimise the socioeconomic burden of disease.

The aspects of human life which are relevant for rehabilitation have been classified by the WHO in the International Classification of Functioning, Disability and Health (ICF). ICF components include domains concerning body structure, functions and patients' participation. In some countries selected domains serve as indicators for the management of the rehabilitative process, such as the activities of daily living. These indicators are statistically analysed in outcome studies and may be used to assess the rehabilitative progress on an individual basis.

Most affected individuals seek to continue treatment even if their progress is minimal. In contrast the law requires medical insurance in most West European countries to cover only therapies which are necessary and adequate. The management of these diverging demands constitutes an important aspect of patient care. Guidelines integrating the different perspectives would benefit all but are largely missing in West Europe.

In this situation we provide a review of quality of life measures in conjunction with a socioeconomic cost analysis for the rehabilitation of patients with CNS injuries. We outline the varying relation between improvements in function and participation and improvements in qol. To date it has not been fully understood how rehabilitative improvements in function and participation act to modulate the individuals' quality of life. We integrate these findings into a socioeconomic analysis from a societal perspective and argue that from this perspective it may be possible to focus the rehabilitative efforts without loss of outcome.

Based on these data we developed a number of care paths for our hospital. These paths are based on the ICF concerning diagnostics, communication within the rehabilitative team, definition of goals to be achieved at discharge and the selection of appropriate therapies. In parallel we introduced a patient based accounting system. We demonstrate that with this method reductions in treatment

costs are possible without loss of treatment outcome. We argue that from the societal perspective patient care paths should routinely be based on a cost-benefit analysis of rehabilitative efforts.

08 TRAUMATIC HEAD INJURY | C EARLY NEUROREHABILITATION FOLLOWING TRAUMATIC BRAIN INJURY (TBI) IN 100 PATIENTS – PREVIOUS RESULTS FROM A MULTI CENTRE PROSPECTIVE CLINICAL STUDY ON 6800 TBIs

K. von Wild (Münster, D)

Objectives: Lack of reliable figures on epidemiology of TBI and effectiveness of functional neurorehabilitation after TBI year required this prospective clinical study. What is the management quality about regarding the acute "early" rehabilitation (phase "B" according to the German classification of rehabilitation)? Could we improve the TBI patients early outcome by using the given standard medical treatment as well as by routinely compliance with guidelines Data collection for this multi centric study had to be restricted to two defined regions in Germany, both providing comparable standards of public health care and trauma care system. The study was aimed to evaluate the quality of the acute and postacute management of TBI patients in 2000–2002.

Methods: Prospective multi centre study on epidemiology, acute hospital care and neurorehabilitation of patients because of the anamnesis of an acute TBI of all kind of severity (GCS) in the regions of Hanover and Muenster within one year. Definition of acute TBI according to ICD 10: S 02, S 04; S 06, S 07, S 09 in combination with at least two out of following complaints: dizziness or vomiting; retrograde or anterograde amnesia; consciousness disturbances; skull fracture; focal neurological impairment. Data collection was supervised and statistically analysed by ZQ Hannover in cooperation with the TBI advisors .

Early outcome was assessed according the Glasgow outcome scale (GOS) scores 1–5.

Results: 6.819 patients were admitted to one of 27 hospitals between 1.3.2000 to 1.3.2001 with completed files in 6.783 TBIs (58% male). Incidence was 368 TBIs/100 000. Severity: mild in 319, moderate in 32, severe in 16 TBIs/100.000. 75% of TBIs were hospitalised. Age groups: 28% <1 to 15 years; 11% TBIs >75 years. Review of 4525 patients 63.5% one year after the accident. For rehabilitation only 258 patients (3.8%) were admitted, 6 TBIs were still in rehabilitation. Early rehabilitation was performed in only 100 out of 258 TBIs (39%). Mean duration of "B" was 41 days (1–289 days) compared with phase "C" 41 days (2–300) and "D" 80 days (5–841). GOS at the end of "B" assessed for 75 TBIs was: 1=4% (dead); 2=2.2%; 3=37.5%; 4=26.7% and GOS 5=29.3% ..while GOS in 176 out of 258 at the end of neurorehabilitation ("B,C,D,E") was: 1=1.2%; 2=1.2%; 3=21,6%; 4=35.8%; 5=39.2%. For all 4525 TBI reviewed GOS 1 was 4.7% (212 TBI) Over all mortality was 3.1.

Discussion: Less than 5% of all TBI patients received any kind of neurorehabilitation within one year. Data confirmed the expected differences regarding patients age, transfer, medical treatment, complications, and outcome in phase "B" when treated in a special unit for early neurotrauma rehabilitation as part of the department for neurosurgery (the authors concept) compared with the common treatment in rehabilitation institutes.

Conclusion: Although less than 5% of TBIs profited by neurorehabilitation, this study corroborates our conception for early neurological-neurosurgical rehabilitation. as it was introduced in accordance with the German task force in 1994. Data warrants the high standard and quality of neurorehabilitation in respect to TBI early functional outcome.

09 COGNITIVE REHABILITATION | C EVIDENZEN FÜR DAS THERAPEUTISCHE VORGEHEN BEI DYSPHAGIEN – ZWEI FALLBEISPIELE

B. Gröne, V. Hömberg (Meerbusch, D)

In zwei Fallbeispielen wird eine an evidenzbasierten Leitlinien orientierte Vorgehensweise in der Therapie dysarthrischer Störungen vorgestellt. Patient A hatte eine schwere gemischte Dysarthrie mit ataktischen und schlaffen Anteilen. Patient B zeigte das ausgeprägte klinische Bild einer rigid-hypokinetischen Dysarthrie bei Parkinsonerkrankung.

In beiden Fällen war die Dysarthrie hochgradig chronifiziert und die Patienten über Jahre „austherapiert“. Bei beiden Patienten konnte in den letzten Jahren(!) kein Fortschritt mehr durch therapeutische Intervention erzielt werden. Beide waren in ihrer Kommunikationsfähigkeit massiv beeinträchtigt, so dass sie sich mehr und mehr sozial zurückzogen, bzw. dass es zu wiederkehrenden Konflikten in der Partnerschaft kam.

Für beide wurde ein handlungsleitendes Konzept zur Modifizierung des Sprechens entsprechend der jeweiligen Pathophysiologie erstellt. Bei Regelumsetzung waren beiden Patienten gut verständliche verbalsprachliche Äußerung möglich.

Typischerweise zeigten auch unsere Patienten die nahezu immer auftretende Diskrepanz zwischen grundsätzlicher Fähigkeit zur Umsetzung der Konzepte in der Therapiesituation und der ungenügenden Übernahme in das alltägliche Sprechen.

Die daraus gezogene therapeutische Konsequenz bestand in einer kontrollierten Erhöhung eines aktiven repetitiven Trainings kombiniert mit einer geeigneten Stimuluspräsentation als Hilfestellung für die Umsetzung der sprechmodifizierenden Verhaltensregeln.

Die Basis für die technische Unterstützung beim hochfrequenten Eigentraining der Patienten wurde auf einem mobilen Pocket-PC entwickelt.

Unter den so geänderten Therapiebedingungen deuteten sich erste nachhaltige Verbesserungen in der Spontansprache beider Patienten ab.

010 COMA | C PREVALENCE OF VEGETATIVE STATE IN VIENNA

Ch. Stepan, L. Zaunbauer-Haslik, G. Haidinger, H. Binder (Vienna, A)

In November 28th 2001 a project to survey the hospital prevalence of vegetative state in a federal state in Austria (Vienna) at an exact point in time took place. In total 32 hospital patients who met the clinical criteria for vegetative state were recorded. The point prevalence of vegetative state was 1.9/100 000 inhabitants.

As a consequence the Viennese government has developed a rehabilitation concept for patients with vegetative state. A better coordination between hospitals and nursing facilities were developed. If a patient is suspected to the diagnosis vegetative state, he will be sent to a department, specialized for assessment.

To control the results and the rehabilitation concept a second point prevalence study took place in November 27th 2003 in Vienna. The central element was the same questionnaire like in our first prevalence study, which provided an exact recording of patients condition. All hospitals (n=48) and nursing facilities (n=44) in Vienna were included in this investigation.

In total there was a response rate of 98% from all the medical and nursing institutions in Vienna. At the time 73 patients in Viennese hospitals and nursing facilities were reported to have met the criteria set. In the examination 29 patients of them displayed vegetative state. The point prevalence of vegetative state was 1.7/100 000 inhabitants.

Both results showed less differences. As a result of this work the exact survey of hospital prevalence of vegetative state could be found.

011 MOTOR REHABILITATION | C AUGMENTED FEEDBACK FOR ARM MOTOR REHABILITATION IN POST-STROKE PATIENTS

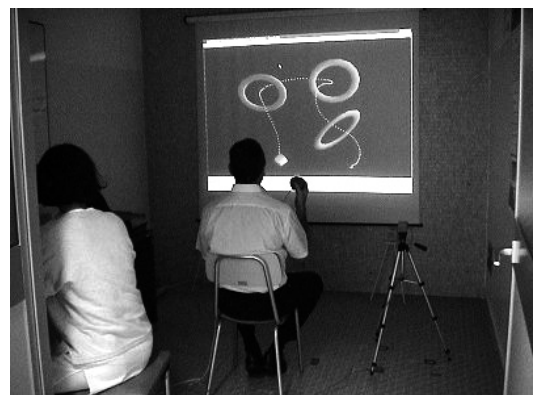
L. Piron, P. Tonin, C. Zucconi, M. Agostini, V. Iaia, F. Piccione, M. Dam (Venice, Padova, I)

Previous studies have demonstrated that the enhanced feedback supplied through virtual reality systems could promote motor learning in normal subjects. We evaluated the possibility of using this method in patients with arm motor deficits after stroke. The rationale is based on the artificial visual feedback for the patient's central nervous system (CNS). In particular, we could provide patients with “knowledge of performance” and “knowledge of results” of their arm movement during simple tasks in the virtual environment. Having the visual feedback of their own performance artificially displayed on a screen, subjects could develop a “reinforcement learning” mechanism in order to improve their motor performance.

Fifty post-stroke patients (at least six month after a cortical ischemia) with mild/intermediate arm impairment underwent a program of Virtual Environment Training (VET) therapy. The program consisted of twenty daily sessions, in four weeks. Subjects were forced to perform goal directed skills in a virtual environment emulating the correct arm trajectory (pre-recorded by a physical therapist) displayed in the same frame of reference. The arm movement was recorded by means of a motion tracking system. Before and after the therapy, we assessed the degree of motor impairment and the autonomy of daily living activities with the Fugl-Meyer scale for the upper extremity and Functional Independence Measure, respectively. In addition we analyzed the velocity, the duration and the morphology of a sequence of the reaching movements, and we compared the cinematic measures to the clinical scale scores.

Both clinical scores improved significantly in response to the VET therapy (Fugl-Meyer UE mean score by 15% and the FIM mean score by 6%). In addition the mean duration and the mean linear velocity of the reaching movements improved by 18% and by 23% respectively. No patient complained of any VET therapy side-effect.

Our data indicated that arm motor performance in post-stroke patients got better by twenty VET therapy sessions. Motor gains developed a functional improvement in the activities of daily living scores (FIM). Furthermore, kinematics of arm motion provided reliable measures of motor changes in response to the treatment.



012 PLASTICITY | C IN CHRONIC SCI PATIENTS THE BRAIN REMAINS COMPETENT TO CONTROL MOTOR EXECUTION

S. Hotz Boendermaker, M. Funk, M.-C. Hepp-Reymond, P. Summers, P. Brugger, S.S. Kollias, A. Curt (Zurich, CH)

It has been shown that motor imagery in chronic paraplegic patients with complete spinal cord injury (SCI) produces activation in both the motor execution and motor imagery networks defined in healthy subjects. The objective of this study was to determine which network is activated when SCI subjects attempt to move.

Functional MRI was performed in six chronic complete SCI subjects who could differentiate between an "attempt to move" and motor imagery of a simple foot movement and 12 healthy controls. The SCI volunteers had to attempt performing extension-flexion of the right foot while the healthy subjects executed the same movement. The movements were self-paced at 0.5 Hz. The tasks were exercised prior to scanning. Blood oxygenation level dependent (BOLD) sensitive fMRI was carried on a 1.5 T MR scanner. Thirty contiguous, axial slices (5x3.4x3.4mm) covering the entire brain were acquired. Statistical analysis was carried out using statistical parametric mapping (SPM99)

The preliminary analysis of the data acquired when the SCI subjects attempted to move revealed a contralateral activation of primary sensorimotor cortex (M1, S1) and, in addition, of premotor and parietal areas. Subcortically, bilateral activation was found in the cerebellum, whereas the activation was stronger in the ipsilateral anterior part, as well as in the thalamus and basal ganglia. The contrast between attempt to move in SCI and execution in healthy volunteers revealed additional activation in the parietal and lateral premotor cortex and in the whole cerebellum bilaterally.

The present study indicates that "attempt to move" in SCI subjects activates the same regions as the movement execution in healthy controls. The higher activation in parietal, premotor and subcortical regions suggests that attempt to move also activates parts of the motor imagery network. These findings should have a significant clinical relevance for rehabilitation and medical engineering.

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013 FUNCTIONAL IMAGING | C PHONEME PROCESSING IN APHASICS STUDIED WITH EVENT-RELATED BRAIN POTENTIALS IN A SYLLABLE DETECTION TASK

F. Becker, I. Reinvang (Nesoddtangen, NORW)

In this study of Norwegian language comprehension, we examined the neurophysiology of detecting infrequent target syllables (/ta/) amongst frequent standard syllables (/ba/). Event-related brain potentials (ERPs) were recorded from three groups: healthy persons (n=11), patients with severe aphasia (n=10) and patients with mild or moderate aphasia (n=9). The aphasics were grouped by Token test score (</>16.5).

All persons were able to detect the target syllables, but reaction time differed significantly: 383, 451, and 565 ms for controls, mild/moderate and severe aphasics respectively.

Three ERP components were of special interest: N1, P3, and N2, where N1 reflects processing of the standard syllable /ba/, P3 reflects processes involved in detecting the target /ta/, and N2 is the processing difference resolving from the subtraction of the ERP of the standard syllable from the ERP of the target syllable.

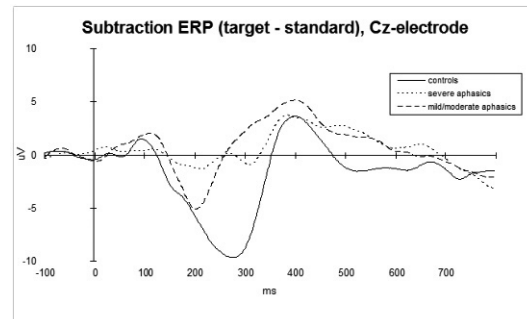
Analysis reveals differences between groups regarding all these components. With respect to the N1 component, there are no differences in latency, but in amplitude with the severe aphasics showing the smallest and the controls showing the largest amplitude. In addition, there are some hemisphere differences in the

aphasics (reduced amplitude left vs. right) which are not found in the controls. A pattern similar to the N1 results can be observed for the P3 component.

The largest differences between groups are found regarding the N2-component: While the healthy subjects show a large negativity which can be recorded over the whole scalp and which extends from about 100 to 350 ms, the severe aphasics only show a small negativity. This difference seems to result from the lack of a central-parietal negativity with a peak at about 270 ms after the target stimulus in the severe aphasic patients. In addition, there are greater differences in amplitude between left and right hemisphere electrodes, which can not be observed in the controls. The mild/moderate aphasics hold an intermediate position. Interestingly, ERP latencies do not correspond with the reaction times recorded.

The results of this study will be discussed in the light of theories of auditory cognition and language comprehension models. This study suggests that ERP-measures – especially the negativity in the subtraction ERP – are correlated with the severity of language comprehension impairment.

At present, some aphasics are retested after rehabilitation; some first results will be presented as well.



014 LOCOMOTION | C WALKING-RELATED GAINS OVER THE FIRST 12 WEEKS OF REHABILITATION FOR INCOMPLETE TRAUMATIC SPINAL CORD INJURY: THE SCILT RANDOMIZED CLINICAL TRIAL

B. Dobkin, D. Apple, H. Barbeau, A. Behrman, D. Deforge, J. Ditunno, M. Saulino, R. Elashoff, S. Harkema, L. Fugate, M. Basso, M. Scott, G. Dudley (Los Angeles, USA)

Background: The Spinal Cord Injury Locomotor Trial (SCILT) was designed to compare two strategies for training patients with incomplete SCI to walk over the first 12 weeks of rehabilitation. The primary endpoint was 6 months after SCI. No studies have reported walking-related outcomes during rehabilitation for traumatic SCI.

Methods: A single-blinded, randomized trial conducted by 6 regional American and Canadian centers entered 107 ASIA C and D subjects and 38 ASIA B subjects who were unable to walk without physical assistance on admission for rehabilitation within 8 weeks of SCI. Subjects received conventional physical therapy (CONV) for mobility compared to the same amount of therapy employing body weight-supported treadmill training (BWSTT) and over ground practice. The Functional Independence Measure (FIM) for walking, walking speed for 50 feet, walking distance in 6 minutes, and lower extremity motor score (LEMS) were collected every 2 weeks during the intervention.

Results: Planned secondary analyses at 12 weeks revealed no significant differences in the ability to walk for UMN ASIA B and C subjects (p=0.41). ASIA B subjects were unable to walk. For ASIA C and D subjects, no differences were found between BWSTT vs CONV for walking speed (mean speed 51 vs 56 m/min, p=0.56)

or walking distance. The LEMS correlated with walking speed ($r=0.57$) at 12 weeks, and 12-week walking speeds correlated with those at the primary endpoint at 6 months ($r=0.91$).

Conclusions: BWSTT and CONV therapy produced equal outcomes for walking parameters over the first 12 weeks of rehabilitation in ASIA B, C and D subjects. Most ASIA C and D subjects made remarkable improvements that were apparent by 5 weeks after starting inpatient rehabilitation. This data may help in the design of future clinical trials.

015

FUNCTIONAL IMAGING | C

CEREBRAL PERFUSION CHANGES DETECTED IN MOTOR AREAS AFTER CONSTRAINT-INDUCED MOVEMENT THERAPY

I. Tarkka, M. Kononen, M. Husso-Saastamoinen, E. Vanninen, J. Kuikka (Kuopio, FIN)

Permanent hemiparesis is the most common deficit after stroke. Constraint-induced movement therapy (CIMT) belongs to a family of neurorehabilitation methods which emphasizes task-relevant repetitive training. Cerebral perfusion in twelve chronic stroke patients (mean duration of the disease 2.8 yrs; mean age 48 yrs) was studied to assess the effect of the two-week long CIMT rehabilitation. For SPECT imaging 550 MBq of Tc-99m-ethylcysteine dimer was intravenously injected similarly before and after the therapy. The SPECT scan was carried out 45-60 minutes later while the patient was resting. Mean total duration of supervised practice was 53 hours. A 16-task structured motor test was performed to assess changes in voluntary motor behavior. The mean total task time of the motor test decreased from 3.8 min to 2.5 min and functionality of movement scores improved significantly after rehabilitation. Images of those patients whose lesion was in the left hemisphere, were mirrored (i.e. all lesions were in the right hemisphere). Increased perfusion was found in motor control related areas. The specific areas with perfusion increase in the affected hemisphere were in precentral gyrus, premotor cortex (BA6) and in the frontal cortex, in superior frontal gyrus (BA10). In the non-affected hemisphere, perfusion was increased in superior frontal gyrus (BA6) and in cingulate gyrus (BA31). In the cerebellum, there was increased perfusion bilaterally. Perfusion decreased in lingual gyrus (BA18) in the affected hemisphere. In the non-affected frontal cortex, two areas with decreased perfusion were found in the middle frontal gyrus (BA8/10). Also the fusiform gyrus (BA20) and inferior temporal gyrus (BA37) showed decreased perfusion. Intensive therapy appears to facilitate motor restoration even in very chronic stroke patients who retain some residual motor control. Both the restoration seen in motor performance and in the changes of cortical perfusion at rest in motor related areas suggest that plastic processes can be enhanced by intervention also in the chronic state.

016

LOCOMOTION | BS

INTER-LIMB COORDINATION CONTRIBUTE TO AMPLIFY LOCOMOTIVE NEURAL OUTPUT IN SPINAL CORD INJURED PERSONS

N. Kawashima, D. Nozaki, M. O Abe, M. Akai, K. Nakazawa (Tokorozawa Saitama, J)

It is well recognized that coordinated muscular activity can be induced by imposing locomotion-like movements even in the paralyzed lower limb muscles of complete spinal cord injured (SCI) persons. While the significant role of the afferent input related to hip joint movement and body load has been emphasized considerably in previous studies, it is still not fully understood to what extent the inter-limb neuronal pathway contribute to the human locomotive motor output. In the present study, we examine

the effect of modalities of the contralateral leg motion on the magnitude of "locomotor-like" muscle activity.

The knee-locked leg swing movement was imposed on ten complete SCI subjects using a gait training apparatus. The following three different experimental conditions were adopted: (i) bilateral alternate leg movement, (ii) unilateral leg movement, and (iii) bilateral synchronous (in-phase) leg movement. In all experimental conditions, the passive leg movement induced the electromyographic (EMG) activity in the soleus muscle in all SCI subjects and in the biceps femoris muscle in eight of ten SCI subjects. On the other hand, the tibialis anterior and rectus femoris muscle didn't show common synchronized EMG activity among the subjects. The EMG level quantified by integrating the rectified EMG activity recorded from the right leg was significantly larger for bilateral alternate leg movement than for unilateral and bilateral synchronous movements, although the right hip and ankle joint movements were identical in all experimental conditions. Further, the relation between EMG activity and applied load on the foot could not explain our results.

The present results suggest that the sensory information came from contralateral limb plays a substantial role in amplifying the induced locomotor-like muscle activity. It is reasonable to suppose that there is neuronal circuits enabling inter-limb coordination within the spinal cord, and this might contribute to regulate and shape human locomotive motor output.

017

LOCOMOTION | BS

STEPPING-LIKE MOVEMENTS IN HUMANS WITH COMPLETE SPINAL CORD INJURY INDUCED BY EPIDURAL STIMULATION OF THE LUMBAR CORD: ELECTROMYOGRAPHIC STUDY OF COMPOUND MUSCLE ACTION POTENTIALS

M.M. Pinter, K. Minassian, F. Rattay, H. Binder, B. Freundl, F. Gerstenbrand, B. Freundl, M.R. Dimitrijevic (Vienna, A; Houston, USA)

Study Design: It has been previously demonstrated that sustained non-patterned electric stimulation of the posterior lumbar spinal cord from the epidural space can induce locomotor-like movements in subjects with longstanding complete spinal cord injury. In the present paper we explore physiologically related components of electromyographic (EMG) recordings during the induced stepping-like activity.

Objectives: To examine underlying mechanisms activated by electrical epidural stimulation of posterior lumbar cord structures effective to elicit stepping-like movements.

Material and Methods: The study is based on the assessment of epidural stimulation to control spasticity by simultaneous recordings of the electromyographic activity of quadriceps, hamstrings, tibialis anterior and triceps surae. We examined induced muscle responses to frequencies of 2.2–50 Hz in ten subjects classified as having a motor complete spinal cord injury (ASIA A and B). We evaluated stimulus-triggered time windows of 50 ms length of the original EMG traces. Stimulus-evoked compound muscle action potentials (CMAPs) were analyzed with reference to latency, amplitude, and shape.

Results: Epidural stimulation of the posterior lumbosacral cord recruited lower limb muscles in a segmental-selective way, which was characteristic for posterior root stimulation. 2.2 Hz-stimulation elicited stimulus-coupled CMAPs of short latency which were approximately half that of phasic stretch reflex times of the respective muscle groups. Their EMG-amplitudes were governed by the stimulus strength. Stimulation at 5–15 and 25–50 Hz elicited sustained tonic and rhythmic activity, respectively, and initiated lower limb extension or stepping-like movements representing dif-

ferent levels of muscle synergies. All EMG responses, even during burst-style phases were composed of separate stimulus-triggered CMAPs with characteristic amplitude modulations. During burst-style phases, a significant increase of CMAP latencies by about 10 ms was observed.

Conclusion: The muscle activity evoked by epidural lumbar cord stimulation as described in the present study was initiated within the posterior roots. These Posterior Roots Muscle Reflex Responses (PRMRRs) to 2.2 Hz stimulation were routed through monosynaptic pathways. Sustained stimulation at 5-50 Hz engaged central spinal PRMRR components. We propose that repeated volleys delivered to the lumbar cord can effectively modify the central state.

018 MOTOR REHABILITATION | C USAGE OF A COMBINED METHOD OF DYNAMIC PROPRIOCORRECTION AND PROGRAMMED ELECTRO-STIMULATION IN REHABILITATION AMONG NEUROLOGY PROFILE PATIENTS

K.V. Lyadov, I.V. Sidiyakina, S.L. Zuev, T.V. Baidova, T.V. Shishova (Moscow, RU)

In our research we estimated the therapeutic effectiveness of a combined influence of a device "Gravistat" and a programmed electro stimulation using a computerized complex "Multimios-tim" on the dynamics of movement status figures. An objective control-diagnosis criterion of the result of patients' conditions was stabilometer scale – a method of estimation of patients' vertical pose balance. Dynamic proprio correction took place using "Gravistat". The principle of the device lies in the effect of a strong flow of proprioceptor impulse on brain structures. It becomes a base for development and recreation of a misbalanced movement, patients' emotional and will sphere. The flow is formed while the patient performs some movements wearing the "Gravistat" costume, which allows to set an individually dosed task, regulate it during the course of the recreation treatment. Programmed multi-channel electro-stimulation models physiological movement patterns, regulates person's pathological movement stereotype, helps people with neuromotoric problems. Computerized complex "Multimios-tim" is responsible for the phase muscle micro stimulation while patient's walking based on independence and synchronization. 67 patients were under our research with pareses of different etymology: 43% – strong brain blood circulation misbalance, 34% – brain injuries, 15% – a spontaneous injury and neurosurgical operations, 8% due to pathology in spine brain. The research lasted from 3 weeks to 4,5 months. The first group of patients (36 people) in addition to their base treatment received treatments in costumes and multi-channel stimulation course, the other group – a standard course of recreation treatment. In the comparative analyses of the effectiveness of the patients' rehabilitation in the two groups the following results were received: in the first group the figures of the statokinethiogram improved by 16,7% (in the other group by 5,8%); the average speed of pressure center movement decreased by 19,1% (in the other group by 7,3%), the average square of the statokinethiogram decreased by 21,3% (9,8% in the other group). The front pressure center place among the first group patients had an average of 12,2mm dynamics to the center, while 4,2mm in the second group. The shift of the pressure center in the sagittal part among first group patients had an average of 3,1mm, while 1,1mm among the second group patients. Thus, using a combined treatment of programmed multi-channel myo-stimulation and dynamic proprio correction allowed to achieve better results in a shorter period of time, that proves the advantage of this method for recreation treatment among patients who suffer movement misbalance.

019 BS DIFFERENTIAL TIME COURSE OF NEUROPLASTIC PROCESSES FOLLOWING EXPERIMENTAL SPINAL CORD INJURY

U.H. Wiese (Cottbus, D)

Purpose: To test if patients with minimal volitional movements of the upper limb can regain better upper limb control and hand function using self-administered FES system.

Method: Only patients with ischemic stroke who despite intensive rehabilitation showed very little or no improvement 6 weeks after stroke onset (Fugl-Meyer [F-M] upper limb <10 at admission to acute rehabilitation, and <17, at 6 weeks post stroke) are considered in this report. Using randomized controlled trial, group 1 receive FES program (HandMaster system) plus standardized physical rehabilitation while group 2 receive standardized rehabilitation alone for 12 weeks. Training begins in the acute rehabilitation and continue at the patients' residence. All patients practice 30 min, twice every day. Group 1 combine exercises with up to 4 hrs of daily FES to the forearm/wrist hand flexors/extensors using the Handmaster system. The stimulation is combined with task-specific training tailored and modified to each patient's ability. Outcome measures of hand function (Box & Blocks [BB]; Jebsen-Taylor [J-T], and motor control [F-M] are recorded in addition to baseline at 4, 8 and 12 weeks.

Results: To date, 3 control and 3 experimental patients all with very slow recovery completed the trial. One FES treated patient recovered some hand function (able to perform the BB and J-T timed sub-test) and all 3 patients improved the F-M score considerably higher than the control patients who only gain few points on the F-M score.

Conclusion: The trend of faster and observationally greater recovery of motor control and better chance for re-learning hand function in these few patients suggest that as the study sample size increase these improvement should become both statistically and clinically significant. Based on previous data published by our group and other researchers worldwide, early initiation of FES training is clearly indicated.

020 MOTOR REHABILITATION | C BOTULINUM TOXIN IN THE TREATMENT OF SPASTICITY OF THE UPPER LIMB: A SYSTEMATIC REVIEW OF THE LITERATURE

T. Sycha, K. Elwischger, E. Auff, E. Fertl (Vienna, A)

Background: Botulinum toxin (BTX) has been used for the management of focal spasticity since several years, but data on treatment outcomes in upper limb spasticity (ULS) are scarce.

Objectives: With this systematic review we set out to clarify functional outcomes of BTX treatment (versus systemic myotonolytic agents, functional therapy, placebo, or no treatment) in ULS following stroke, traumatic brain injury or multiple sclerosis.

Methods: We searched the bibliographic databases MEDLINE, EMBASE, and the Cochrane Library from 1985 up to May 2004. We also reviewed the reference lists from identified articles and reviews of treatment studies. Furthermore we searched booklets of scientific congresses in the field of neurology, and contacted experts. Randomised controlled trials (RCTs) testing any dose of BTX for ULS caused by stroke, traumatic brain injury or multiple sclerosis, and describing functional improvement and subjective pain assessment were included in this review. All trials were quality scored and two independent reviewers extracted data. Results were compared for differences and discrepancies were resolved by discussion.

Results: Within 112 relevant citations we identified ten RCTs dating from 1996 to 2004. Nine RCTs reported on BTX type A, including 413 patients suffering from chronic post-stroke ULS and

37 patients with other reasons for chronic ULS. There was a single RCT testing BTX type B in chronic post-stroke spasticity of the upper limb. No RCT addressed the question of early versus late initiation of BTX treatment after stroke. Nine RCTs used placebo as control condition was. Injection sites were flexor muscles of the elbow, wrist and fingers. Pre-post modified Ashworth scores were measured in all studies. Pain ratings were reported in 3/10 RCTs. Various functional motor outcomes were measured in 6/10 RCTs. Subjective disability ratings were measured in 8/10 studies, and also carer burden was addressed in one trial. The statistical combination of the study results (meta-analysis) is ongoing.

Reviewers' conclusions: There is substantial scientific evidence for the efficacy of BTX-A in the reduction of chronic ULS caused by stroke. Treatment goals vary considerably between the RCTs and the focus on function and pain has just evolved during the last four years. There is still more work to be done in terms of optimal timing of BTX treatment after stroke, and in ULS caused by other cerebral disorders.

021 REGENERATION | BS AXONAL SPROUTING IN THE DENTATE GYRUS OF CAP23-OVEREXPRESSION MICE AFTER ENTORHINAL CORTEX LESION

D. Del Turco, G. Burbach, C. Gebhardt, A.G. Woods, J.P. Kapfhammer, M. Frotscher, P. Caroni, T. Deller (Frankfurt/Main, Freiburg, D; Basel, CH)

After entorhinal cortex lesion (ECL) the outer molecular layer (OML) of the dentate gyrus is denervated. In response to this deafferentation several fiber systems sprout and reinnervate the OML. However, only few commissural/associational (C/A) fibers invade the denervated area from the adjacent non-denervated inner molecular layer (IML). In order to study whether the sprouting response of C/A fibers can be enhanced by overexpression of the growth-associated protein cortical cytoskeleton-associated protein 23 (CAP23), ECL was performed in mice overexpressing CAP23 in adult neurons. The expression of CAP23 mRNA as well as the axonal sprouting response was compared in control and CAP23 transgenic (CAP23tg) mice. Non-radioactive in situ hybridization demonstrated that the sprouting neuron population expresses the transgene. Laser microdissection in combination with qRT-PCR revealed a very high level of transgene expression in the area of origin of the sprouting neurons. Anterograde tracing as well as immunocytochemistry were employed to analyze the sprouting response at the light- and electron microscopic level. In comparison to controls, CAP23tg mice showed an increased axonal sprouting response after ECL: Whereas only some C/A fibers invaded the denervated OML in controls, an enhanced invasion of the OML was observed in CAP23tg animals. In addition, sprouting fibers were longer in transgenic mice. These data indicate that CAP23 expression determines the extent of the C/A sprouting response in the hippocampus after ECL. (Supported by the DFG)

022 PHARMACOTHERAPY | BS THE VALUE OF DRUG TREATMENT IN THE FUNCTIONAL MOTOR RECOVERY AFTER STROKE: A CRITICAL REVIEW

J. Nijlant, M. Ijzerman (Enschede, NL)

Background: Different techniques are used to improve functional motor recovery after stroke. These vary between conventional physical therapy to more complex therapeutic regimens. Many of them have shown to be effective as far as motor control is concerned.

Another approach to be considered in the rehabilitation after stroke is the use of pharmacotherapy. In human some clinical trials have been carried out. Glycerol, selegiline, amphetamine and fluoxetine were used in different studies. Glycerol is a hyperosmolar agent which improves cerebral blood flow by reducing edema around cerebral infarcts. Selegiline is a selective irreversible inhibitor of monoamine oxidase type B and has both neuroprotective and neuronal rescuing properties. Amphetamine has dopaminergic, noradrenergic and serotonergic effects. Fluoxetine, a selective serotonin reuptake inhibitor, leads to an increased concentration of serotonin in the synaptic cleft. It influences brain processes. The objective of the present review was to assess the available evidence about the effect of pharmacological modification of functional motor recovery after stroke

Methods: A systematic literature search was performed to identify randomised placebo controlled trials (RCTs) that have studied the effect of these drugs. The methodological quality of the studies was assessed by two independent raters. In particular outcome measures addressing motor control and functional gain were explored to judge the effect of drugs.

Results: Seven RCTs, with 428 patients in total, were included for this review. Three studies used amphetamine, two used fluoxetine, two used glycerol and one study used selegiline. The methodological scores ranged from 12–19. Commonly used functional outcome measures were Barthel index (5 studies) and the Fugl-Meyer assessment scale (4 studies). Of seven studies, four studies reported a positive effect: two studies of amphetamine (only when paired with physical therapy) and two studies of fluoxetine. For selegiline there's no significant but some clinical motor improvement. Glycerol reduces mortality rates, but has no long term effect on functional motor recovery.

Conclusions: This review suggests a positive effect of amphetamine (only paired with physical therapy) and fluoxetine on the functional motor recovery after stroke. No firm conclusions can be drawn regarding the clinical implications of prescribing medication to improve functional motor recovery after stroke.

023 PLASTICITY | C VISION RESTORATION THERAPY (VRT) AFTER BRAIN DAMAGE: THE ROLE OF EYE MOVEMENTS AND FIXATION BEHAVIOR

B.A. Sabel, S. Kenkel, E. Kasten, I. Müller (Magdeburg, D)

Objective: We wished to study if eye movements and/or fixation are altered after vision restoration therapy.

Background: Patients with visual field deficits following stroke or neurotrauma can train their residual vision with VRT (Kasten et al., Nature med., 1998; www.novavision.info). VF-size increases have been demonstrated using super-threshold or near-threshold perimetry, but not with laser-scanning ophthalmoscopy (SLO; Reinhard et al., in press).

Methods: Data were compared among different, independent studies with respect to eye movements, border position shifts and fixation behavior, including determination of the blind-spot position. *Results:* SLO measurements did not reveal evidence for eye movements before and after VRT greater than 1–2 degrees (Reinhard et al., unpublished). Only 1/3 of the patients showed slightly increased eye movements, but they were in the normal 1–2 range; in other cases, they remained unchanged. When analyzing the perimetric topography of the visual border position before and after VRT, border shifts were typically non-uniform: while in some areas VF border shifts clearly occurred, in other areas they did not. Also, the shift of the visual field border in most patients was much greater than the expected 1–2 degrees caused by normal eye movements (max. of up to 30). Furthermore, when different perimetry meas-

ures are compared, the border shift are not identical: while in some patients the border shift may be pronounced when a simple task is used (such as super-threshold perimetry), no border shift occurs when a difficult task is used (such as the SLO). Both the blind spot position and fixation quality measurements collected with standard perimetry remained unchanged before and after VRT.

Conclusion: VRT does not affect eye movements nor fixation in any significant way; rather true restoration of vision is possible.

O 24 MULTIPLE SCLEROSIS | C
NEUROGENIC BLADDER DYSFUNCTION IN WOMEN WITH MULTIPLE SCLEROSIS-DIAGNOSIS AND PRIMARY TREATMENT OUTCOME

B. Schurch, A. Reitz, P. A. Knapp, S. Boy, A. Haferkamp (Zurich, CH; Heidelberg, D)

33 women with bladder dysfunction due to multiple sclerosis underwent clinical, neurological and detailed urodynamic examination and were treated according to complains and urodynamic results. Prevalence of clinical symptoms, urodynamic findings and primary treatment outcomes were analyzed.

Leading clinical symptoms were urgency in 87.9% followed by nocturia in 78.8% and urge incontinence in 72.7%. Most common urodynamic abnormalities were neurogenic detrusor overactivity in 63.6% and positive ice water test in 60.6%. In a group of 29 women who were able to void, incomplete voiding occurred in 79.3%. Anticholinergic medication was used in 26 patients with overactive detrusor, but 23% of the patients stopped medication after six weeks because of side effects like dry mouth, constipation and blurred vision. The alpha blocking agent tamsulosin was given to 18 patients with 100 ml residual urine and more. Although the drug slightly reduced residual volume, it was discontinued by 50% of the patients after six weeks because of side effects.

In conclusion, proper diagnosis and effective, well-tolerated treatment of bladder dysfunction in women with multiple sclerosis are challenging. A full urodynamic examination is recommended and may help to identify the underlying dysfunction. Troublesome side effects of the anticholinergic and alpha blocking medication limit patient compliance and lead to high attrition rates.

Poster Sessions

P1 ANIMAL MODELS | BS
MULTISENSORIC REHABILITATION MODEL IMPROVES RECOVERY OF NEUROMOTOR FUNCTION AFTER TRAUMATIC BRAIN INJURY IN RATS.

M. Lippert-Grüner, M. Mägele, E.T. Bode, N. Klug, D. Angelov (Köln, D)

The present study was designed to determine whether exposure to multisensorial early rehabilitation model (MRM) after moderate traumatic brain injury (TBI) in rats would promote the recovery of neuromotor function superior to that under standard conditions (SC). Materials and Methods: A total of 28 Sprague-Dawley rats were randomized to one of the following groups: 1) injured/MRM (n=12); 2) sham/MRM (n=2); 3) injured/SC (n=12); 4) sham/SC (n=2). Under anaesthesia, animals were subjected to either a moderate fluid-percussion injury (2,1 atm) or to a sham-injury. Thereafter the injured/MRM and the sham/MRM groups were placed together into specially modified custom made cages (three large cages connected via tunnels) containing various types of bedding and stimulating objects, e.g. balls, robes, running wheel etc.. Along with environmental complexity the animals underwent a specific protocol of motor and multisensoric rehabilitation model. In contrast, the injured/SC and the sham/SC groups were returned to their standard cages where they were housed individually without stimulation. Motor function was assessed by using a composite neuroscore (NS) test battery at 24h, 7, and 15 DPI. Results: Neuromotorfunction assessed by NS was markedly reduced in both injured groups at 24h post-injury being non-significant. However, animals in the injured/RM group performed significantly better when tested for neuromotorfunction as compared to injured/SC animals on 7d and 15d DPI (7d: p = 0,005; 15d: p < 0,05). Conclusion: These results provide experimental evidence that postoperative exposure of rats to multisensoric rehabilitation model (MRM) is associated with significant improvements in the recovery of neuromotorfunction after TBI. Whether these improvements correlate with reduced CNS scar formation is currently under investigation.

P2 ANIMAL MODELS | BS
THE EFFECTS OF NEUROTROPHIC FACTOR NT-3 ON THE OUTGROWTH AND DIFFERENTIATION OF THE RAT MOTOR NEURON COCULTURED WITH THE HUMAN MUSCLE

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Experiments in vitro have several advantages over the in vivo studies. One such advantage is that they permit continuous observation of the investigated process at the cellular level. In the experimental model used here, motor neurons extend from the explants of the embryonic rat spinal cord and form functional synapses with the human myotubes. This coculture system has been extensively characterized and found to reproduce very well the in vivo differentiation of neurons and glia as well as the formation of the neuromuscular junction [1]. Its particular advantage is that it allows quantitation of various aspects of neuronal outgrowth including the ability of motor neurons to form functional neuromuscular junctions with the human muscle.

In our study we employed this system to follow the effects of neurotrophic factor NT-3 on the neuronal outgrowth from the spinal cord and the ability of extending neurons to functionally innervate human muscle in vitro. Several parameters were quantitatively determined: neuronal outgrowth from the embryonic spinal cord

explant, percentage of contraction-positive explants, the number of contracting units per explant and the number of clusters of nicotinic receptors. All determinations were carried out during the first two weeks of coculture which is the period of time during which the process of functional innervation is completed. The concentration of NT-3 used throughout the experiments was 10 ng/ml; it was selected as optimal in our initial testing. At this concentration NT-3 significantly increased all the parameters listed above. The approach used here for the quantitation of the effects of NT-3 on the neuronal growth and differentiation may prove useful also in testing of other substances that might have an effect on these parameters.

Reference:

1. Mars T, Yu KJ, Tang X-M, Miranda AF, Grubic Z, Cambi F, King MP: Differentiation of glial cells and motor neurons during the formation of neuromuscular junctions in co-cultures of rat spinal cord explant and human muscle. *J Comp Neur* 2001; 438: 239-251

P3 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C THE EFFECT OF METHYLPHENIDATE ON ATTENTION IN ACQUIRED BRAIN INJURY AS RECORDED BY USEFUL FIELD OF VIEW

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Objectives: To assess the ability of the Useful Field of View (UFOV) test to measure change in attention of patients with acquired brain injury (ABI) when introduced to methylphenidate in an inpatient rehabilitation unit.

Design: This study reviewed data from consecutive patients who were introduced to methylphenidate while being monitored for visual processing speed, divided attention, and selective attention with the UFOV test. Changes in UFOV scores were also compared with changes in Functional Impairment Measures (FIM).

Patients: A series of 16 patients diagnosed with traumatic brain injury (n=12) and subarachnoid hemorrhage (n=4) were followed before and after introduction to methylphenidate as a part of treatment for clinically identified attentional deficit.

Results: The introduction of methylphenidate was correlated with an improvement in processing speed loss, divided attention loss and selective attention loss on the UFOV test. The introduction of methylphenidate was further correlated with improvement on FIM cognition and FIM activity of daily living subscales.

Conclusions: The introduction of methylphenidate to an inpatient population of patients with ABI resulted in a significant improvement in attention and divided attention, which can be measured by the UFOV. This change in attentional ability seems to correlate with improvement in the cognitive and the activity of daily living subscales of the FIM.

P4 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C PRISM ADAPTATION IN NEGLECT INVESTIGATED WITH PSYCHOPHYSICS AND ELECTRO-OCULOGRAPHY

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Short-term adaptation to rightward-deviating wedge prisms has been shown to reduce neglect in right-brain damaged patients on a variety of visuo-verbal and visuo-motor tasks and has been attributed to changes in spatial representations. Neglect patients are known to be impaired in perceiving contralateral targets and also in initiating contralateral saccadic eye movements [1]. Frassinetti et al. [2] suggested that the improvement seen after prismatic adaptation (PA) may be linked to the ocular system. They

suspected that PA may induce eye deviation, which in turn may modify spatial representations.

The present study examined eye movements via electro-oculography (EOG) and discrimination reaction times to laterally-presented visual stimuli performed by a patient with unilateral neglect following a right-hemispheric lesion. The paradigm crossed two factors: target space (left or right of a fixation point aligned on the body midline) and direction of saccade (leftwards or rightwards of a fixation point located right or left of the body midline). Reaction times were measured as well as the latency between the stimulus onset and the end of the saccadic eye movement. The experiment was administered twice; before and after PA to rightward-deviating prisms.

ANOVAs were conducted with the EOG measure and reaction times, using space (left or right of the body midline), direction of saccade (leftwards or rightwards) and session (prior to or following PA) as within-subject factors. The main finding concerns a significant interaction between space and session for the EOG measure, reflecting the fact the time between the initiation and landing of the saccade was reduced in the left space and increased in the right space following prismatic adaptation. By contrast, PA did not significantly affect reaction times. These data thus support a predominant role of PA in altering eye movements [3], rather than higher-level discrimination abilities.

References:

1. Behrmann M, Ghiselli-Crippa T & Dimatteo I: Impaired initiation but not execution of contralesional saccades in hemispatial neglect. *Behavioural Neurology* 2001/2002; 13: 39-60
2. Frassinetti F, Angeli V, Meneghello F, Avanzi S & Làdavas E: Long-lasting amelioration of visuo-spatial neglect by prism adaptation. *Brain* 2002; 125: 608-623
3. Ferber S, Danckert J, Joannisse M, Goltz HC & Goodale MA: Eye movements tell only half the story. *Neurology* 2003; 60: 1826-1828

P5 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C "CONSTRAINT-INDUCED MOVEMENT THERAPY": SUCCESSFUL THERAPY-FORM FOR CERTAIN PATIENTS AFTER STROKE TO REGAIN FUNCTION OF THE UPPER EXTREMITY.

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"Constraint-induced movement Therapy" ("Forced-use therapy") is a therapy-form for selected persons with hemiparesis.

In therapy, the paretic arm is trained or lead to function by immobilising the affected hand with a mit, hand-orthesis or similar device, up to 90% of the patients' waking hours. The affected upper extremity is then intensively trained with task oriented activities as well as used in daily life, for a minimum of six hours a day during two consecutive weeks.

Patients suitable for this kind of therapy must be carefully selected and fulfill certain criteria.

"Constraint-induced movement therapy" requires large efforts by both patients and therapists, but is highly successful.

P6 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C BABINSKI SIGN AND EVIDENCE BASED MEDICINE

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Purpose: Joseph Felix François *Babinski* (1857–1932) was one of the most famous physicians of polish origin. He was the co-originator of contemporary neurology and neurosurgery. *Babinski*'s the most known discovery was the description of the plantar reflex ("toe phenomenon" – now *Babinski* sign – *phénomène des orteils*).

Methods: *Babinski* presented his findings for the first time before the Biological Society of Paris on February 22nd, 1896 as a very short communication “Sur le réflexe cutané plantaire dans certaines affections organiques du système nerveux central”. He wrote: “J’ai observé dans un certain cas d’hémiplégie ou de monoplégie crurale liée à une affection organique du système nerveux central une perturbation dans le réflexe cutané plantaire dont voici en quelques mots la description...”. It is fascinating that the whole communication took just 28 verses! *Babinski* didn’t use any randomizing, no double-blind trial, no statistical calculations, no citations from literature!

Results: *Babinski* presented his observation abroad in 1897 during International Congress of Neurology in Brussels, from this time the plantar reflex has been known as Babinski’s sign. Hence since 1898, after publication in “Semaine médicale”, Babinski’s sign became known in all world.

Conclusions: The whole description of the plantar reflex took just 28 verses. There is strong contrast between that and Evidence-Based Medicine. *Babinski* didn’t use any randomization, no double-blind trial, no statistical calculations, no citations from literature. Living nowadays *Babinski* would have no chance for publication.

Reference:

1. Babinski J.: Du phénomène des orteils et de sa valeur sémiologique. Semaine Médicale, 1898; 18: 321

P7 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C NEUROREHABILITATION OF PATIENTS WITH CONSEQUENCES OF ISCHEMIC BRAIN LESIONS OF DIFFERENT GENESIS DURING THE TREATMENT BY METHOD OF DISTRACTION OSTEOSYNTHESIS OF CRANIAL BONES

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A surgical technique for stimulation of the cerebral circulation by means of distraction osteosynthesis was developed in RISC “RTO”. A trephine opening is made in the cranial bone in projection of a brain ischemic focus. A separated bone lamina is transformed into a bone fragment, positioned onto the initial place (maternal bed) and fixed with traction devices and their ends are attached to a frame support. As a result of gradual traction at the rate of 0.5 mm/day a bone regenerate forms between the bone fragment and an edge of the maternal bed. This process stimulates the blood afflux to an affected nidus of the brain.

31 patients with consequences of ischemic insults and brain injuries were operated with this technique. Neurologic symptoms declared themselves preoperatively by hemiparesis and aphasia. We distinguished the following stages in a developed scheme of rehabilitation: early, late, restorative postoperative and residual. At the early stage microcircular and thrombotic complications were managed, vascular medicines and nootropics were proscribed, orthostatic loading and respiratory exercises were performed. A non-significant increase of muscle force was noticed. At the late stage electrostimulation of muscles, massage, physical therapy and logopedic exercises were used. The dynamics of neurologic symptoms became more apparent in comparison with the first stage. During the restorative stage locomotive regime of physical therapy was enlarged. At the residual stage patients underwent the above mentioned course of treatment in an interval of 6 months.

In 17 patients the neurologic status corresponded to the restorative stage, in 14 cases a significant regress of aphasic-hemiparetic syndrome was observed. Clinical data was confirmed by data of instrumental methods of investigation: electromyography, esthesiometry, angiography, ultrasound dopplersonography.

P8 CLINICAL TRIAL DESIGN AND OUTCOME STUDIES | C RELATED IMPACT FACTORS OF THE CHEMONUCLEOLYSIS WITH COLLAGENASE OF LUMBAR DISC HERNIATION

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Objective: To study the related impact factors of intradiscal injection with collagenase in patients with lumbar disc herniation.

Methods: All of 168 patients were in-patients. Male,112; Female,56; Age is among 14–73 years old, average 43. 168 patients were divided into two groups depending on size, the type, the number of herniated disc and with or without spinal stenosis respectively. 65 patients with the herniation size less than or equal to 6 mm; 103 patients with the size large than 6 mm. 122 patients with protruded disc, 46 patients with bulge disc. 128 patients with single level herniation, 40 with more than two levels herniation. 154 patients without spinal stenosis, 12 with spinal stenosis. All patients were examined by magnetic resonance imaging (MRI) and discography. Findings of MRI were correlate with the patient’s signs, symptoms, and physical examination. Local anesthesia was used in all patients. The patient was in the prone decubitus position, properly padded under the abdomen. C-arm fluoroscope was used. Both the lateral and anteroposterior views of the spine were monitored. Patients were intradiscal injected with collagenase (1200 U). The collagenase was provided by Shanghai Joy Biopharm. Co., LTD. Assessment was made after 1 week, 3 months and 1 year follow up.

Results: The overall success rate after 1 week, 3 months, and 1 year following the therapy was 22.62%, 89.29% and 92.26%; 7 patients were operated, One of them developed cauda equina syndromes at the third day after the injection and were operated immediately. It is found that the size of herniation did not affect the treatment when smaller than 10 mm. The protruded disc got better result than bulge disc after 1 week following the chemonucleolysis ($P < 0.01$). Patients manifesting single disc herniation had a better outcome than those manifesting more than two discs herniation ($P < 0.05$) after 3 months/ ($P < 0.01$) after 1 year. The total effective rate in patients without spinal stenosis was higher than that in patients with spinal stenosis ($P < 0.01$). 52 patients suffered from severe pain for about 4 days after the treatment. Anaphylaxis did not occur.

Conclusion: Intradiscal therapy with collagenase is effective. The stenosis can affect the treatment negatively. The herniation bigger than 10mm is better to be operated.

P9 COGNITIVE REHABILITATION | C DIE NEUROPSYCHIATRISCHE BEHANDLUNG VON PATIENTEN MIT SCHWEREN HIRNORGANISCHEN PSYCHOSYNDROMEN IN DER NEUROCHIRURGISCHEN FRÜHREHABILITATION

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Über die Behandlung schwerster deliranter und amnestischer Psychosyndrome in der neurochirurgischen Frührehabilitation wurde bisher wenig publiziert.

Ziel der Untersuchung ist die Darstellung der rehabilitativen Behandlungsziele und des Outcomes.

Die untersuchte Stichprobe umfasst 1293 Patienten, die auf zwei geschlossenen Stationen der neurochirurgischen Frührehabilitationsklinik Holthausen in einem Zeitraum von 11,7 Jahren (1993–2004) behandelt wurden.

In die Untersuchung wurden die neurochirurgischen Grunddiagnosen, Altersstruktur, Geschlecht, neuropsychologische Testergebnisse, die klinische Einschätzung der sozialen und beruflichen Reintegrationsfähigkeit, Entlassungsziele und bei aSAB-Patienten die Versorgungsmethode (Coil/Clip) bzw. Shuntpflichtigkeit während der Behandlung, einbezogen.

Die führenden neurochirurgischen Grunddiagnosen verteilen sich wie folgt: SHT 38,4%, aSAB 32,4%, spontane ICB 11,8%, Hirntumoren 5,7%. Das Durchschnittsalter der Patienten beträgt 52 Jahre. Geschlechtsspezifisch überwiegen Männer mit 71%. Bei 28,6% der Patienten bestand die Indikation zu Shuntanlage.

Mit einem multiprofessionellen interdisziplinären Therapiekonzept verbesserte sich die hirnorganische Symptomatik in bezug auf Kognition, Mnestic und soziale Integrationsfähigkeit, so dass 57,2% der Patienten in ihr häusliches Umfeld reintegriert werden konnten, 18,1% wurden in AHB-Kliniken überwiesen, 4,4% in Tageskliniken teilstationär weiter behandelt und 21,2% in Pflegeeinrichtungen verlegt.

Die Ergebnisse zeigen, dass die neuropsychiatrische Frührehabilitationsbehandlung von Patienten mit schwersten deliranten und amnestischen Psychosyndromen ein notwendiger und lohnender Bestandteil des postoperativen Behandlungsmanagement ist und das Outcome positiv beeinflusst.

P10 COGNITIVE REHABILITATION | C
NEUROPSYCHOLOGISCHE REHABILITATION VON ORGANISCHEN GEDÄCHTNISDEFIZITEN

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Gedächtnisdefizite spielen als Folgen neurologischer Erkrankungen eine nicht unerhebliche Rolle. Die Erforschung der Rehabilitation von Gedächtnisdefiziten ist dagegen überwiegend auf die Behandlung schwerer Amnesien konzentriert. Es werden vier Studien vorgestellt, in deren Zentrum die neuropsychologische Behandlung von nicht-amnestischen, aber gedächtnisgestörten Patienten steht: eine erste Studie, die drei verschiedene, für Patienten der Phase D der neurologischen Rehabilitation entwickelte Gruppentherapien mit einer Kontrollgruppe vergleicht. Eine zweite Studie, die für zwei analoge Patientengruppen ein funktionelles Training mit einem Strategietraining vergleicht. Die dritte Studie basiert auf dem Vergleich einer computerisierten Form des funktionellen Trainings mit einer Kontrollgruppe (beide Gruppe Patienten mit schubförmiger MS). Und eine letzte Studie, die wiederum bei Phase D Patienten die computerisierte Form des funktionellen Trainings mit einer Kontrollgruppe vergleicht.

Alle Studien kommen zu dem Ergebnisse, dass die Behandlung der Nichtbehandlung überlegen ist. Beim Zwischengruppenvergleich zeigt aber regelmäßig nur das funktionelle Training eine signifikante Überlegenheit gegenüber den Kontrollgruppen.

Die spezifische Form des funktionellen Trainings (inkl. der in ihm geleisteten Vermittlung von einfachen Basisfähigkeiten bzw. -strategien) sollen diskutiert werden, wie auch die Frage, ob auch für die Gedächtnisrehabilitation repetitive Stimulation eine gewisse Rolle spielt.

P11 COGNITIVE REHABILITATION | C
STUDIE ÜBER DIE EFFIZIENZ NEUROLOGISCHER REHABILITATION AM BEISPIEL ALLTAGSRELEVANTER KOGNITIVER FÄHIGKEITEN MIT DEM MESSINSTRUMENT VAT (VALENSER ALLTAGSORIENTIERTE THERAPIE)

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Das in der Klinik Valens entwickelte und publizierte Messinstrument VAT (Valenser alltagsorientierte Therapie) dient zur Erfassung der Selbständigkeit bei neurologischen Patienten in der erweiterten Alltagsaktivität. Um die Effizienz in der neurologischen Rehabilitation erfassen zu können, untersuchten wir eine Gruppe von Patienten (CVI, SHT, Hirnblutungen) zu Beginn des stationären Aufenthaltes (Messzeitpunkt 1) sowie im Anschluss an ein dreiwöchiges stationäres Therapieprogramm (Messzeit-

punkt 2). Dabei interessierte uns welche der Funktionen sich nach der dreiwöchigen intensiven Therapie verbessern.

Neben der Absolvierung des VAT-Tests wird der Mini-Mental-State (als Ausschlusskriterium für eine Demenz) sowie die Anzahl der erfolgten Therapien (Rekreation, Ergo-, Physiotherapie, neuropsychologische und logopädische Behandlung) erfasst. Dabei interessierte die Frage, ob die Anzahl der Therapien im Zusammenhang mit möglichen Verbesserungen im VAT-Parcour stehen. Wir untersuchten bisher 16 Patienten (Durchschnittsalter 51 Jahre). Davon sind 10 Patienten zum ersten Mal zu einem Rehabilitationsaufenthalt sowie 6 Patienten zum wiederholten Mal in einer Reha-Klinik. Alle Personen absolvierten den VAT-Test, einen Parcours mit folgenden Unteraufgaben: einen Kaffeeautomaten bedienen, ein Büro nach Plan finden, einen Brief versenden, am Kiosk Preise vergleichen und eine Kaufentscheidung treffen, einen Parkautomat bedienen (Zeit und Gebühr lesen, Rechnen) etc..

In einer ersten Auswertung der Erst- und Zweitmessungen zeigt sich insgesamt eine signifikante Steigerung. Vor allem die Leistungen in den Unteraufgaben Kaffeeautomat, Personalbüro finden, Brief versenden, Aufgaben am Kiosk lösen sowie das Gehen mit und ohne Hindernisse haben sich signifikant verbessert.

Literatur:

1. Keller M., Kool J., Keller-Hahn N., Kesselring J. Valenser Alltagsorientierte Therapien (VAT) – Validierung eines neuen Verfahrens zum Messen der Selbständigkeit von neurologischen Patienten. *Neurol Rehabil* 2002; 8 (5): 239-246

P12 COGNITIVE REHABILITATION | C
BIO-PHYSICAL HEALTH TECHNOLOGIES IN THE REHABILITATION OF PATIENTS SUFFERING CONSEQUENCES AFTER BRAIN INJURIES

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A brain injury can be a starting point in the development of a traumatic brain disease. According to different authors, after a brain injury, a psycho-vegetative syndrome, followed by vegetative diseases such as headaches, feeling dizzy, getting tired quickly, memory problems and a decrease in work abilities, dominates in 78% of cases.

This work was aimed at studying a complex effect of bio-physical technologies by Professor *Fomin M.I.* among patients suffering a post traumatic syndrome.

The work was based on the results of observation of 28 patients (17 women and 11 men, age 18–64). 8 patients had aesthetic syndrome, 14 people had vegetative-dystonic syndrome, 6 people suffered cerebral-oriented syndrome.

All patients received a complex consequent treatment, without any breaks using “Anotron”, “Barocyclon”, “Molecule-cell regulator” and vibro-massagers (all the equipment was patented by Fomin M.I.).

These technologies allow a complex approach in patient’s rehabilitation, detoxication of the whole organism; affect central and distant mechanisms of the pathological process regulation, improving microcirculation and cell metabolism. All these approaches together improve each other’s effectiveness. The complex treatment lasts 1,5–2 hours. The parameters of the effect and the position of electrodes were chosen individually due to the patient’s prevailing complex of symptoms; as a rule, one pair of electrodes was set trans-cerebrally to influence the central brain structures. The patients went through the procedures well, they felt relaxed, sleepy and experienced after treatment effect (3–4 hours later) – they felt active and that feeling became more stable by the end of the treatment. After the complex treatment, a positive tendency among all the patients was noticed: a decrease in their complaints

about insomnia, headaches, anxiety, and annoyance. They started to tolerate psycho-emotional and physical exercises more easily. The effectiveness of the treatment went along with a better result in psychological testing.

After the treatment a decrease of the latent period R300 was noticed among 85,7% of the patients.

Thus, health technologies by Professor *Fomin*, influencing the organism and activating the processes of self-regulation and adaptation can be used successfully in treatment of patients suffering consequences after brain injury.

P13 COGNITIVE REHABILITATION | C
SOUND OBJECT SEGREGATION FOLLOWING HEMISPHERIC LESIONS

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Brain-damaged patients often complain of hearing difficulties in noisy surroundings. This suggests putative disturbances of sound segregation mechanisms, the most powerful of which is the use of spatial cues. We report here on the capacity to use spatial cues for the identification of sound objects in noisy surroundings and for explicit sound localisation following brain damage. Eleven patients with unilateral or bilateral hemispheric lesions (stroke, head-injury, colloidal cyst with hydrocephalus, sequelae of meningitis), aged between 23 and 67 years, who participated in our rehabilitation program and had a full neuropsychological evaluation with detailed assessment of auditory cognitive functions. The latter included recognition of environmental sounds, sound localisation, sound motion perception and capacity to segregate sound objects by means of spatial cues (spatial-release-from-masking=SRM). Sound localisation was tested with a task that simulated five different azimuthal positions by means of varying interaural time differences (ITD). Subjects were instructed to indicate the perceived position on their head with their ipsilesional hand. Normative data have been obtained from 60 normal subjects (and published previously; *Clarke et al. 2000*). Sound object segregation based on spatial cues was tested using the SRM paradigm (a soft noise that is masked by a louder noise of similar frequency range can be perceived with increasing spatial separation between the target sound and the masking noise). In our test spatial removal of the masking noise was simulated by ITD (and thus, each ear continued to receive the same frequencies at a same intensity level). Normative data have been obtained from 60 normal subjects (and published previously; *Bellmann Thiran and Clarke 2003*). Four patients had a normal performance in sound localisation and presented correctly the SRM effect. Three other patients were deficient in sound localisation and did not present the SRM. The remaining four patients presented dissociation between these two capacities. Two were deficient in sound localisation, but presented correctly the SRM effect, the other two had the reverse profile, with normal sound localisation and absent SRM effect. In conclusion, the capacity to use spatial cues for the identification of sound objects in noisy surroundings can be impaired following brain damage, either in isolation or in association with deficits in explicit sound localisation.

P14 COMA | C
COMA FOLLOWING A SEVERE TRAUMATIC BRAIN INJURY – FUNCTIONAL OUTCOME AFTER 12 MONTHS.

M. Lippert-Grüner, C. Wedekind, N. Klug (Köln, D)

Introduction: In the last years there has been significant progress in medical technology and treatment, leading to a considerable increase in the number of severe traumatic brain-injury (TBI)

survivors. Most of them show severe functional deficits. For rehabilitation treatment, coma-patients present a special challenge.

Material and methods: The aim of the study is to improve the 12-months outcome in 24 severe brain injured patients with a coma duration for more than seven days. All patients had received an uninterrupted rehabilitative treatment, starting in the acute phase of illness and including Multimodal-Early-Onset-Stimulation (MEOS). Outcome after 12 months was assessed by means of Glasgow Outcome Scale (GOS) and Functional Independence Measure (FIM).

Results: 12 Months after trauma: six (25%) of the patients had died (GOS=1), three (12.5%) continued to be in a vegetative state (GOS=2), six (25%) were severely disabled (GOS=3), six (25%) were moderately disabled (GOS=4) and three (12.5%) achieved a good recovery with only minimal disability (GOS=5). Mean FIM was 88.3 (range 18–126).

Discussion and conclusion: The early onset rehabilitation is one of the most important factors for the outcome of the severe brain injured patients with a prolonged phase of coma. If patients survive the critical stage of TBI, mortality rate during the first year is still very high. Patients who survive and receive early and continuous rehabilitative treatment, despite of high number of severe neurological deficits, it is possible to get a high degree of autonomy and independence on care.

P15 COMA | C
A NEW SHOULDER RANGE OF MOTION SCREENING MEASUREMENT, ITS RELIABILITY IN THE ASSESSMENT OF THE PREVALENCE OF SHOULDER CONTRACTURES IN PATIENTS WITH IMPAIRED CONSCIOUSNESS DUE TO SEVERE BRAIN DAMAGE

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Objective: To determine reliability of a new shoulder joint range of motion (ROM) measurement for unconscious patients, and to assess the prevalence of shoulder joint contractures in such patients.

Design: Prospective cohort survey.

Setting: An early rehabilitation center for adult persons with neurological disorders.

Subjects: 50 patients with impaired consciousness due to severe cerebral damage of various etiologies. In addition, normal reference values were measured in 60 healthy adults.

Intervention: Shoulder ROM was assessed by measuring the distance between olecranon and underlay while the patient was lying supine on a solid surface and the patient's hands were passively positioned behind the neck. Distances between olecranon and underlay were measured first manually by the rater and second, for control, digitally by a blinded person from a digital photo taken while a constant force was applied on the elbow.

Main outcome measures: Prevalence of contractures defined as increased distance between olecranon and underlay or impossibility of positioning the hands passively behind the neck, and intra- and interrater-reliability of the two different shoulder ROM measurements with the interclass-coefficient (ICC).

Results: Measurement of shoulder ROM showed a high intra- (ICC: 0.78–0.91) and interrater-reliability (ICC: 0.77–0.90) for manual measurement, a high intra- (ICC: 0.91–0.95) and interrater-reliability (ICC: 0.90–0.94) for the digital analysis, and a high interclass correlation for both methods (ICC 0.87). The prevalence of shoulder contractures was found in 56 percent of the patients and in 50 percent of all shoulder joints.

Conclusion: The described method provides a reliable measurement for reduced shoulder ROM and appears to be a useful

screening method to demonstrate the prevalence of shoulder joint contracture in these patients.

P16 FUNCTIONAL IMAGING | C
THE NEURAL MECHANISMS OF MIRROR TRAINING

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It has been proposed that rehabilitation of hemiparesis after stroke can be improved by viewing the non-affected limb as the affected one by means of a vertical parasagittal mirror ('mirror training', *Altschuler et al., Lancet, 353 (1999): 2035-36*). Here, we describe two neuroimaging experiments (reported previously) which might help to understand the mechanism of this training procedure. In the first experiment, six right-handed normal subjects performed finger movements with either hand under visual control via a video chain while lying in a functional magnetic resonance (fMR) scanner. In a second experiment with positron emission tomography (PET), ten right-handed normal subjects performed movements with their right arm that were displayed in real-time as a computergraphic model of a human arm via a virtual reality system. In half of the trials of both experiments, the visual image was inverted horizontally, thus that the subject's right hand / arm was viewed as a left hand/arm and vice versa. Imaging analysis was performed employing Brain Voyager 4.9 (fMR) and SPM 99 (PET) respectively, each thresholded at a level of significance of $p < 0.01$ (corrected for multiple comparisons). In both experiments, inversion of the visual image lead to an activation of the hemisphere contralateral to the visual image. In the fMR experiment, these activations were found in the primary and higher order visual areas (*Dohle et al., J. Neurophysiol, 91(2004): 2376-9*). In the PET experiment, the activation focus was in the precuneal region (*Dohle et al., Soc Neurosci Abstr 163.7, San Diego, 2002*). Taking both findings together, the beneficial effect of mirror training in hemiparetic patients might be caused by the activation of the damaged hemisphere through the inverted visual image. Possible reasons for the differences in the activation patterns in both experiments and the implications for the implementation of mirror training procedures will be discussed.

P17 LEGAL ISSUES | C
CLINICAL PATHWAYS FÜR DIE STATIONÄRE NEUROLOGISCHE REHABILITATION

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Das therapeutische Vorgehen in der Neurologischen Rehabilitation ist weniger abhängig von der ätiologisch orientierten Diagnose als viel mehr von den entstandenen Funktions- und Fähigkeitsstörungen. Um hier clinical pathways (Behandlungspfade) als Abbild und Dokumentationsinstrument des unter den im klinischen Alltag gegebenen Randbedingungen bestmöglichen Ablaufs aufzustellen, müssen diagnoseunabhängige, fähigkeitsorientierte Parameter der Erkrankungsmanifestation betroffener Patienten beschrieben werden. Dafür wurde ein komplexer Algorithmus entwickelt, der auf empirischer Grundlage ermittelte, aufwandrelevante Komponenten („Behandlungspfeile“) umfasst. Jeder Behandlungspfeil beschreibt die bei Vorliegen bestimmter Funktionsstörungen (z. B. Bewusstseinsstörung, Sprachstörung, Hemiparese, Tetraparese, Dysphagie) erforderlichen Behandlungsprozesse, basierend auf den Prinzipien der evidence-based medicine, einschließlich der Erhebung des personellen und Sachmittel-Aufwandes. Kombiniert mit einem zentralen „Planungs- und Entscheidungspfeil“ kann die an den im individuellen Falle eines betroffenen Patienten vorlie-

genden Beeinträchtigungen orientierte Auswahl der zutreffenden Behandlungspfeile den Ablauf des Rehabilitationsprozesses adäquat abbilden.

Der Planungs- und Entscheidungspfeil enthält unter anderem Zieldefinitionen, das Zeitraster für Ergebniskontrollen und Handlungsanweisungen im Falle des Erreichens oder Verfehlens von Vorgaben. Zudem ist diese Darstellung der rehabilitativen Prozesse nicht nur hinsichtlich der Reha-Methoden, sondern auch des erforderlichen Aufwands nachvollziehbar und überprüfbar. Da innerhalb der Behandlungspfeile der personelle und Sach-Aufwand differenziert beschrieben wird, lässt sich der für einen individuellen Patienten erforderliche Aufwand in Abhängigkeit seiner Funktionsstörungen im Längsschnitt durch Zusammenfassung der einzelnen Behandlungspfeile ermitteln, was für die Kalkulation etwa von DRG oder anderen Fallpauschalen herangezogen werden kann. Im Querschnitt ergibt sich die in einem bestimmten Zeitkorridor erbrachte Leistung. Deren Umfang kann in Beziehung gesetzt werden zu dem in Deutschland eingeführten Phasenmodell der Neurologischen Rehabilitation. Eine derartige Abbildung soll nicht zuletzt zu der von gesundheitspolitischen Entscheidungswie von Kostenträgern gewünschten Leistungstransparenz in der Neurologischen Rehabilitation beitragen.

P18 LOCOMOTION | C
A PRELIMINARY NON-RANDOMISED STUDY TO EVALUATE THE SAFETY AND PERFORMANCE OF THE ACTIGAIT IMPLANTED DROP-FOOT STIMULATOR IN ESTABLISHED HEMIPLEGIA: PATIENTS' PERCEPTIONS

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Correction of drop-foot using surface functional electrical stimulation has been shown to be effective, particularly in stroke [1]. Despite benefits in walking, patients reported problems with electrode positioning, skin irritation and the inconvenience of external leads and electrodes. Implanted systems have failed to achieve as good improvement in walking partly because of their inability to control inversion and eversion, as components of normal ankle lift during walking. The ActiGait is an implantable drop-foot stimulator comprising a stimulation implant (nerve cuff and receiver), external control unit and transmitter, wireless heel switch and clinical station (PC based programming of stimulation parameters) (Fig 1). The system allows independent adjustment of output from four channels of stimulation via one nerve cuff, placed around the common peroneal nerve just proximal to its bifurcation into the deep and superficial branches. This design avoids many of the inconvenient aspects of external systems.

A prospective non-randomised trial to evaluate safety, performance and patients' perception of the device was conducted. All subjects who had a drop-foot following a stroke at least six months prior to recruitment gave informed consent. The study was approved by the Local Ethical Committees. Patients' perception was evaluated via an independently administered questionnaire based on one used with a surface system [2]. The questionnaire comprised 31 multiple choice questions and opportunity for comments.

Fifteen subjects were recruited from three stroke rehabilitation centres. Results showed statistically significant improvement in walking parameters and no changes in nerve conduction velocity. Thirteen subjects who completed the trial were sent the questionnaire. Twelve replies that have been received identified that 91% of subjects used the stimulator everyday and 82% for over 9 hours each day. 82% could don the stimulator without help, 63% in less than three minutes, the remainder in less than six. Compared with *Taylor et al's* study of a surface stimulator, patients used the

stimulator more often (91% everyday as opposed to 53%) and for longer (82% as opposed to 58% for 9 hours or more) and no problems were encountered with electrode positioning or skin irritation. The most 'popular' reason for using the stimulator was to make walking less effort and 90% of subjects said they were less likely to trip or fall.

In conclusion: the ActiGait system is as effective as the surface stimulator, is used more regularly, for longer periods and has fewer practical problems.

References:

1. Burridge JH: Does the drop-foot stimulator improve walking in hemiplegia? *Neuromodulation* 2001; 4 (2): 77-83
2. Taylor PN, Burridge JH, et al.: Patient's perceptions of the Odstock Dropped foot Stimulator (ODFS). *Clinical Rehabilitation* 1999; 13: 439-446

P19 LOCOMOTION | C COMPARISON OF FOUR DIFFERENT TECHNIQUES FOR LOMOMOTOR TRAINING AFTER SCI: FUNCTIONAL AND REFLEX OUTCOMES

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Background: In individuals with chronic (>1 yr) incomplete spinal cord injury (SCI), body weight supported (BWS) locomotor training has been shown to improve walking ability and other functions. However, optimal methods and parameters for training have not been established. Additionally, plasticity of spinal reflex circuitry may be associated with changes in function and this relationship has not been investigated fully.

Methods: Eighteen (18) individuals with chronic motor-incomplete SCI were assigned to 1 of 4 different BWS locomotor training protocols. Training was performed 5 days per week for 3 months using either: 1) treadmill training with manual assistance (TM), 2) treadmill training with peroneal nerve stimulation (TS), 3) treadmill training with robotic assistance (Lokomat robotic orthosis; LR), or 4) overground training with peroneal nerve stimulation (using a WalkaideII stimulator; OG). Prior to and following participation we assessed walking speed, balance, lower extremity strength, EMG patterns and selected spinal reflexes.

Results: All groups demonstrated improvements in overground walking speed: TM: +31.4%, TS: +30.8%, OG: +29.3%, LR: +42.9%. Mean initial strength scores (based on ASIA lower extremity motor scores; max= 50) were statistically different among training groups: TM= 36.2, TS= 27.8, OG= 39.8, LR= 20.5. There was a significant inverse correlation between change in walking speed and initial strength scores ($r = -0.83$). Mean balance scores (Berg Balance Scale max= 48) improved in 2 of the 4 groups: TM= 2, TS= 0, OG= 5, LR= 0. EMG patterns were more robust following training in all groups based on analysis of walking-related RMS values. Reciprocal inhibition was increased following training (16%; pooled data); there was a trend toward increased presynaptic (D1) inhibition and low frequency depression but this trend was not significant (likely do to small samples size).

Conclusions: Locomotor training is associated with improvements in walking function regardless of the form of training. Individuals with the greatest deficits in lower extremity strength made the greatest improvements in walking function. Overground training was associated with the greatest improvement in balance score. Changes in spinal reflex activity may be associated with changes in motor function. Supported by: NIH grant #HD41487, the Schumann Foundation and The Miami Project to Cure Paralysis.

P20 LOCOMOTION | C EFFECTS OF LOCOMOTION TRAINING WITH ASSISTANCE OF A DRIVEN GAIT ORTHOSIS IN HEMIPARETIC PATIENTS AFTER STROKE

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Aims: The results of gait rehabilitation after stroke is strongly dependent on exercising walking. However, in the beginning patients are often unable to practice walking due to their disability. In the last ten years it was assumed that treadmill training is effective to improve walking capabilities, partially with the assistance of graded body weight support.

During the early stages of treadmill training the paretic leg has to be moved manually on the treadmill. The physical capabilities and the individual experience of the therapists usually limit this training in severely handicapped patients.

To aid the therapists, a driven gait orthosis has been developed for paraplegic patients.

The apparatus is capable of moving the legs of a patient in a symmetric and physiologic way on the moving treadmill, while securing the patient at the level of pelvis and trunk. Actuators at the knee and hip joints are controlled by a position controller and produce angular movements of the joints. We report our experiences and measurements when transferring the use of the LOKOMAT to hemiplegic patients.

Design: Randomized controlled trial, pilot study.

Participants: 29 acute stroke survivors 14 in the treatment group and 15 in control group.

Intervention: Treatment group received daily approximately 30 min Lokomat therapy and control group 30 min daily regular physiotherapy based on proprioceptive neuromuscular facilitation and Bobath concepts. In addition both groups received 30 min regular physiotherapy daily. Participants were tested at baseline and after completing 20 units Lokomat therapy and 20 units physiotherapy or 40 units physiotherapy.

Main outcome measures: Time-walking-test and functional ambulation category.

Results: The walking speed after 4 weeks therapy in the Lokomat group and in controls was significantly improved compared to the baseline speed but there was no significant difference between the groups. The functional ambulation category shows in both groups an significant gain in the walking ability but did not reveal any statistical significant differences between the therapy and control group.

Conclusions: This pilot study indicates that the Lokomat therapy is a promising intervention for gait rehabilitation. There is no difference in effect compared to patients, who receive only physiotherapy, when intensity of treatment is controlled. Lokomat training eases hard work of therapist when exercising with severely handicapped patients. There is a subgroup, patients starting with a functional ambulation category score higher than 2 who showed more than average improvement. However, a larger trial is needed to define patients who would show more pronounced effects.

P21 LOCOMOTION | BS COMPARISON OF SURFACE EMG PATTERNS IN HEMIPLEGIC PATIENTS DURING TREADMILL TRAINING WITH AND WITHOUT ASSISTANCE OF A DRIVEN GAIT ORTHOSIS

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Aims: Restitution of gait after hemiplegia due to a stroke is strongly dependent on exercising walking. However, in the beginning patients are usually unable to practice walking due to their disability. Different technical apparatus have been developed to

assist gait training during the early period. There is evidence, that regular treadmill training is an effective measure to improve walking capabilities, partially with the assistance of graded body weight support. During the early stages of treadmill training the paretic leg has to be moved manually by therapists or assistants during walking movements on the moving treadmill. The physical capabilities and the individual experience of the therapists usually limit this training in severely handicapped patients. In addition, asymmetric walking can be alleviated by body weight support, yet not completely prohibited.

A driven gait orthosis (LOKOMAT) has been developed for gait exercises in paraplegic patients. The apparatus is capable of moving the legs of a patient in a symmetric and physiologic way on the moving treadmill, while securing the patient at the level of pelvis and trunk. Actuators at the knee and hip joints are controlled by a position controller and produce angular movements of the joints. We report our experiences and measurements when transferring the use of the Lokomat to hemiplegic patients.

The aim of this study was to find out whether automated treadmill training in the Lokomat induces a muscle activation how the EMG pattern differs in hemiparetic patients and healthy subjects during manual and automated treadmill training.

Methods: 7 Healthy controls and 9 hemiplegic stroke patients were measured while walking on a treadmill with assistance of a driven gait orthosis (LOKOMAT) as well as on a normal treadmill with facilitation techniques by therapists. We present data of movement recordings by surface EMG muscle patterns from muscles tibialis anterior, gastrocnemius, quadriceps and biceps femoris.

Results: Our results indicate in healthy subjects and on the unaffected side of patients, that the use of an extrinsically given cyclic leg movement will induce typical muscular walking patterns. Faster velocities induced higher amplitudes of muscular patterns. Not surprisingly, patterns and EMG amplitude were reduced on the affected side. Rather astonishing, most recordings on the treadmill without the use of the Lokomat, only with the assistance of a facilitating physiotherapist would induce less pronounced muscular patterns.

Conclusion: Our experiences support the idea, that a close to normal rhythmic locomotor pattern can be elicited when a driven gait orthosis is used for inducing cyclic leg movements in healthy controls and hemiplegic subjects.

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LOCOMOTION | C

ENERGY EXPENDITURE OF HEMIPARETIC PATIENTS AND HEALTHY SUBJECTS: WALKING IN A LOKOMAT VS. ON A TREADMILL

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Purpose: This study examined the oxygen and energy expenditure for normals and severely disabled hemiparetic patients while walking in a driven gait orthosis (Lokomat) and in comparison to walking on treadmill.

Methods: 5 hemiparetic patients (age 50±15, Body Mass Index 25±3, FAC 4) and 5 healthy subjects (age 46±14, Body Mass Index 26±4) were measured during walking in the Lokomat and on treadmill at a speed of 1 and 2 kilometer per hour. Patients who could not walk with 2 km/h on treadmill, walked with their maximum speed. Reference was measured while standing in the Lokomat and on treadmill with 30% Body weight support.

Measured parameters are $\dot{V}O_2$ [$\text{ml} \times \text{min}^{-1}$], $\dot{V}CO_2$ [$\text{ml} \times \text{min}^{-1}$] received breath-by-breath and heart rate [beats per minute]. To describe energy expenditure the terms $O_2\text{cost}$ [$\text{ml} \times \text{kg}^{-1} \times \text{m}^{-1}$] and $O_2\text{rate}$ [$\text{ml} \times \text{kg}^{-1} \times \text{min}^{-1}$] are used. The rate of O_2 consumption ($O_2\text{rate}$) relates to the level of physical effort and the $O_2\text{cost}$

determines the total energy required to perform a task of walking. For statistical analysis the parameters were averaged over the last 30 seconds of each condition and each person.

Results: For patients oxygen consumption is higher on treadmill than in the Lokomat, this already in the reference condition, indicating that standing in a treadmill is physically more demanding for patients, while for controls it is the opposite. Healthy subjects show significant higher energy level on the treadmill when walking at 2 km/h. At 1 km/h patients have significant higher values for $O_2\text{rate}$ and $O_2\text{cost}$ than normals on the treadmill, while there are no significant differences in the Lokomat.

Conclusions: Energy expenditure is higher for treadmill than for Lokomat exercise. But to calculate total expenditure for one Lokomat therapy session or one treadmill therapy session, the average duration of 30 min for Lokomat and 10 min for treadmill therapy have to be considered.

P23

LOCOMOTION | C

DIFFERENT WALKING STRATEGIES IN THE LOKOMAT: MEASUREMENT OF ENERGY EXPENDITURE

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Purpose: This study investigated the oxygen uptake and energy expenditure of hemiparetic patients and controls while walking in a driven gait orthosis (Lokomat) at several robotic strategies.

Methods: 10 hemiparetic patients (age 54±14, Body Mass Index 26,3±2,6) and 10 healthy subjects (age 48±12, Body Mass Index 25,3±4,3) were measured while they were walking in the Lokomat. They underwent different robotic strategies, in permuted order between subjects. Baseline was measured while standing in the Lokomat with 30% body weight support (BWS). Robotic strategies were walking with 100% BWS at a speed of 1 vs. 2 km/h, walking with 30% BWS at a speed of 1 vs. 2 km/h. A complete different control option allows to reduce the force that supports the moving leg, to allow more active movements. We measured this option by reducing the driving force to 60% or to 0% of either side.

Each robotic strategy was executed for 3 minutes, separated by 2-minutes resting periods. Measured parameters are $\dot{V}O_2$ [$\text{ml} \times \text{min}^{-1}$], $\dot{V}CO_2$ [$\text{ml} \times \text{min}^{-1}$] received breath-by-breath and heart rate [beats per minute]. To describe energy expenditure the terms $O_2\text{cost}$ [$\text{ml} \times \text{kg}^{-1} \times \text{m}^{-1}$] and $O_2\text{rate}$ [$\text{ml} \times \text{kg}^{-1} \times \text{min}^{-1}$] are used. The rate of O_2 consumption ($O_2\text{rate}$) relates to the level of physical effort and the $O_2\text{cost}$ determines the total energy required to perform a task of walking. For statistical analysis the parameters $O_2\text{rate}$ and $O_2\text{cost}$ were averaged over the last 30 seconds of each period and each person.

Results: For patients all Lokomat strategies with 30% body weight support are significantly different from baseline, but there are no significant differences between baseline and walking with 100% body weight support. In contrast for healthy subjects 30% BWS with 100% unilateral force reduction is significantly different from baseline. This indicates, that for healthy controls typical walking conditions in the Lokomat are not physically demanding. Both groups show no significant difference between walking with 1 and 2 km/h for $O_2\text{rate}$, leading to a reduction of $O_2\text{cost}$ for higher speed in both groups.

Conclusions: Walking in the Lokomat is not passive according to the measurement of oxygen consumption. Improved activity is an effect of an active stance phase (walking with 30% BWS), not of the passive leg movement (walking with 100% BWS). For the amount of oxygen consumption within a therapy unit speed is no relevant parameter.

P24 LOCOMOTION | C
EFFECTIVE GAIT TRAINING ON THE TREADMILL AND THE LOKOMAT: COMPARISON OF ACHIEVABLE TRAINING TIME AND SPEED

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Introduction: Physiotherapy is the mainstay of rehabilitation approaches for impairments in motor function. Only during the last few years the application of treadmill training has helped to improve the possibility of gait training in severely impaired patients. Due to the high effort for therapists when exercising with stroke patients or paraplegic patients on the treadmill, new robotic devices have been developed to assist and even increase the effect of training sessions. The most advanced apparatus is the Lokomat, which has been developed to enable completely paralyzed patients to walk on a treadmill without the physical help of therapists. The patients are walking in a driven gait orthosis, with actuators at hip and knee joints of either side inducing cyclic gait patterns.

Methods: We compared the effective training time and walking speed as well as the increment from begin to end of therapy sessions of groups of stroke and spinal patients during their physiotherapy who were either exercising on a treadmill (n=50) or in the lokomat (n=44). To make sure that comparable efforts were requested from the patients, we restricted our analysis to our three most experienced physiotherapists. An identical goal of the sessions was to achieve the maximum walking speed as well as to continue exercising as long as the patients could tolerate it. Sessions had to be limited to a maximum of 45 minutes effective training time for logistic reasons, which only came into effect for Lokomat training.

Results: On the average, patients could continue gait exercise on the treadmill to a maximum of 13 minutes, leading to a distance of 460 meters per session at the end of the rehabilitation period. In contrast, patients treated on the Lokomat ended their walking endurance at 37 minutes average, with a resulting distance of 1230 meters per session. Groups were comparable in terms of the motor items of the Barthel Score.

Conclusion: This analysis confirmed subjective impressions, that effective training time can be enhanced two- to threefold by the use of robotic assistance. Although the net time of gait exercise may not be the only parameter to control the rehabilitation outcome what locomotion is concerned, it certainly is an important factor.

P25 LOCOMOTION | C
VERGLEICH DER AEROBEN ÜBUNGSINTENSITÄT BEI PATIENTEN NACH SCHLAGANFALL – GANGTRAINER VERSUS KONVENTIONELLE PHYSIOTHERAPIE. EINE RANDOMISIERTE UND KONTROLLIERTE LONGITUDINALSTUDIE

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Einleitung: Obgleich die Erkrankungen Schlaganfall und Herzkrankheit gemeinsame Risikofaktoren und pathophysiologische Prozesse besitzen, existierten nur wenige Untersuchungen bezogen auf die kardiorespiratorische Belastung in der Rehabilitation von Patienten nach Schlaganfall. Die aktuellen AHA-Leitlinien empfehlen ein Trainieren der aeroben Kapazität von 20-60 Minuten pro Tag an mindestens 3 Tagen der Woche. Die vorliegende Studie vergleicht die Übungsintensität im Verlauf der physiotherapeutischen Behandlung von Patienten nach Schlaganfall.

Methoden: Insgesamt 150 Patienten nach Schlaganfall (Intervall <60 Tage, Barthel Index 25–60) wurden im Rahmen der multizentrischen Studie DEGAS (DEutsche GANgtrainer-Studie) zwei Gruppen zugewiesen. Die Experimentalgruppe erhielt jeden Werktag 20 min Gangtrainer (GT) plus 25 min Physiothe-

rapie (PT) und die Kontrollgruppe (KG) 45 min PT für jeweils 4 Wochen. Mit einem Pulsmessgerät (POLAR S410) wurden bei den Studienpatienten des Zentrums Kreischka (n=71) einmal wöchentlich die Parameter Ruheherzfrequenz (HR rest), mittlere Herzfrequenz beim Üben (HR mean), höchste Herzfrequenz (HR peak) und der Anteil der Übungszeit im aeroben Trainingsbereich in einer Behandlungseinheit kontinuierlich gemessen. Die Parameter des aeroben Trainingsbereiches wurden mit der adaptierten Karvonen-Formel berechnet.

Ergebnisse: In der GT-Gruppe wurde länger pro Tag im empfohlenen Trainingsbereich trainiert als in der KG-Gruppe (15,8 min vs. 5,3 min; $p < 0,05$; Anteil der Übungszeit im aeroben Trainingsbereich 34% vs. 11%; $p < 0,05$). Im Vergleich mit der KG-Gruppe fanden wir signifikante Unterschiede zugunsten der GT-Gruppe in den Parametern HR mean: 103 b/min vs. 93 b/min und HR peak: 122 b/min vs. 112 b/min; $p < 0,05$. Kein Patient wurde kardial überbelastet.

Schlussfolgerungen: Das repetitive Gehtraining mit dem Gangtrainer von Patienten nach Schlaganfall (integriert in die physiotherapeutische Behandlung) ist ein adäquater Reiz, um in der Frührehabilitation das kardio-respiratorische System ohne Überbelastung der oft multimorbiden Patienten zu trainieren.

Die Auswertung der DEGAS-Studie wird zeigen, ob sich die Vorteile in der kardio-respiratorischen Belastung auch auf die funktionellen Outcome-Parameter der Gehens und der Alltags-selbstständigkeit auswirken.

P26 MOTOR REHABILITATION | C
RELIABILITY OF A VIDEO-BASED MODIFIED FUGL-MEYER SCALE FOLLOWING STROKE AND UPPER-LIMB MOTOR DEFICITS

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The Fugl-Meyer Assessment Scale (F-M) is a commonly used to document motor impairment of the upper-limb following a stroke. The scale's intra- and interrater reliability while the raters are attending the patients are documented. However, the utility of the test in randomized controlled clinical trials is questioned due to the difficulty of concealing rater knowledge of subjects' group assignment. The purpose of this methodological study was to establish intra- and interrater reliability of a video-based scoring of a modified F-M. Five raters of varied disciplines scored four videotapes of patients performing the F-M test. The order of tape reviews was randomized in each of three sessions separated by five to eight days. All raters participated in a two-hour training session prior to testing. An independent data manager conducted analysis of variance (ANOVA), inter- and intraclass correlation coefficients (ICC) and a Tukey post-hoc analysis using SPSS software. There were no significant differences of tester scores across sessions but significant difference between testers ($P < .05$). Post-hoc analysis identified that two raters with previous experience with the F-M test, scored higher than those with no previous experience ($14.5 \pm .25$ vs. $11.47 \pm .19$ points). Four raters' intrarater ICC was 0.99 and one was 0.95 yielding a group mean of 0.98. Coefficient of variation (CV) ranged from 0.049 to 0.084. We concluded that a video-based Fugl-Meyer assessment scale is reliable and can be used by an independent evaluator in randomized clinical trials provided they have similar experience administering the test.

P27 MOTOR REHABILITATION | C
THE EFFICIENCY OF IMPULSE MAGNETO STIMULATION IN REHABILITATION OF THE PATIENTS WITH MOVEMENT DISORDERS AFTER DISCECTOMY

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Purpose of this study is to estimate the efficiency of inductive impulse magneto therapy in the patients within early period after discectomy.

Materials and methods: Magneto stimulation was applied in 104 patients with paresis of foot flexor or foot extensor on the 2th–5th day after discectomy (L5 or S1) (group 1). Stable and scanning methods were used with induction 0.5–1.7 Tl daily during 12–18 days. The control group consisted of 62 age- and gender matched patients with the similar severity of disease (group 2). The patients of control group were conducted by usual rehabilitation (massage, kinesiotherapy, laser therapy). We used Muscular Force Scale of *R. Braddom*, MOS SF-36 and ENMG before and after the treatment.

Results: There was significant regress of degree of paresis by 1–2 marks in 74% of the patients of the group 1 ($p < 0.05$). Only 51% of patients of the group 2 had the same changes. SF-36 scores were considerably improved in group 1. The patients of control group had not considerably improved dynamics of these scores. Significant increase (on 50% and more) of initially reduced peak parameters was registered in stimulating ENMG in 45% of the patients of group 1 and in 29% of the patients of group 2. In the group 1 motor nerve conduction velocity on fibular nerve increased in 42% of the patients, on tibial nerve – in 51%. The factor of dynamics was 15–22%. Significant changes of nerve conduction parameters were not registered in the patients of group 2.

Conclusion: Additional magneto stimulation therapy heightens the efficiency of rehabilitation in the patients within early postoperative period after discectomy.

P28 MOTOR REHABILITATION | C
MULTICHANNEL PROGRAMMABLE ELECTRICAL STIMULATION IN REHABILITATION OF THE PATIENTS WITH GUILLAIN-BARRÉ SYNDROME

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Purpose of this study is to estimate efficiency of multichannel programmable electrical stimulation in rehabilitation of the patients with Guillain-Barré syndrome (GBS).

Material and Methods. Multichannel programmable electrical stimulation (adaptive movement proofreader) was used in 86 patients with GBS (group 1). The stimulation was taking during locomotion. The control group consisted of 40 age – and gender – matched patients with GBS of the same severity (group 2). The patients of control group were conducted by usual rehabilitation (massage and kinesiotherapy). We used MOS SF-36 and ENMG before and after the treatment.

Results. After the rehabilitation course with the use of multichannel functional stimulation SF-36 scores was increased only in the patients of group 2. In consider of the data of stimulating ENMG in 64% of the patients of the group 1 the increase of amplitude M-answers in muscles analysis was noticed ($? < 0.05$). Only 28% of patients of the group 2 had similar changes. The motor nerve conduction velocity of upper extremities increased in 15% of the patients, lower extremities – in 10%. In the control group there were not any significant changes of nerve conduction parameters. **Conclusion.** Multichannel programmable electrical stimulation improves restoration of motor function in the patients with GBS. This method leads to regress of peripheral paresis, improves the conductivity of affected nerves and motion activity of patients with GBS.

P29 MOTOR REHABILITATION | C
AEROBES LAUFBANDTRAINING PLUS PHYSIOTHERAPIE VERBESSERT DIE GEHÄHIGKEIT VON SUBAKUTEN SCHLAGANFALLPATIENTEN: EINE RANDOMISIERTE KONTROLLIERTE STUDIE

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Absicht: Die Studie wollte klären, ob selbständig oder mit Hilfe gehfähige subakute Schlaganfallpatienten von einem aeroben Laufbandtraining (LBT) plus Physiotherapie (KG) hinsichtlich ihrer Gehgeschwindigkeit und -ausdauer mehr profitieren konnten als mit Physiotherapie gleicher Intensität allein. Weitere Frage war die nach der Gangqualität.

Methodik: 50 hemiparetische Patienten (<6 Wochen Intervall, Functional Ambulation Category 2, 3 oder 4, kardiovaskulär belastbar, erfolgreicher Belastungstest), per Los einer von 2 Gruppen zugeordnet, Gruppe A: 20 min LB + 30 KG, Gruppe B: 50 min KG, jeden Werktag, 6 Wochen lang, LB: pulskontrolliert, angestrebt wurde eine Herzfrequenz nach folgender Formel: HF-Ruhe + (HFmax – HFRuhe) * 0.6, über die Bandgeschwindigkeit und Neigung, KG: konventionelle Therapie, zusätzlich in beiden Gruppen 20 min Ergometertraining am Fahrrad jeden Werktag. Primär abhängige Variablen: Gehgeschwindigkeit (10m-Test), Ausdauer (6min-Test) und Gangqualität (Score, blinde Beurteilung anhand von Videos) erhoben vor, nach Studienende und nach 3 Monaten.

Ergebnisse: Gruppen vor Beginn homogen, signifikant größerer absoluter Zugewinn an Gehgeschwindigkeit und maximaler Gehstrecke zu Studienende und nochmals zum Follow-up in der Experimentalgruppe. Keine relevanten Nebenwirkungen. Gangqualität unterschied sich zu keinem Zeitpunkt zwischen den Gruppen.

Diskussion: Das aerobe LBT plus Physiotherapie bewirkt unter Berücksichtigung geeigneter Einschlusskriterien eine signifikant größere Steigerung der Ganggeschwindigkeit und -ausdauer hemiparetischer Patienten als Physiotherapie alleine. Häufig befürchtete ungünstige Auswirkungen auf die Gangqualität konnten nicht bestätigt werden.

P30 MOTOR REHABILITATION | C
RELATION BETWEEN STIMULATION CHARACTERISTICS AND CLINICAL OUTCOME IN STUDIES USING ELECTRICAL STIMULATION TO IMPROVE MOTOR CONTROL OF THE UPPER EXTREMITY FOLLOWING STROKE

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Introduction: Functional impairment of the affected upper extremity is one of the disabling consequences of a stroke. Electrical stimulation is one of the therapies that can be applied to improve the impaired arm function. Several reviews have shown that electrical stimulation has a positive effect on motor control of the affected upper extremity in stroke. However, various devices and approaches are available for the application of the current.

The aim of this review is to explore the relationship between characteristics of stimulation and the effect of electrical stimulation on the recovery of upper limb motor control following stroke.

Methods: A systematic literature search up to December 2003 was performed in Medline, Embase and the database of the Cochrane Field 'Rehabilitation and Related Therapies' in order to identify clinical trials (both randomised and non-randomised) in which electrical stimulation was applied to improve motor control and/or function of the upper extremity in stroke. The outcome measures used were examined to identify a possible relationship between the reported effect and the following characteristics: duration of stimulation, method of stimulation, setting of stimulation parameters, target muscles and stage after stroke.

Results: Nineteen clinical trials were included, and the results of 22 patient groups were evaluated. A positive effect of electrical stimulation was reported for 13 patient groups. Positive results were more common when electrical stimulation was triggered by voluntary movement rather than non-triggered electrical stimulation. There was no relation between the effect of electrical stimulation and the other characteristics examined.

Conclusion: Triggered electrical stimulation may be more effective than non-triggered electrical stimulation in facilitating upper extremity motor recovery following stroke. It appears that the specific stimulus parameters may not be crucial in the effect of electrical stimulation.

P31 MOTOR REHABILITATION | C
TRANSCUTANEOUS TRICEPS STIMULATION TO OVERCOME ABNORMAL JOINT TORQUE PATTERNS IN PARETIC UPPER EXTREMITIES OF CHRONIC STROKE SUBJECTS

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The goal of the research project was to quantitatively assess if transcutaneous functional electrical stimulation of elbow extensors can overcome the expression of abnormal torque patterns in the paretic upper limb of subjects with hemiparetic stroke. Abnormal torque patterns consist of a strong coupling between shoulder abduction (SAB) with elbow flexion (EF) or between elbow extension (EE) and shoulder adduction (SAD) torques. Both patterns reduce the active range of motion during reaching movements.

Eight subjects (5 male and 3 female; age 44–73) with a unilateral brain injury resulting from a stroke at least two years prior to participation in this study were selected. All subjects showed a moderate to severe upper limb motor impairment (Fugl-Meyer assessment scores of 21–36). Joint torques of shoulder and elbow were measured under isometric condition using a 6 DOF load cell. The subjects were seated in a Biodex chair with shoulder and waist strapped to restrain trunk and shoulder movements. The forearm and wrist were cast and attached to the load cell. The triceps brachii muscle was stimulated with a Compex Motion electric stimulator using trapezoidal stimulation patterns. In the first part of the experiment the stimulation parameters required to obtain the highest EE torque were determined. In the second part the subjects were asked to lift their arm with different SAB torque levels while the triceps muscle was stimulated to produce EE in order to compensate the abnormal EF torque. In the third part the subjects were asked to perform different levels of SAB and to add voluntary EE during triceps stimulation.

Maximal EE torque obtained with triceps stimulation was 6.3 (± 4.2) Nm or 25.8 (± 14)% of maximum voluntary contraction ($n=8$). In six subjects triceps stimulation could overcome abnormal EF during SAB. With triceps stimulation the subjects could achieve a SAB of 11.7 (± 7.2) Nm without generating abnormal EF, enough to lift up the arm against gravity. In two subjects triceps stimulation could not completely reverse EF to EE during SAB. The other six subjects produced a net EE moment of 7.0 (± 4.0) Nm with voluntary EE and stimulation for a SAB of 13.7 (± 7.0) Nm. These isometric results showed that electrical stimulation could overcome abnormal torque patterns in chronic stroke subjects. A future goal of our work will be to develop a system that enables controlled FES-assisted arm movements to enlarge the active workspace.

P32 MOTOR REHABILITATION | C
EFFECT OF EMG-TRIGGERED ELECTRICAL STIMULATION IN PATIENTS WITH CHRONIC HEMIPLEGIA

K. SungHoon, L. Young-Hee (Wonju KangWonDo, Korea)

Introduction: Following a cerebrovascular accident (CVA) and traumatic brain injury (TBI), any spontaneous recovery of the upper limb motor function is generally limited to the first six months. During this period, the motor recovery has been reported to be enhanced, beyond that attained by conventional therapy, rehabilitation techniques, including neurofacilitatory physical therapy, EMG bio-feedback and positional feedback, with electrical stimulation. However, there is a consensus that the current rehabilitation techniques are less effective in improving upper limb motor function in a chronic brain lesion (>6 months). As the months after a stroke accumulate into years, individuals typically accept the chronic motor problems, and attempt to compensate for their losses. Wolf et al. [1] argued that individuals with upper-extremity motor problems display behaviors that indicate learned nonuse. An affected arm is not used for any voluntary movements, whereas an unaffected arm will attempt to execute all of the motor actions required for daily living. So, control of upper extremity functions, such as wrist and finger extensors, are a challenging aspect in upper extremity recovery. In this study, attempts were made to identify the effect and mechanism of EMG-triggered electrical neuromuscular stimulation for the recovery of hemiplegic arm function.

Methods: Eight subjects, 6=1 year after stroke, and 2 with TBI, with chronic upper-extremity impairments, were recruited. All the subjects were male, with a mean age of 40 years ($SD=5.8$) and an average time after brain lesion of 26 months ($SD=19$). Six of the subjects had left hemisphere brain lesions, whereas the other two had right hemisphere brain lesions.

Both before and after treatment, six clinical tests were administered to evaluate the effects of the treatment. The Box and Block timed manipulation test, Fugl-Mayer (FM) score and functional independence measure (FIM), were used to evaluate the functional recovery in hand and wrist/finger movements after the brain lesion. A modified Ashworth scale (MAS) was used to evaluate the spasticity. The motor free visual perception test (MVPT) and Loewenstein occupational therapy cognitive assessment (LOTCA) were used to evaluate the perceptual and cognitive function. A quantitative EMG, from the extensor digitorum communis (EDC) muscle, and an excursion of the 2nd metacarpophalangeal joint, using the MP150[®] system (BIOPAC systems Inc.), were administered to evaluate... (for full abstract please contact kimrehab@hanmail.net).

P33 MOTOR REHABILITATION | C
AN EXPERIENCE OF USING TRANS-CRANIAL MAGNET STIMULATION AS A PREDICTOR OF MOVEMENT FUNCTIONS RESTORATION

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The method of transcranial magnet stimulation gave neurophysiology new opportunities: it allows to estimate the functional conditions of the motor crust, to localize the cause of the injury (in the strong phase of the stroke before any visual changes on MRI and Computer Tomography), and also predict restoration of movement functions, evaluate effectiveness of rehabilitation technologies. In our research method of transcranial magnet stimulation was used to estimate recreation treatment predictions. The research took place on the device "Magstim", the maximum power of the stimulus -2. The registration was checked bilaterally from two muscles (distal and proximal arm parts). The period of first registration –

from 7 to 10 days, of the repeated one – from 21 to 30 days from the beginning of the disease. 8 patients with a strong brain blood circulation misbalance, having a serious hemiparesis (from 1 to 2 marks due to Weiss 6 score scale) were observed. Following parameters were estimated: the fact of called motor reaction presence (even minimal), the crust reaction. During the first registration in the first group of patients (3 people) no motor reaction during the injured hemisphere stimulation was observed. In the second group (4 people) – the called motor answer was registered when high level of crust motoneurons excitement was applied. No changes were received in one case.

When the repeated registration took place in the first group the following dynamics was observed:

2 patients showed low motor reaction at almost maximum power of the impulse. A positive dynamics from the neurological point of the problem was noticed – the level of hemiparesis regressed during this period of time to 2,5–3 marks. One patient had no neurophysiological dynamics.

When the repeated registration took place in the second group the following dynamics was observed:

The estimated criterion of the crust latency decreased among 3 patients (by 2,04). The growth of muscle strength to 3–3,5 marks was noticed. One patient had no neurophysiological dynamics and a little regress of hemiparesis was observed (to 2,5–3 marks). Thus, the received results allow us to make a conclusion about sensitiveness of neurophysiological parameters of transcranial magnet stimulation in the prediction of movement rehabilitation among after stroke patients.

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MOTOR REHABILITATION | C

FEATURES OF THE HIGH-PEAK MULTIFREQUENCY VIBROTHERAPY IN TREATMENT LUMBAR SPINE PAIN

K.V. Lyadov, I. Solonets, V. Korotky (Moscow, RU)

The information found in literature on vibrotherapy has controversial character, and often doesn't agree with our observations, that leads to more detailed studying of the influence of high-peak vibration on neurological conditions among patients with spine diseases, depending on therapeutic frequencies.

26 patients were observed, 23–56 years old, 11 (42%) men and 15 (58%) women. The basic clinical forms were lumbar spine reflex syndromes. In the first group of 14 patients, procedures were carried out using low frequency (30–35 Hz). In the second group to 12 patients the high-frequency vibrotherapy (50–55 Hz) was used. All patients received procedures from the device “VIBRAMATIC”, by a labile technique, duration of 10 minutes.

Anaesthetizing action, influence on a muscle tone, speed of occurrence and degrees of an expressiveness of a dermal hyperemia were estimated. Inspection was carried out before the procedure, right after it and 30 minutes after the procedure. To study the influence on muscle tone the method of the EMG on the device “NORODYN” was chosen symmetric juxtaspinal muscular groups were investigated.

The research showed that the analgesic effect in a greater degree is expressed and develops much faster at frequency 50–55 Hz. At low-frequency influence the analgesic effect is expressed less considerably and appeared only by the end of the procedure.

The EMG control among first group patients revealed a well noticed detonization effect during low-frequency vibrotherapy. In the second group detonization was not so obvious, and sudden changes of a muscle tone, up to complete myotonical inversions were observed.

Dermal hyperemia that appeared stably at the beginning of the procedure (between 1 and 3 min) was noticed among the second group patients.

In the first group hardly seen hyperemia appeared by the end of procedure only among 3 patients. In 30 minutes the expressiveness of the received effects became 20%–30% lower, but the basic tendency remained former.

Thus, it is possible to conclude, that the high-peak vibrotherapy from the device “VIBRAMATIC” causes strongly separated clinical effects. Low frequencies (30–35 Hz) render expressed detonizing action on pathological muscular hypertonus. High frequencies (50–55 Hz) show fast analgesic effect and obvious hyperemising action. It allows applying a high-peak multi-frequency vibrotherapy to patients who suffer spine reflex syndromes, depending on pathogenetic variant of the current disease.

P35

MOTOR REHABILITATION | C

INFLUENCE OF A COMPLEX OF MANUAL THERAPY AND VIBROTHERAPY ON DYNAMICS OF FUNCTIONAL INFRINGEMENTS IN TREATMENT OF LUMBAR SPINE PAIN

K. V. Lyadov, I. Solonets, V. Korsakov (Moscow, RU)

Studying influence of highpeak vibration on clinical current spinal reflex sets of symptoms we made a conclusion that low frequencies (30–35 Hz) render expressed downstroke effect on a pathological muscular spastic structure. High frequencies (50–55 Hz) achieve analgesia accompanying with expressed hyperemia. Based on these facts we offered a complex of manual therapy and vibrotherapies to be appointed in view of pathogenetic variant of current disease.

For an estimation of efficiency of complex treatment 78 patients (24–49 years old) were diagnosed and treated. The basic clinical cases were lumbar spine reflex syndromes. An EMG on the device NORODIN revealed imbalance of bioelectric activity of symmetric juxtaspinal muscular groups within the limits of 20–50%. Goniometry NOROTRAC showed restriction of sagittal excursion of lumbar spine 20–40% from norm but thus at 36% of patients hypermobility in a frontal plane was revealed.

38 patients (basic group) received vibrotherapy with the subsequent manipulation. 40 patients (control group) were treated by only manual therapy. A vibrotherapy carried out daily from the device VIBRAMATIC with frequency 30–35 Hz by a labile technique. All patients in addition received not steroid anti-inflammatory drugs.

As a result of treatment 26 basic group patients (68%) showed improvement on the 5th day that was evident by normalization of bioelectric activity of muscles. 10 patients (27%) an EMG showed a difference between healthy and damage sides of spine on 10–15% and 2 patients (5%) showed no changes in health status. Repeated goniometry at the end of a course has revealed a normalization of sagittal excursion in 27 patients (71%).

Control group 22 (55%) patients subjectively showed appreciable improvement and 11 patients (27,5%) – only improvement, 7 patients (17,5%) marked ineffective results of treatment. By the end of treatment 17 patients (42,5%) had normalized bioelectric activity of juxtaspinal muscles. 23 (57,5%) an improvement of EMG parameters was marked only on 12–20%. Sagittal excursion of spinal was normalized among 24 (60%) patients.

Frontal hypermobility, in total, has decreased at 19 patients (68%). This research has shown that manual therapy has no influence on forcing of hypermobility available in patients but normalizes spine movements parameters. Using a complex of low-frequency vibrotherapies and manual therapy allows considerably accelerate the terms of rehabilitation course which we recommend for treatment of spinal pain sets of symptoms.

P 36 MOTOR REHABILITATION | C
NEW APPROACHES TO RESTORE THE FUNCTION OF WALKING TO PATIENTS WHO HAVE SUFFERED FROM CRANIOCEREBRAL TRAUMA

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One of the most serious consequences to address in patients suffering from severe craniocerebral trauma is the weakening effect on the functional abilities, including, significantly, the function of walking. Therefore, the restoration of the skills of walking, together with improvement of quality and speed of gait, and control of a pose are priorities in the rehabilitation of such patients.

In research, we estimated the therapeutic efficiency of joints influenced by programmed multi-channel electro-stimulation of muscles and compared this result with that achieved using therapy by balance.

Programmed multi-channel electro-stimulation uses artificial intelligence to monitor movement. Artificial correction of movement in pathological walking will take place when electric stimulation of muscles during movement occurs in exact conformity to natural excitation and reduction of muscles in the given impellent act. However, the methodology of therapy by balance makes use of biological feedback to regain a vertical pose when the impellent is introduced. The session is carried out on a special platform, which registers change of the pressure centres of the patient.

Results of research are confirmed on a computer complex of the clinical analysis of movement and gait, stabilometry and on neurological scales. From the parameters describing walking we have chosen the following: speed and temp of walking and factor of rhythm.

In a group of patients where we carried out electro-stimulation of muscles in walking and therapy by balance, these parameters have increased 1.4 times in comparison with other groups. The best results in terms of pose control were from groups taking therapy by balance. Significant improvements were noted in all patients with reference to their mental and emotional condition and their improved motivation towards rehabilitation. The estimation as "in daily life" level on scale FIM (Functional Independence Measure) has shown activity growth of functional independence in sectors 'self-service' and 'moving'.

Thus, results achieved by us give an optimistic forecast to the application of multichannel electro-stimulation and therapy by balance in cases of craniocerebral trauma. Methods are characterised by good levels of tolerance and efficiency leading to considerable improvements in motor function with pleasing, and often commensurable, cognitive improvements noted.

P37 MOTOR REHABILITATION | C
TILT TABLE WITH STEPPING MOVEMENTS IN THE EARLY PHASE OF REHABILITATION. A PRELIMINARY CASE STUDY

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Immobile neurological patients suffer from loss of muscle bulk and strength, negative changes in blood conditions, urinary complications, nutritional problems, sensory deprivation, isolation and confinement. Exercise in early stages is of crucial importance in order to combat these complications.

The dynamic tilt table provides the patient with the opportunity to execute step-like movements in a position ranging from the horizontal to vertical according to his ability and daily condition. It consists of a tilt table combined with a driven orthosis which moves the patient's limbs passively in accordance with the gait cycle. Plantar pressure supplies afferent input during the stance phase and is then released during the swing phase. The angle of the table and the speed of movement are continuously adjustable.

A body weight support system supports the patient in the upright position, and an additional hinge emphasizes hip extension during training.

We studied a 51-year-old male who had suffered a spontaneous subarachnoidal haemorrhage caused by rupture of an aneurysma in the right cerebral middle artery. His initial Glasgow Coma Score was 3. Within eighteen months he developed a spastic tetraparesis, reduced alertness, no reaction to pain, some compliance with simple commands, and a critical-illness polyneuropathy. We used an evaluation score for vegetative state, the neutral-0 method in joint measurement and the modified Ashworth scale to evaluate the patient's development during a three-week training period on the tilt table.

The results showed significant reduction in muscle tone between the beginning and end of each training session ($P=0.05$) as well as between baseline and end of the 3-week training period ($P=0.01$). The patient demonstrated an improvement of alertness, head control and reaction to pain between pre- and post-training session and a significant improvement of the same parameters between baseline and end of training ($P=0.04$). ROM improved between baseline and end of treatment ($P=0.07$). We observed better communication, more prompt reaction to commands and a better sitting position in the wheelchair. The three-week automated tilt table training made handling, nurture and access to the patient easier.

P38 MOTOR REHABILITATION | C
LAUFBANDTHERAPIE PER FUNKTIONELLER ELEKTROSTIMULATION FÜR SCHLAGANFALLPATIENTEN: BENEFITS IM VERGLEICH ZUR PHYSIOTHERAPIE NACH BOBATH

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Hintergrund: Das Wiederherstellen der Mobilität und Selbstständigkeit ist das wichtigste Ziel der Gangschulung in der Rehabilitation von Schlaganfallpatienten. Frühere Studien zeigten in Einzeluntersuchungen die positiven Effekte der funktionellen Elektrostimulation (FES) und der Laufbandtherapie (LB) in der Gangrehabilitation von Schlaganfallpatienten. In dieser Studie wird eine neue Methode für stationäre Patienten mit Schlaganfall mittels Phasenablaufsteuerung und serieller Geräteschnittstelle zwischen Stimulator und Laufband vorgestellt. Die Ergebnisse der Kombinationstherapie (FES-LB) wurden mit denen der Physiotherapie nach Bobath (SPT) verglichen. *Patienten:* Jeweils 7 Patienten wurden randomisiert in die Gruppen FES-LB und SPT zugeordnet. *Methode:* Die Effekte jeder Therapiemethode wurden durch Ganggeschwindigkeit, Physiological Cost Index, einer Visual Analogue Scale des persönlichen Empfindens, Barthel- und FIM-Index und Video Ganganalyse ermittelt. *Ergebnisse:* Die Kombinationstherapie hat einen höheren therapeutischen Nutzen nach einer vier wöchigen Behandlung bzgl. der Mobilität, Kraft, Ausdauer und Selbstständigkeit eines vom Schlaganfall betroffenen Patienten als die physiotherapeutische Maßnahme. *Diskussion:* Der Therapievorsprung der FES-LB verglichen zur SPT ist auf die repetitiven Bewegungen und die zentralnervöse Plastizität zurückzuführen. Die Ergebnisse sind jedoch erst vorläufig und müssen durch weitere Untersuchungen belegt werden.

P39 MOTOR REHABILITATION | C
EMG-TRIGGERED ELECTROTHERAPY (EMG-ES) IN STROKE PATIENTS: EFFECT OF LIFE AGE ON CLINICAL OUTCOME

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Background: In preliminary investigations, comparing EMG-triggered electrotherapy (EMG-ES) with routine physiotherapy (concept of Bobath), EMG-ES has proved to be effective in reducing

spasticity and increasing voluntary muscle force in patients with spastic hemiparesis following stroke. Abilities of daily living were improved, and quality of life increased. Life age was presumed to play a role in clinical outcome, meaning that elderly people profit by this therapy, but not as much and not so quickly as younger patients, and according to today's monetary considerations, insurance companies look for clinical and scientific evidence for the effectivity of therapeutical methods in different life age.

Question: The present study was performed in stroke patients to evaluate a possible age-dependency in the clinical outcome.

Methods: A series of 81 indoor stroke patients (unilateral first event, 31–79 ys) with incomplete spastic hemiparesis were treated with an observation time of 4–12 weeks. EMG-ES was performed 7–11 times a week. Patients were divided into three groups (I: =50 ys N=16, II: 51–75 ys N=46, III: >76 ys N=19).

Results: Spasticity was reduced in each group (pendulum test and modified Ashworth scale), showing a significantly better improvement in younger patients I vs. II ($p=0.01$) and II vs. III ($p=0.01$). There was a higher increase of voluntary muscle contraction force (handheld myometer) in the younger groups I vs. III ($p=0.001$). There was also a better improvement in the abilities of daily living (Barthel-Index) I vs. II ($p=0.005$) and II vs. III ($p=0.005$) and quality of life (v. Zerssen) I vs. II ($p=0.005$) and II vs. III ($p=0.005$). Even the oldest patient (92 ys.) showed some improvement, above all in his motor abilities, but also in his estimation of his life's quality. **Conclusion:** While EMG-ES has proved to be effective in motor rehabilitation of stroke patients, there now has been shown a clear dependency of life age on the clinical outcome following this therapy. The clinical effectivity of this therapy is better in younger patients, but is distinct in each life age. The implication of these results for the clinical routine in motor rehabilitation of indoor stroke patients is the necessity of this therapy in indoor patients. The next investigation will be done concerning the effectivity in outdoor patients.

P40 MOTOR REHABILITATION | C RECOVERY OF HAND FUNCTION AFTER HEMIPARETIC STROKE

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Recovery of hand function after stroke is one of the most important handicaps in daily life.

In order to advance and to measure its purposeful improvement synchronously over a longer period of time, the present study compared twelve patients with three different interventions over a time period of eight weeks with regard to successful training. While the control group was trained very unspecifically with tools usual in rehabilitation, two experimental groups absolved repetitive finger movements for half an hour each day either performing or mentally imaging the execution of the finger sequence. Weekly, different parameters of hand function were measured. Only data of the Jebsen-test and pinch grip seemed to be functional in reflecting the recovery. Both experimental groups equally profited by the repetitive training. In comparison with the control group they were able to improve hand function significantly during the period of training.

P41 MOTOR REHABILITATION | C THERAPEUTIC INTERVENTION FOR THE POST-STROKE HEMIPLEGIC UPPER LIMB IN THE ACUTE PHASE

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Arm function recovery is in many post stroke patients poor. The effect of treatment modalities, particularly those directed

at improving upper limb function, has been studied primarily in chronic stroke patients. The purpose of this study was to investigate the effect of a new therapeutic intervention on arm function in the acute phase after stroke. The treatment was named Functional Electrical Therapy (FET). A database was established with detailed general, neurological, and neuro-radiological data for 41 subjects. The average age was: mean = 59, S.D.=7 years, and the average time between the onset of stroke and admission to program was: Mean=6.5, S.D.=1.5 weeks. During the study 5 patients died, 2 had secondary stroke, and 6 left the program because of various non-medical reasons. 28 subjects completed the study. In this single-blind, randomized, controlled trial patients were allocated to either an experimental group that received an additional treatment of sensorimotor stimulation or to a control group. The sensorimotor stimulation in the FET comprised four channel electrical stimulation that assisted functional use of various objects (e.g., can, telephone receiver, comb, toothbrush, VCR tape) via surface electrodes. A functional use of an object consisted of the following phases: reach, grasp, manipulate, bring back to the original post, and release the object. The objects were selected to force the patients to practice palmar, lateral, and precision grasps. The electrical stimulation was delivered with the prototype of the Acti-grip CS (Neurodan A/S, Aalborg, DK). The FET was applied for 3 weeks, five days a week, 30 minutes a day. Patients were evaluated for level of functioning (the Upper Extremity Function Test [UEFT], and the Drawing Test [DT]) before, after the intervention period, and at follow-up 6 months after the beginning of the study. Patients in the experimental group performed significantly better in both outcome measures than those in the control group throughout the study period. The effect of the therapy was attributed to the repetitive stimulation of muscle activity and simultaneous volitional exercise in the acute phase of hemiplegia. No adverse effects due to the intervention were found. Adding the FET during the acute phase after stroke improved motor recovery, which was apparent 6 months later. These results emphasize the potential beneficial effect of therapeutic interventions for the arm.

P42 MOTOR REHABILITATION | C CONTROLLED CLINICAL STUDY OF GAIT RETRAINING IN ACUTE HEMIPARETIC PATIENTS: EFFECTS OF ELECTRICALLY TRIGGERED FLEXION REFLEXES ON GAIT PROPERTIES.

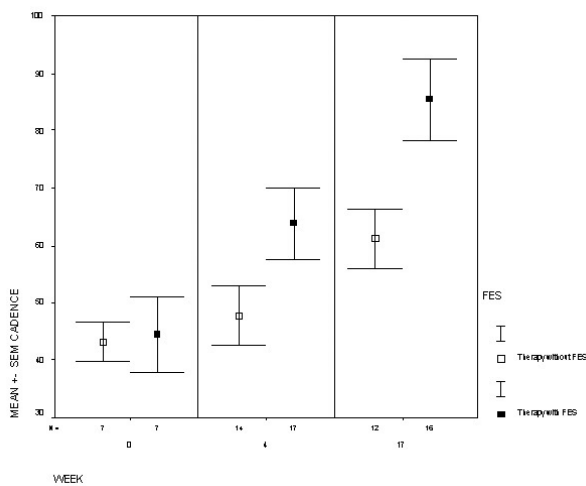
J. Quintern, C. Krewer, B. Husemann, S. Heller, F. Mueller (Bad Aibling, D)

There is increasing evidence that the spinal neural networks transmitting long latency flexion reflexes are closely linked to the networks which generate the locomotor rhythm. In the present study we therefore investigated the effects of electrical stimulation of flexor reflex afferents during gait retraining in hemiparetic patients. Important selection criteria were hemiparesis after unilateral stroke, and positive flexion reflexes on test stimuli below the pain threshold. The latter was true for about 70% of the tested patients. 38 non-ambulatory patients after acute stroke were enrolled into the study and randomly assigned to one of two groups. Both groups received 4 weeks of gait retraining, 5 x 30 min per week and 3 x 30 min of conventional physiotherapy. The control group received gait training without electrical stimulation. In the functional electrical stimulation (FES) group, bursts of electrical stimuli were applied through surface electrodes to sensitive areas of the paretic leg or foot synchronized with the gait cycle. The main outcome variable was the walking speed as measured by a 10 m time-walking test. Several gait parameters were measured by pressure insoles (ParoTec (R)) before the specific therapy (week 0), after the specific therapy (week 4), and 2 weeks and 3

months later (week 17). In the FES group only the measurements without stimulation were used for further analysis.

At baseline measurement (week 0) both groups were similar with respect to the main outcome variables. After 4 weeks of intensive gait retraining, the walking speed significantly improved in both groups, however it improved significantly more in the FES group ($p = 0.02$) than in the control group. The higher walking speed in the FES group at week 4 was not only attributed to a significantly higher cadence but also to a higher step length compared to the control group. The difference in walking speed between the groups was still significant in favour of the FES group 3 months (week 17) after the end of the treatment period ($p=0.03$). Although the electrical stimulation was only applied during the beginning of the swing phase of the paretic leg, also the relative duration of the stance phase of the paretic leg improved more in the FES group than in the control group.

From this study it can be concluded that electrical stimulation of flexor reflex afferents during gait retraining enhances the recovery of gait in acute hemiparetic patients after stroke.



P43 MOTOR REHABILITATION | C
REPETITIVE PERIPHERAL MAGNETIC STIMULATION (RPMS) AS INNOVATIVE APPROACH FOR REHABILITATION OF CENTRAL PARESIS – CLINICAL AND EXPERIMENTAL INVESTIGATIONS

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Our goal is the rehabilitation of goal-directed hand and finger movements like reaching and grasping following localized brain lesions of vascular or traumatic origin. As known, highly controlled fine skilled motor tasks especially manipulation and exploration seldom recover sufficiently. In principle the rehabilitation has to achieve a reduction of spasticity and a facilitation of voluntary movement activity.

The concept of RPMS is based on the activation of a reorganization process in the CNS (neuromodulation) by induction of proprioceptive inflow to the CNS. This inflow corresponds physiologically to the lost inflow during active movements. For the induction of the proprioceptive inflow to the CNS we use the RPMS, which depolarizes thick myelinated nerve fibers of the terminal sensorimotor branches. In contrast to FES, the magnetic field penetrates deeper regions of the muscle, whereas the current caused by the electrical field will take the way of lowest resistance, thus being fairly limited spatially on the surface.

In addition to the clinical experimental investigations of the effects of the RPMS, the development of a nonlinear adaptive closed

loop control to induce coordinated finger movements by RPMS as depicted in fig. 1 is the overall target in order to increase the therapeutic outcome.

Various components of an improvement due to RPMS are clinically and experimentally investigated:

- Spasticity independent of the level of origin can always be suppressed by RPMS. In an clinical experimental investigation with spastic paresis of finger and hand extensors a dramatic decrease of spasticity together with a increase of voluntary movement could be demonstrated.
- In a PET study of eight patients it was shown that, due to RPMS, areas of the fronto parietal circuits which are involved in goal-directed controlled movements, are activated.
- In disturbed goal-directed motor performances like reaching and grasping the regularity of the performed trajectory could be improved.
- In patients with local tactile extinction (neglect) the RPMS reduces the recognition error of different local tactile stimuli. Also the spatial cognition (position sense) can be improved due to RPMS.

We may assume, that these various and long lasting effects on spinal and cortical level are based on neuromodulation which is caused by muscle mechanoreceptor afferents. Therefore the gaba- and glutamergic systems maybe involved.

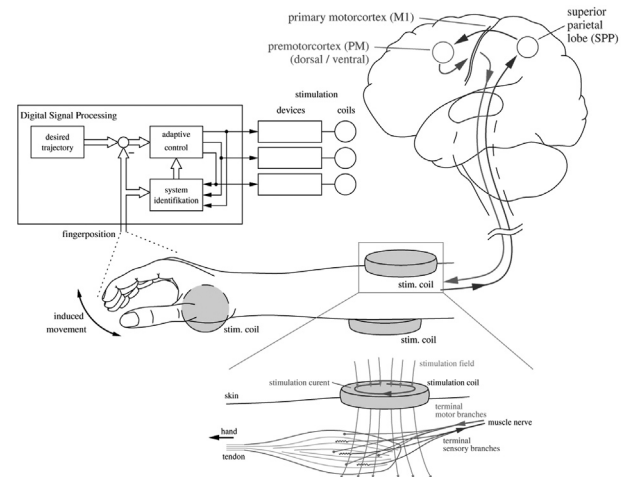


Fig. 1: Therapeutic RPMS application

P44 MOTOR REHABILITATION | C
D-AMPHETAMINE AND PHYSICAL THERAPY IS NOT SUPERIOR TO PHYSICAL THERAPY ALONE IN ACUTE RECOVERY OF MOTOR FUNCTION AFTER STROKE

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D-Amphetamine (D-Amp) and physical therapy promotes recovery of motor function after acute stroke in patients according to two clinical studies with small samples. In the present study 24 stroke patients with first supratentorial stroke, intervall from onset < 40 days, Barthel Index 25 – 50, either received D-Amp every 4th day up to a total of 100 mg in the verum group or were given placebo together with intensive rehabilitation treatment. Both groups improved their motor abilities and the level of independance in activities of daily living. There was no difference however in motor function at any point in time during the study period.

We conclude that D-Amp cannot be recommended for improving motor function after stroke at that level of evidence.

P45 MOTOR REHABILITATION | BS
EFFECT OF NEUROMUSCULAR STIMULATION FOR UPPER EXTREMITY MOTOR RECOVERY AND INFARCT SIZE IN ACUTE STROKE

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Background and Purpose: Following brain injury, both the intensity of rehabilitation and the amount of time between the injury and initiation of rehabilitation influence the recovery of neuronal function. Some experimental studies showed early and forced exercises after ischemia may be accompanied by increased brain damage. Thereby the purpose of our study was to assess the influence of early and intensive neuromuscular stimulation (NS) on the diffusion and perfusion lesion size and the upper extremity recovery (UER) in patients with acute ischemic stroke in the territory of MCA.

Methods: The basic group consisted of 6 patients, which received conventional therapy plus NS of the paretic wrist and fingers extensors from the first day of stroke. NS were made 20 min twice daily during 3 weeks. Control group was of 4 patients received only conventional therapy. All patients were studied with MRI (T2 dark-fluid, diffusion- and perfusion – weighted MRI) at the first hours (pretreatment), 5, 21 days and 3 months after stroke and assessed with NIHSS, Barthel Index, Fugl-Meyer scale and Motor Assessment Scale at the same time. Basic and control groups were comparable on the baseline clinical characteristics.

Results: The repetitive NS of extensors prevented the spasticity and the flexor muscle contracture in hand. The improved relationship between extensor and flexor muscle tones enhanced the motor capabilities in the basic group. The increasing of extensor strength influenced on motor and functional recovery. Our study revealed a statistically significant enhancing of UER in the basic group. There was shown that NS didn't disturb normal evolution of perfusion characteristics in basic group versus control. Besides, early and intensive implication of NS didn't cause in expansion of brain injury that was seen in dynamic diffusion- and T2-weighted MRI. **Conclusion:** Adding a NS of the paretic wrist and fingers extensors during the acute phase after stroke resulted in a clinically meaningful and long-lasting effect on motor function. Preliminary data indicate the early NS (passive and intensive exercises) improve UER with no detrimental effect on infarct size.

P46 MOTOR REHABILITATION | C
MODIFIED BARTHEL INDEX AND FIM AS OUTCOME MEASURES IN VASCULAR BRAIN DAMAGE PATIENTS

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A rehabilitation audit was performed comparing admission and discharge values of Functional Independence Measure (FIM) and modified Barthel Index (BI) (self-report) in vascular brain damage patients treated in a rehabilitation centre between 1996-2001. The results indicate substantial improvement in FIM and BI (mean sum all items: FIM: 82.9 (stddev =27.72) (admission), 97.1 (stddev =24.85) (discharge), $t=-16.61$, $p=.000$; BI: 73.2 (stddev =25.82) (admission), 85.5 (stddev =20.83) (discharge), $t=-12.40$, $p=.000$; (93.3% patients improved)), thus justifying the rehabilitation process of these patients. Performing an audit of the used instruments we found a small group of patients (5% in FIM, 25% in Barthel) for whom no overall improvement could be indicated. These patients reached higher values on admission in both measures than the other patients (mean sum total: BI: 77.4 (stddev =31.90) (no improvement); 72.9 (stddev =25.36) (improvement); FIM: 90.8 (stddev =34.10) (no improvement), 82.9 (stddev =26.83) (improvement)), thus indicating possible ceiling effects in FIM and in BI (though this difference is not sig-

nificant (t-test, BI: $t=.65$, $p=0.520$; FIM: $t=1.07$, $p=.297$). However, the large standard deviations of the FIM and BI total scores in the patients whose scores did not improve indicate that there are some patients who did not improve for other reasons. This analysis shows that the observational measure (FIM) produces fewer 'unimproved' scores between admission and discharge suggesting a smaller ceiling effect than the self-assessment measure (BI). It is suggested that other admission-discharge measures must be included in the analysis in order to examine whether the ceiling affect could be reduced.

P47 MOTOR REHABILITATION | C
PASSAGERE GEWICHTSBELASTUNG DES OBERLIDES ZUR UNTERSTÜTZUNG AUFGABENSPEZIFISCHEN REPETITIVEN TRAININGS BEI LIDSCHLUSSSCHWÄCHE IN FOLGE PERIPHERER FAZIALISPARSE

Th. Winter, S. Hesse, J. Wissel (Beelitz-Heilstätten, Berlin, D)

Lidschlußschwäche ist ein häufiges Symptom der peripheren Fazialisparese. Insbesondere bei der idiopathischen Fazialisparese zeigt sich häufig ein günstiger Verlauf mit guter Restitution der motorischen Funktion. Manchmal jedoch, insbesondere bei traumatischen Läsionen des Nervus facialis oder bei Schädigung nach chirurgischen Eingriffen ist die motorische Erholung unvollständig und Defizite wie eine Lidschlußschwäche persistieren.

Um dabei Komplikationen wie eine Keratokonjunktivitis sicca zu vermeiden werden artifizielle Tränenflüssigkeit und während der Nachtruhe Uhrglasverbände eingesetzt. Physiotherapeutisch kommen Fazilitationstechniken zur Anwendung um die motorischen Defizite in Mimik und Lidschluß zurückzubilden. In der Augenheilkunde werden seit Jahren kleine Gewichte am Augenlid eingesetzt um eine Lidschlußschwäche auszugleichen und bei persistierenden Defiziten als Prothesen ins Augenlid implantiert. Die motorische Rehabilitation folgt nach Kriterien der evidenzbasierten Medizin dem Prinzip des repetitiven aufgabenspezifischen Trainings mit einer möglichst hohen Zahl an Wiederholungen. Diesem Konzept folgend übertrugen wir die Idee der Gewichtsbelastung zur prothetischen Versorgung der Lidschlußschwäche in die motorische Rehabilitation nach peripherer Fazialisparese. Die Patienten erhielten ein individuell angepasstes kleines Metallgewicht das mittels Klebeband auf dem Oberlid befestigt wurde. Das Gewicht wurde so gewählt, dass es ausreichend schwer war um den kompletten Lidschluß zu ermöglichen, aber leicht genug um die ausreichende Lidhebung für normales Sehen zu gewährleisten. Die Patienten wurden therapeutisch zum Eigentaining vor dem Spiegel angeleitet und führten das Training anschließend mindestens 2 x pro Tag selbst durch. Von therapeutischer Seite erfolgte in regelmäßigen Abständen eine Therapiekontrolle. Wenn es von den Patienten toleriert wurde verblieb das Gewicht während des gesamten Tages auf dem Oberlid, so dass die Zahl der Wiederholungen durch den unwillkürlichen Lidschluß weiter erhöht wurde.

An einer kleine Patientenstichprobe zeigten wir, dass sich durch aufgabenspezifisches repetitives Training mit erhöhter Wiederholungszahl die Lidschlussfunktion bei inkompletter peripherer Fazialisparese gut bessern lässt. Die Therapie wurde von den Patienten gut angenommen.

P48 MOTOR REHABILITATION | C
INPATIENT REHABILITATION IS EFFECTIVE IN PATIENTS WITH NEUROPATHIES – A PILOT STUDY

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Objective: To describe the effect of rehabilitation in patients with neuropathies (NPs) on physical parameters, pain, functional scores and well-being.

Design: Clinical trial with consecutive patients in a specific time frame.

Setting: Inpatient rehabilitation in the Neurological Rehabilitation Centre Pirawarth.

Patients: 29 patients (13 female, 16 male; mean age 63,3 years; range 26 to 88 years) with a NP as the primary diagnosis.

Interventions: Exercise therapy (gait training, balance and coordination exercises; strength and endurance training: isometric and isokinetic exercises, treadmill and bicycle training), occupational therapy (functional training, deep sensibility and fine motor manipulation exercises), and other physical modalities.

Main Outcome Measure: Scores and parameters for endurance (bicycle exercise testing: Resistance, Total Cycling Time (TCT), percentage of the expected individual result), pain (VAS), functional scores (Barthel Score), and well-being (Zerssens Befindlichkeitskala, BF-S) were assessed at the beginning and at the end of rehabilitation.

Results: The overall mean scores for bicycle exercise testing were 102.1W (pre) and 117.2W (post) ($P=.002$) for resistance, 551.5s (pre) and 642.3s (post) ($P=.001$) for the Total Cycling Time (TCT), and 68.3% (pre) and 78.3% (post) ($P=.001$) for percentage of the expected individual result. The overall mean pain score was 4.9 (pre) and 3.6 (post) on the VAS scale ($P=.005$). The overall mean Barthel score was 76.1 (pre) and 80.3 (post) ($P=.036$). The overall mean BF-S score was 11.6 (pre) and 6.9 (post) ($P=.003$).

Conclusions: Rehabilitation was effective in patients with NPs. The results of this study show the impact of a full residential rehabilitation for patients with NPs.

P49 MULTIPLE SCLEROSIS | C
THE INFLUENCE OF EMOTION RECOGNITION AND COGNITIVE DEFICITS ON QUALITY OF LIFE AND COPING IN MS PATIENTS

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Background: Many patients suffering from multiple sclerosis have cognitive deficits. Processing of emotion can be understood as part of complex abilities concerning basal neurocognitive abilities. Further, a correlation can be presumed between emotion recognition and cognitive functions. And cognitive deficits affect social integration, occupation and rehabilitation. Therefore we investigated if deficits in emotion recognition occur in MS and if they correlate with cognitive deficits and if quality of life and coping are influenced by emotion recognition.

Patients and Methods: German versions of Penn Facial Memory Test, Emotion Discrimination Test, Emotion Acuity Test, Wisconsin Card Sorting Test, PASAT, Nottingham Health Profile (NHP), Quality of Life Index (QLI) and a coping questionnaire were administered. 30 patients (22 female, 8 male) aged 36,8 years with relapsing remitting or secondary progressive multiple sclerosis were included and were divided into three EDSS groups: A) 0–1.5; B) 2.0–3.5; C) 4.0–6.5.

Results: Compared to healthy controls all patients performed significantly worse in the Facial Memory Test ($p<0.05$), Facial Memory Delayed Test ($p<0.05$) and Emotion Acuity Test ($p<0.01$). Coping showed no significant differences between EDSS groups.

Quality of life measured by QLI was worse in 5 of 10 dimensions in group C compared to group A ($p<0.05/p<0.01$) and in 2 dimensions compared to group B ($p<0.05/p<0.01$). In the NHP quality of life was worse concerning “energy”, “pain” ($p<0.05$) and “mobility” ($p<0.01$) in group C compared to group A. “Pain” and “mobility” correlated with the EDSS ($p<0.05$, $p<0.01$) and 5 dimensions of the QLI correlated with the EDSS ($p<0.05/p<0.01$). The results of the coping questionnaire and NHP did not correlate with emotion recognition tasks or the PASAT or Wisconsin Card Sorting Test. “Interpersonal functioning” and “personal fulfilment” of the QLI correlated with the Emotion Acuity test ($p<0.05$). PASAT and Wisconsin Card Sorting Test did not correlate with quality of life or coping scales.

Conclusion: MS patients showed deficits in emotion recognition which were associated with cognitive deficits. Quality of life and coping were reduced with increasing impairment measured by EDSS. Although an influence of cognitive dysfunctions and deficits in emotion recognition on quality of life and coping was assumed no definite evidence for an impact of emotion recognition on quality of life and coping was found.

P50 PAIN | C
NABILONE REDUCES SPASTICITY RELATED PAIN: A DOUBLE-BLIND PLACEBO-CONTROLLED CROSS-OVER TRIAL

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Introduction: Recent studies suggest that Tetrahydrocannabinol (THC) may be effective in the treatment of spasticity-associated pain. In two case reports the synthetic cannabinoid Nabilone® showed pain relieve in patients with multiple sclerosis (MS) and pain. To evaluate the safety and efficacy of Nabilone on pain and spasticity a double-blind placebo-controlled cross-over trial was performed.

Methods: Thirteen consecutive patients (4 male, 9 female) with severe intractable spasticity-associated pain syndromes due to MS ($n=7$) or other diagnoses (spinal [$n=3$] & cerebral lesions [$n=3$]) were included into a double-blind, placebo-controlled, cross-over trial. Premedication and physical treatment remained unchanged during the study period. Patients were randomly assigned to either four-week placebo or Nabilone®-treatment (1mg/d). Following a one week wash-out phase patients on placebo were switched to Nabilone® and vice versa. Evaluation included 11-Point-Box-Test, Ashworth-Score, Rivermead-Motor-Assessment and Barthel-Index at baseline, end of treatment-phase I, end of wash-out, and at the end of treatment-phase 2.

Results: Eleven out of 13 patients completed the trial. Two drop-outs occurred in patients with MS due to acute relapse ($n=1$) and exacerbation of weakness in the lower limbs ($n=1$). 11-Point-Box-Test decreased significantly with verum compared to placebo treatment ($p<0.05$), while spasticity, Rivermead Motor Assessment and Barthel-Index did not improve significantly with Nabilone®. Except for weakness in one patient, no severe side effects were reported.

Discussion: This first controlled study of Nabilone® showed in a cross-over design a significant reduction of pain without improvement of spasticity or motor function. Results of our study are in accordance with a recently published controlled multicenter trial on THC treatment in chronic MS (Zajicek J et al. 2003) in which only pain was reduced with THC and not spasticity. However, by contrast to THC, Nabilone® does not have psychotropic side-effects and has no potential for physical dependence.

P51 PARKINSONISM | C
PIRIBEDIL FOR THE TREATMENT OF INITIAL STAGES OF PARKINSON'S DISEASE

V. Daminov, K. Lavrentiev, A. Kuznetsov, L. Turbina, R. Bogdanov (Moscow, RU)

Purpose of this study is to estimate efficiency of piribedil for the treatment of initial stages of Parkinson's disease (PD).

Materials and methods. We investigated the effect of piribedil on daily living activities and motor function in 70 patients with PD (male 20, female 50). Patients received piribedil 50 mg one time daily (during 1th week), 50 mg two times daily (during 2th and 3th weeks), and than 50 mg three times daily. Assessments UPDRS (Unified Parkinson's Disease Rating Scale) scores and vital signs were made before treatment, in 1, 2, 3, 4 weeks, 3, 6, 9, 12 months of treatment.

Results. The total score of UPDRS subscales I to III was used as a measure of overall severity of impairment. This score was significantly reduced on 23% (in 9 months of the treatment). UPDRS subscale II (activities of daily living) score was reduced on 62%. UPDRS subscale III (motor) score was also reduced on 42%. The effect of piribedil was greatest in patient's tremor (score was reduced on 43%). In contrast to the changes of tremor, bradykinesia and rigidity were reduced on 26% and 30%. Adverse events were occurred in 12.8%. Four of these events (anorexia, sleep disorders, nausea and vomiting) were dopaminergic effects (5.2%). Anorexia, nausea were reduced by domperidon. Orthostatic hypotension was occurred in 4.6%, headache – in 3%. Most adverse events were mild or moderate.

Conclusion. The results of our study show that treatment with piribedil improved daily living activities and motor function in the patients who had early, nonfluctuating PD. The results were consistent with those of other studies. This improvement was maintained up to the 9 month of assessment.

P52 PHARMACOTHERAPY | C
INTRATHECAL BACLOFEN FOR STABILIZATION OF AUTONOMIC DYSREFLEXIA DUE TO SPINAL CORD INJURY

H. Matzak, K. Poustka, M. Kofler, L. Saltuari (Hochzirl, A)

Introduction: Autonomic dysreflexia may follow spinal cord lesion on the cervical or thoracic level, commonly developing within the early posttraumatic period. Among several features cardiovascular dysregulation is the most prominent, and is characterized by paroxysmal high blood pressure attacks. Extensive hypertension may be due to distension of urinary bladder or bowels, wounds (e.g. ulcerations of skin) or increased spastic muscle tone. In contrast, severe drops in blood pressure may occur in orthostatic conditions. Baclofen is accepted as an effective drug for treating spinal and supraspinal spasticity. While orally administered baclofen often fails to alleviate spasticity adequately, intrathecal administration of baclofen (ITB) via implanted automatic pump systems is more effective and thus increasingly applied.

Case report: A 61-year-old male sustained a spinal cord injury, subsequently developing severe spastic tetraparesis, predominantly in the legs. Some 30 years later he experienced marked spasms of the muscles of the abdominal wall, leading to extreme fluctuations of blood pressure. After positive evaluation with ITB the patient underwent implantation of a pump-catheter-system for ITB application. The abdominal wall spasms ceased entirely with a daily dose of 190 µg ITB. Remarkably, this resulted in a sustained normotonous blood pressure profile. However, spasms recurred after changing the ITB concentration but subsided again when the optimal antispastic dose was reestablished.

Discussion: Baclofen per se has the potential of lowering blood pressure, particularly in high doses. In this patient, however, ITB

treatment was able permanently to stabilize insidious blood pressure fluctuations. It appears that suppression of abdominal spasms prevented the triggering of dysautonomic crises. This case demonstrates that ITB administration may help to stabilize autonomic dysreflexia in patients with spinal cord lesions.

P53 PHARMACOTHERAPY | C
INTRATHEKALES BACLOFEN ZUR STABILISIERUNG VON BLUTDRUCKKRISEN BEI QUERSCHNITTSBEDINGTER AUTONOMER DYSREFLEXIE

H. Matzak, K. Poustka, M. Kofler, L. Saltuari (Hochzirl, A)

Hintergrund: Die autonome Dysreflexie stellt eine Komplikation nach zervikalen oder hohen thorakalen Rückenmarksverletzungen dar, die in den ersten posttraumatischen Monaten auftreten kann. Sie ist in erster Linie durch kardiovaskuläre Dysregulation gekennzeichnet und geht zumeist mit anfallsweise auftretenden Bluthochdruckkrisen einher. Darm- oder Blasendehnung, Hautläsionen oder Muskelspasmen können einen plötzlichen, massiven Blutdruckanstieg provozieren. Insbesondere unter Orthostasebedingungen werden auch ausgeprägte Blutdruckabfälle beobachtet.

Baclofen gilt als effektives Medikament zur Behandlung von spinaler und supraspinaler Spastizität. Während die orale Applikation bei ausgeprägten Muskelspasmen und erhöhtem Muskeltonus häufig nicht ausreicht, gilt eine Langzeitbehandlung mittels implantiertem Pumpensystem zur intrathekalen Verabreichung von Baclofen als derzeit effektivste antispastische Therapiemethode.

Fallbeschreibung: Ein 61jähriger Patient erlitt bei einem Tauchunfall eine HWK 4-Fraktur mit konsekutiver beinbetonter Tetraparese. 30 Jahre nach dem Trauma entwickelte er heftige abdominelle Spasmen, die mit extremen Blutdruckschwankungen nach oben und nach unten einhergingen. Aufgrund positiven Ansprechens in einer Evaluierungsphase mit Baclofen wurde ihm ein Pumpensystem zur kontinuierlichen intrathekalen Applikation implantiert. Die einschließenden Spasmen sistierten gänzlich unter einer Applikationsdosis von 190 µg/Tag. Erstaunlicherweise zeigte sich auch ein anhaltendes normotones Blutdruckprofil. Aufgrund einer akzidentiellen transienten Baclofen-Entzugssymptomatik nach Konzentrationsumstellung von 500 µg/ml auf 2000 µg/ml traten wiederum abdominelle Spasmen und ein generalisierter Juckreiz auf, sowie massive Blutdruckschwankungen nach oben und nach unten. Nach Wiedereinstellung der vorbestehenden Baclofendosis sistierten diese Symptome und das Blutdruckprofil normalisierte sich wieder.

Diskussion: Obwohl Baclofen insbesondere in höheren Dosen selbst eine blutdrucksenkende Wirkung aufweist, gelang im vorgestellten Patienten mittels intrathekaler Baclofenapplikation eine nachhaltige Blutdruckstabilisierung. Offenbar wurden durch die Suppression von abdominellen Spasmen spasmusassoziierte Blutdruckschwankungen sowohl nach oben als auch nach unten verhindert. Somit wirkt sich intrathekales Baclofen positiv auf Blutdruckkrisen bei querschnittsbedingter autonomer Dysreflexie aus.

P54 PHARMACOTHERAPY | C
USE OF PROPHYLACTIC AGENTS IN THE ACUTE MANAGEMENT OF SPINAL CORD INJURY PATIENTS

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Study Design: A Questionnaire survey. Objectives: To observe the practice of spinal injuries specialists with regard to DVT, Stress Ulcer and Urinary tract infection prophylaxis & use of High dose Methylprednisolone in the acute management of Spinal Cord Injuries.

Setting: Spinal injuries Center in the UK including Ireland Method: A Questionnaire was sent to all the consultants working in all the spinal injuries center in the UK during month of May 2000.

Results: 28 Questionnaires were sent to all consultants, 20 of them replied (71.4%). 13 (65%) respondent have adopted active use of prophylaxis strategy for stress ulcers and 7 (35%) were not using any drug therapy. 17 (85%) were using prophylaxis for Thrombo-embolism. Duration of DVT prophylaxis was up to 6–8 weeks in 5(25%), 12 weeks in 5 (25%) and until mobilization for 6–8 hours in 7 (35%). Only 3 (15%) were using short term antimicrobial prophylaxis at the time of initiating intermittent urethral catheterization. Most commonly used antimicrobial were Trimethoprim and Norfloxacin. 11 (55%) were using high dose methylprednisolone as pharmacological treatment in the acute stage, as 9 (45%) were not.

Conclusion: Prophylactic practice against known risk of spinal injuries, varies considerably between specialists. We feel that more research is needed to reach a consensus and practice guidelines

P55 PHARMACOTHERAPY | C
BOTULINUM TOXIN A BOTOX® REDUCES URINARY INCONTINENCE EPISODES AND IMPROVES QUALITY OF LIFE IN SPINAL CORD INJURY AND MULTIPLE SCLEROSIS PATIENTS

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Introduction: This first randomised, double-blind, placebo-controlled, multicenter study aimed to show the effect of two different doses of botulinum toxin A on the symptoms of urinary incontinence and quality of life of spinal cord injury and multiple sclerosis patients.

Population and Methods: Patients with neurogenic detrusor overactivity due to spinal cord injury or multiple sclerosis, requiring regular clean intermittent self-catheterisation and who had failed on oral anticholinergic therapy were eligible for the study. Each patient was randomised to receive a single dose of botulinum toxin A (200 U or 300 U BOTOX® or placebo). Doses were administered evenly over the detrusor muscle as 30 injections, each of 1ml, using cystoscopic guidance. Changes in urinary incontinence episodes as a consequence of treatment were monitored via patient diary at weeks 2, 6, 12, 18 and 24. The impact of changes in urinary incontinence on patients' quality of life was monitored at each time point using the Incontinence Quality of Life questionnaire (I-QoL).

Results: Fifty-nine patients were enrolled into the study (53 spinal cord injury and 6 multiple sclerosis). Both doses of BOTOX® produced significant reductions from baseline ($p=0.05$) in number of incontinence episodes, which were apparent from the first assessment point at week 2 and were maintained throughout the study period. Significant reductions were not observed in the placebo-treated group. Reductions in the BOTOX® groups represented an approximate 50% decrease in number of incontinence episodes per day, with 63% of patients experiencing at least one incontinence episode-free week, compared with 24% of patients on placebo. Statistically significant ($p=0.002$) mean improvements from baseline in total I-QoL scores, ranging from 18.0 to 32.7, were recorded in BOTOX®-treated patients, from weeks 2 to 24. Smaller improvements from baseline scores, ranging from 7.0 to 11.2, were observed in the placebo group. The difference between I-QoL scores from BOTOX® and placebo groups was statistically significant at all time points.

Conclusion: These results show rapid and sustained reduction in episodes of urinary incontinence following 200U and 300U

BOTOX® injection which are associated with significant improvements in quality of life scores in patients with detrusor overactivity due to multiple sclerosis or spinal cord injury.

P56 PHARMACOTHERAPY | BS
MECHANISM OF SYNAPTIC LOSS, FORMATION OF EXTRA PROTEINS & NERVE CELL DEATH

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The normal synaptic gap is 200-300 nm, when this gap reduces to 70–140 nm then following events occur. When the nerve cell lost the synaptic connection or the synaptic gap reduces then the pre-synaptic and postsynaptic resting membrane potentials decreases. The result influences the activity of nucleus which greatly increases and the production of extra amount of different proteins, breakdown of large proteins to form smaller insoluble proteins, occur. These toxic proteins like beta amyloid & tau ultimately lead to decreased activity and initiation of cell death especially in hippocampus. At the same time the over activity of nucleus leads to the initiation of mitotic division of nerve cell, which may have a role to the cell death. Synaptic loss also decreases the release of acetylcholine, by inhibiting the activity of its formation & also destroying the receptors. The synaptic loss could be prevented by the use of black seed. (Its role) with Vitamin A as an antioxidant. This would be effective to cure the disease, too, up to 35–40% progress of disease.

If the synaptic loss between the nerve cells, prevented, then this would be the vaccination or probably the cure for the Alzheimer's disease, until the stage 3 of disease.

P57 PHARMACOTHERAPY | C
BEHANDLUNG DES THERAPIERESISTENTEN SYMPTOMATISCHEN ZWERCHFELLMYOKLONUS MIT LEVETIRACETAM

T. Winter, A. Feudenreich, J. Wissel (Beelitz-Heilstätten, D)

Schluckauf bei Gesunden ist ein weitgehend harmloses Phänomen und siliert gewöhnlich ohne spezifische Therapie. Bei Patienten mit Hirnschädigung jedoch, insbesondere nach Hirnstammläsionen kann Schluckauf als symptomatischer Zwerchfellmyoklonus auftreten. Dadurch ist nicht nur die Lebensqualität der Patienten erheblich gemindert, es besteht auch das Risiko von Komplikationen wie Regurgitation von Nahrung mit Aspiration und Pneumonie. Eine kausale Therapie existiert nicht, oft bleiben die pragmatischen medikamentösen Behandlungsversuche ohne Erfolg. Besonders nach Hirnstammläsionen kann der symptomatische Zwerchfellmyoklonus als persistierendes Phänomen auftreten. Therapieansätze sind die Gabe von Medikamenten, die die Motilität des Gastrointestinaltraktes erhöhen, Antikonvulsiva, Neuroleptika und andere Substanzen wie Baclofen oder 5-Hydroxytryptophan. Die Behandlung führt oft nicht zu Beschwerdefreiheit oder muß wegen unerwünschter Arzneimittelwirkungen abgebrochen werden.

Wir untersuchten an Patienten mit symptomatischem Zwerchfellmyoklonus die Effektivität und Sicherheit von Levetiracetam, einem in den letzten Jahren neu eingeführten Antikonvulsivum. Bei allen Patienten wurde eine nicht durch die Hirnstammläsion verursachte Genese des Singultus nicht nachgewiesen. Epileptische supratentorielle Hirnaktivität wurde mittels EEG ausgeschlossen. Der symptomatische Zwerchfellmyoklonus wurde als therapieresistent beurteilt, wenn unter mindestens zwei der etablierten medikamentösen Therapieansätze keine zufriedenstellende Besserung erreicht werden konnte. Der Singultus musste mindestens während 6 Stunden am Tag nachweisbar sein. Die Dauer des Singultus wurde durch das medizinische Personal

(Pflegekräfte, Therapeuten und Ärzte) dokumentiert. Die Frequenz des Zwerchfellmyoklonus wurde klinisch durch Zählen und mittels EMG dokumentiert.

Wir begannen die Behandlung mit einer Einzeldosis von 500 mg und steigerten wöchentlich um 500 mg bis zu einer Maximaldosis von 2 x 1000 mg. Darunter sistierte die myoklonische Zwerchfellaktivität bei der Mehrzahl der Patienten, die Dauer nahm bei den übrigen deutlich ab. An unerwünschten Medikamentenwirkungen wurde bei einem Patienten dysphorische Gereiztheit beobachtet, die nach Absetzen des Medikamentes verschwand. Zusammenfassend lässt sich sagen, dass sich der symptomatische Zwerchfellmyoklonus nach Hirnschädigung mit Levetiracetam erfolgreich behandeln lässt.

P58

PLASTICITY | C

AUDITORY COGNITIVE DEFICITS FOLLOWING HEMISPHERIC LESIONS: EFFECT OF LESION SIZE ON RECOVERY

B. Rey, M. Adriani, R. Frischknecht, Ph. Maeder, St. Clarke (Lausanne, CH)

The size of lesion is often believed to determine the outcome. We have investigated this question in the field of auditory recognition and auditory localization: specialized networks have been identified for sound recognition and sound localization (Maeder et al. 2001). We report here on recovery patterns within these specialized auditory "what" and "where" streams. Twenty five patients who sustained focal hemispheric lesion and were deficient in sound recognition, sound localization, and/or sound motion perception at a first evaluation in the acute (<14 days ; n=9), subacute (14 days to 1 month ; n=7) or early chronic stage (>1 month ; n=9) ; were evaluated a second time (9 months to 55 months later).

Patients who were included in the acute stage tended to have small lesions (the general condition of patients with large lesions did not allow precise testing) and all normalized their performance at the second evaluation. Patients who were included in the subacute and early chronic stages tended to have larger lesions and in some of these cases recovery occurs over time. Patterns of recovery selectively analysed in relation to the degree of damage to the specialized "what" and "where" networks reveal no correlation between outcome and size of lesion in the auditory modality.

Another aspect highlighted in this study is the presence of specific deficits without damage to the specialized network (shown here for deficits of sound localization in cases of lesions to the auditory "what" stream with preserved "where" stream). This pattern is found in the acute and partially subacute stage, but not in the chronic stage. This suggest widespread dysfunction in the auditory network in the acute and subacute stage and a subsequent reorganization.

P59

PLASTICITY | C

RECOVERY OF AUDITORY COGNITIVE FUNCTIONS FOLLOWING INFERIOR COLLICULAR LESIONS

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We report here on the sequential psychophysical and fMRI investigations of 3 patients with IC lesions, addressing the question of recovery of the auditory cognitive functions and of the cortical reorganization of parallel processing streams following such lesions. Patient 1 had a bilateral lesion of the inferior and superior colliculi, patient 2 a bilateral lesion of the inferior colliculi, and patient 3 a unilateral lesion of the right inferior colliculus. Each patient was investigated for i) non-verbal recognition task; ii) localization using

interaural time difference (ITD) or interaural intensity difference (IID); iii) motion perception (simulated by ITD or IID); and iv) verbal dichotic capacities (ITD or IID versions). Brain activation associated with sound recognition or sound localization was investigated as in a previous study with normal subjects (Maeder et al., 2001).

In acute stage, P1 presented a complete bilateral deafness and recovered in the subacute stage sound recognition and sound localization when IID cues were used (but not with ITD cues). His verbal comprehension remained deteriorated during the whole follow-up. P2 recovered rapidly sound recognition and more slowly sound localization (both with IID and ITD cues); he presented left ear asymmetry in the dichotic tasks. P3 was evaluated principally 1 year after surgery and had then normal sound recognition, sound localization and sound motion perception, but left ear extinction on dichotic listening.

Functional MRI evaluation revealed for the 3 patients a gradual increase of auditory cortex activation. Moreover, the selective activation of the what and where networks, which was absent or disturbed in the initial fMRI, was similar to normal subjects' one in later investigations.

Our observations confirm the critical role of IC in the complex sound analysis required for spatial processing, source segregation, and signal detection: spatial, verbal and non-verbal auditory deficits were observed in our patients following a IC lesion. The recovery from these deficit may be due to spared IC regions and/or may speak in favour of a parallel extralemniscal auditory brainstem pathway. The behavioral recovery was associated with a gradual cortical activation increase and with a cortical functional reorganization in the sense of a selective activation of the what and where processing networks.

P60

PLASTICITY | C

FAHRSIMULATOR IN DER NEUROLOGISCHEN REHABILITATION

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Die Frage nach der Fahreignung ist für Patienten nach einer Hirnschädigung häufig sehr zentral. Das Ziel der Rehabilitation ist es motorische und kognitive Funktionen so weit zu trainieren, dass Patienten wieder in der Lage sind so weit als möglich ihr tägliches Leben selbständig zu meistern und möglicherweise wieder arbeiten zu können. Die in der neuro-/verkehrspsychologischen Diagnostik auffälligen Funktionen können neu im Fahrsimulator trainiert werden. Bei der Therapie geht es vor allem um die Verbesserung folgender, für die Fahreignung wichtigen Funktionen: Psychomotorik, Spurhalten, Verarbeitungsgeschwindigkeit, Reaktionsvermögen, Impulskontrolle, Voraussicht, Risikoverhalten sowie Fahrverhalten. Die vorliegende Arbeit zeigt Ergebnisse über den Einsatz eines Fahrsimulators zum gezielten Training der für die Fahreignung relevanten Funktionen.

Am Schluss der Rehabilitation erhielten 20 neurologische Patienten und 17 gesunde Probanden jeweils 6 Übungsfahrten im Fahrsimulator. Sechszwanzig Patienten erhielten kein spezifisches Fahrtraining. Jeweils vor und nach den Übungsfahrten wurden die für die Fahreignung wichtigen Funktionen überprüft. Es ergeben sich signifikante Verbesserungen im Spurhalten, in der Anzahl der Unfälle und Fehler sowie in den Reaktionszeiten.

Literatur:

1. Keller M., Hiltbrunner B., Kesselring J. (2003) Fitness to drive with neurological disabilities. *Neurorehabilitation and Neural Repair*, 17 (3), 168-174.
2. Keller M., Klement-Amann U., Burgard E., Krämer D., Kesselring J.: Fahrsimulator in der neurologischen Rehabilitation. *Neurol Rehabil* 2004; 10 (3): 137-143

P61 PLASTICITY | C
VISION RESTORATION THERAPY (VRT) FOR PATIENTS WITH VISUAL FIELD DEFECTS AFTER POST-CHIASMATIC LESIONS: EFFECTS OF TRAINING BEYOND 6 MONTHS

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Visual Restoration Therapy (VRT) increases visual field size of an average of 4.9–5.8 visual angle in patients with optic nerve or post-chiasmatic lesions suffering from visual field defects (*Kasten et al., Nature med, 1998*). So far, the patients had trained for a maximum of six months. In a retrospective study we now evaluate if an additional six-month training period produced further visual field enlargements. Visual field tests were assessed in 19 patients up to 90 eccentricity using Rodenstock Perimat 206 (monocular) and up to 56 eccentricity with High Resolution Perimetry on a PC monitor (binocular). Patients then carried out VRT at home for 2 consecutive 6 months periods. We observed a significant decrease in the number of undetected visual stimuli by 13.5% in monocular perimetry and a visual-field enlargement in High Resolution Perimetry of about 14% due in the first six months VRT period. After one year of training, however, conventional perimetry revealed additional improvements of about 10% ($p < 0.005^{**}$). In contrast, when vision was measured with high resolution perimetry, no additional visual-field enlargements were found during the second training phase despite improvements during the first training period. This discrepancy between both tests may in part be explained by psychophysical differences between both procedures, e.g., near threshold vs. above threshold presentation of stimuli. Possible neurobiological mechanism explaining these added long-term training effects in conventional perimetry most likely involve the activation of partly surviving neurons near the damaged region and/or improved activation of long-range interactions in visual cortex. In any event, the findings suggests that extended use of VRT is of added value to visual field enlargements.

P62 PLASTICITY | C
VISION RESTORATION THERAPY (VRT) AFTER BRAIN DAMAGE: SUBJECTIVE IMPROVEMENTS OF ACTIVITIES OF DAILY LIFE AND THEIR RELATIONSHIP TO VISUAL FIELD ENLARGEMENTS

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Patients with visual field deficits after brain damage such as stroke or neurotrauma can use vision restoration therapy (VRT) to increase their visual field size (*Kasten et al., Nature med., 1998; www.novavision.info*). However, little is known if such visual field enlargements are relevant to visually guided activities of daily life (ADL). We therefore wish to know if VRT affects ADL measures and to what extent any ADL changes correlate with quantitative measures of visual field enlargements.

A retrospective analysis was performed with data of 73 patients that had carried out a VRT therapy for a 6-months period using the NovaVision “VRT” software (www.novavision.info). Patient testimonials collected during the final examination post-therapy were analyzed post-hoc and correlated with demographic status and pre-post training benefits as measured perimetrically.

As previously described, VRT significantly increased detection ability of visual stimuli and most patients (89%) also reported subjective benefits in ADL during the post-VRT interview. A correlation analysis of quantitative parameters of visual field enlargements as measured perimetrically with subjective patient testimonials collected by a standard questionnaire was significant for the categories “reading” ($r = 0.255^*$) and for the ability of “carrying out hobbies” ($r = 0.400^{**}$). For the categories “general improvement of vision” ($r = 0.222^*$) and “ability to avoid collisions” ($r = 0.205^*$) only

a trend was observed. Visual field size improvements and “visual confidence/mobility” improvements did not correlate.

Thus, we confirmed the original VRT findings in a setting of a retrospective study. The relatively small correlation we found between the enlarged visual field and ADL-measures suggests that visual field size is only one factor determining subjective vision in brain damaged patients. Apparently, there are other, yet unknown factors determining overall vision performance which are also expected to contribute to the restoration of vision.

P63 REGENERATION | C
EVIDENZBASIERTE INTEGRATION VON ANGEHÖRIGEN

W. George (Gießen, D)

In der Versorgungspraxis neurologischer Rehabilitation sind es in vielen Fällen die Angehörigen, die:

1. eine bedeutsame steuernd-koordinative Funktion übernehmen,
2. kompensierende, versorgende und de facto rehabilitative Hilfe gewähren,
3. Rechte, Ziele und Verpflichtungen des Patienten wahrnehmen,
4. eine psychisch und sozial entlastende Funktion übernehmen.

Sie sind es, die als Lebenshilfe, Unterstützung und bedeutsamste Garanten der Lebensqualität des Patienten (mit-) auszumachen sind. Trotz dieser Erkenntnis und den unzweifelhaften Fortschritten der letzten beiden Jahrzehnten, werden die Angehörigen keinesfalls immer professionell in das kommunikative- und Handlungsgeschehen einbezogen. Um dieses Dilemma zu überwinden, wird eine Vorgehensweise vorgestellt, deren zentrale Perspektive die Entwicklung einer evidenzbasierten (datenbasierten) Angehörigenintegration ist. Es wird deutlich werden, dass entlang der bereits durch Fachgesellschaften, Verbänden und anderer Expertengremien auf den Weg gebrachten evidenzbasierten Leitlinien die notwendigen Integrationsziele abgeleitet (a) und durch die Anwendung eines 8 Dimensionen (Vorerfahrung, Situationsverständnis, Entscheidungspartizipation, Wissen, fachliche Kompetenzen, Beziehung zum Patienten, Ressourcen, Fitness) erfassenden Assessments die Kompetenzen und Ressourcen der Angehörigen (b) beschrieben werden können. Durch eine solche Vorgehensweise, die Ähnlichkeiten mit der Erstellung eines Anforderungsprofils und Fähigkeitsanalyse zeigt, können nicht nur die evidenzbasierten Integrationsziele und die mit diesen verbundene Aktivitäten (Interventionen) hergeleitet und auf einander abgestimmt werden, sondern es findet darüber hinaus die notwendige Einbindung der Fähigkeiten und Potentiale des Angehörigen statt. Als Resultat entsteht ein individueller evidenzbasierter Angehörigenintegrationsplan der als Grundlage einer reproduzierbaren Integration der Betroffenen dient, wie diese bisher nicht erreicht wurde.

P64 REGENERATION | BS
INHIBITION OF AXON GROWTH BY THE XENOPUS NOGO-A/RTN4-A HOMOLOGS

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Nogo-A is known as a potent inhibitor of axon regeneration in the adult mammalian central nervous system (CNS) and is the longest of the three main reticulon 4 (rtn4) gene transcripts (-A, -B, -C). It is long known that – in contrast to mammals – axons in the fish CNS regenerate spontaneously after lesion, whereas in frogs, axon regeneration is successful in the optic nerve but not in the spinal cord. The goal of our work was to determine if rtn4/nogo gene transcripts are present in fishes and frogs, what forms are expressed and how this relates to axon regrowth in lesioned fiber tracts.

We have recently shown that fish possess the evolutionary conserved C-terminus of the *rtn4* genes. All identified isoforms share the evolutionarily conserved reticulon homology domain (RHD), a motif of all reticulon protein family members (RTN 1–4). However, Nogo-A, -B, -C are absent in the teleost genome (Klinger et al., *subm.*, Oertle et al., 2003). This correlates with the success of axon regeneration in fish.

Failure of axon regeneration in the frog spinal cord seems to correlate with the presence of two independent *rtn4* orthologs (*rtn4.1* and *rtn4.2*) and the alternative transcripts *nogo-A*, -B, -C. *Xenopus Nogo-A/RTN4-A* is predominantly expressed in the nervous system and detected by specific antisera in myelinated fiber tracts of the spinal cord, hindbrain, optic nerve, tectum opticum and in isolated oligodendrocytes. To test its function we have used the most inhibitory region of rat *nogo-A* (aa 544–725) and the corresponding peptide of *Xenopus RTN4.1-A* and *RTN4.2-A* in *in vitro* assays with fish retinal axons. Our present set of data shows that axon growth is inhibited by the rat and the two *Xenopus* peptides. These results suggest similar functions for *Nogo-A* of rat and *Xenopus*, and show the sensitivity of fish axons for both. Supported by the DFG (TR SFB 11).

P65

SPASTICITY | C

QUANTITATIVE EVALUATION OF THE EFFECT ON POST STROKE SPASTICITY AND MOTOR CONTROL OF REPETITIVE TRAINING WITH AN ARM-TRAINER

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Background: The quantification of motor control and spasticity after training is controversial and the effect of repetitive movement on spasticity using an arm-trainer is poorly studied. We designed a special arm-trainer (cyclo-ergometer) for the measurements and trained the patients on a commercial motorized arm- and leg-trainer (MOTomed Viva from Reck).

Aim: The purpose of this study is to evaluate quantitatively the spasticity and motor control of patients with hemisyndrome after stroke following daily training on an arm-trainer.

Methods: We studied 9 patients with a stabilised hemisyndrome after stroke (mean range: 22.7 months) in an ABA protocol (1 week base line (A), 3 weeks training period (B), 2 weeks baseline (A)). The patients underwent arm-training on a motorized arm-leg-trainer (MOTomed Viva from Reck) 15 minutes daily during 5 days over a period of 3 weeks. Four quantitative measurements (at the beginning and end of each period of the ABA protocol) were performed on the other arm-trainer (cyclo-ergometer) with the specially constructed pedals in order to measure the pedal force and position separately on both sides. The recorded data was analysed in order to obtain the average position, speed and force during a cycle.

In addition, 6 clinical tests were performed at each assessment:

(1) Range of motion and (2) modified Asworth scale to quantify spasticity, (3) muscular testing (M0-5 scale), and (4) Rivermead Motor test to evaluate motor control, (5) EVA (“Evaluation Visuelle Analogique”) for pain evaluation, and (6) life quality questionnaire. Conventional statistical tests were applied to evaluate the significance of differences between pre- and post-training results.

Results: Baseline (T0/T1) showed stability of the assessment of all the 9 patients. After 3 weeks of training on the arm-trainer (T2), 56% of the patients showed significant improvement of the Rivermead Motor Test (Wilcoxon $p=0.027$), of the testing of the motor force of upper-arm flexors (Wilcoxon $p=0,028$); and 67%

of the motor force of upper-arm extensors (Wilcoxon $p=0,016$); and 56% of the motor force as measured by the arm-trainer (cyclo-ergometer) (Wilcoxon: $p=0,028$). Spasticity evaluated by the Range of Motion (ROM) showed an improvement of the extension of the arm, measured by the increase of ROM (Wilcoxon $p=0.047$). These results were confirmed by the patients’ subjective satisfaction as evaluated by the life quality questionnaire and the motivation of all patients to continue this training on their own.

Conclusion: Repetitive training using an arm-trainer can improve motor power, functional gain and diminish spasticity. In addition to conventional physiotherapy, such training can be achieved by the patient himself, and apart from budget constraints, can be conducted daily at home. Further studies are planned in order to investigate if repetitive movement can prolong the efficiency of Botox.

P66

SPASTICITY | C

USE OF THE VOICE HANDICAP INDEX (VHI) TO QUANTIFY LONG-TERM PATIENT RESPONSE TO A BOTULINUM TOXIN PROGRAM FOR ADDUCTOR SPASMODIC DYSPHONIA

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Adductor Spasmodic Dysphonia (AddSD) is a focal laryngeal dystonia characterized by a strained-strangled voice quality. It is defined as a chronic neurologic disorder of motor processing, resulting in action-induced spasms of the vocal folds. It usually does not respond to traditional voice therapy techniques.

Since 1999, a multidisciplinary team consisting of an otolaryngologist, a neurologist, a speech-language pathologist, and a voice scientist has evaluated and monitored patients receiving injections of botulinum toxin type A into the thyroarytenoid muscles for symptomatic treatment of AddSD. Clinical evaluations, perceptual measures of voice quality and spectrographic analyses were complemented by patient self-assessment of the psychosocial impact of AddSD and its treatment. The psychometrically validated Voice Handicap Index (VHI) has been used over the years to objectively quantify and monitor patient perceptions of their quality of life pre- and post injection.

Significantly lower VHI scores after an injection indicate a remarkable improvement in the quality of life of all patients, in particular as it relates to their social interactions and emotional state of mind. The majority of patients, independent of the initial severity of their symptoms, reported consistent and lasting improvements for up to three months following each treatment. Moreover, despite the temporary nature and at times variable outcome of each treatment, positive patient perceptions have not diminished four years after enrolling in the program. The use of the VHI has helped the team and our patients to foster realistic expectations regarding quality of life adjustments for people living with a chronic neurologic voice disorder.

P67

SPASTICITY | C

BEURTEILUNG AMBULANTER PHYSIOTHERAPIE BEI HEREDITÄTER SPASTISCHER SPINALPARALYSE (HSP) AUS DER SICHT BETROFFENER

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Bei der HSP steht die progrediente Gangverschlechterung im Vordergrund. Da eine ursächliche Therapie nicht zur Verfügung steht, kommt u. a. der Physiotherapie (PT) eine besondere Bedeutung zu. Bisher ist jedoch nicht bekannt, welche physiotherapeutischen Konzepte und Methoden sich am günstigsten auf den Erhalt motorischer Funktionen auswirken und aus Sicht Betroffener beurteilt werden.

In dieser deskriptiven Querschnittstudie wurde zur Erfassung der Betroffenen in Deutschland bei 90 Patienten mittels eines standardisierten Fragebogens untersucht, wie der Einfluss der PT auf den Funktionserhalt einerseits und auf HSP-typische Beschwerden (Rückenschmerzen, Kontrakturen, Blasenschwäche) andererseits beurteilt wird. Zur Differenzierung des Schweregrades der Erkrankung wurde eine Einteilung in vier Krankheitsstadien vorgenommen: I. Spastik u. keine Hilfsmittel; II. Spastik und abhängig von Gehstock/orthopädischen Schuhen; III. Spastik und zusätzlich Rollator; IV. Spastik und zusätzlich Rollstuhl. Zur Messung des subjektiven Empfindens der physiotherapeutischen Wirkung auf die Alltagsfunktionen und Mobilität wurde der Barthel-Index angewandt und in eine Rangskala von 0–100% unterteilt. Dasselbe Prinzip wurde bei der Messung der durch PT veränderbaren HSP-typischen Beschwerden angewandt.

64 von 90 Fragebögen wurden ausgewertet. 81% erhielten, d. h. 52 Patienten (38 Männer, 26 Frauen) PT. Demnach erhalten in den Krankheitsstadien I. 8/9; II. 9/14; III. 8/11; IV. 27/30 PT. Unter Berücksichtigung des Krankheitsschwerpunktes „Beeinträchtigung der Gehfähigkeit“ geben die PT erhaltenden Patienten bzgl. der im Barthel-Index repräsentierten Funktionen: 1. „Gehen in der Ebene“ und 2. „Treppe steigen“ sowie 3. bzgl. des „Einflusses auf die HSP-typischen Beschwerden“ nach o. g. Krankheitsstadien folgendes an (Verbesserung = + -Zeichen):

I. 1. 5/8 + 22% (SD 23,61), 2. 7/8 + 23,57% (SD 19,09), 3. 8/8 + 40,63% (SD 27,57);

II. 1. 8/9 + 48,13% (SD 24,29), 2. 9/9 + 38,89% (SD 28,70) 3. 9/9 + 55,56% (SD 24,29);

III. 1. 8/8 + 40% (SD 18,13) 2. 8/8 + 35,63% (SD 19,54) 3. 8/8 + 49,38% (SD 20,43);

IV. 1. 27/27 + 36,29% (SD 33,07) 2. 27/27 + 30% (SD 31,32) 3. 26/27 + 39,62% (SD 27,13).

Patienten in II und III profitieren gegenüber I („PT noch nicht erforderlich“) und IV („Ceiling-Effekt“) am meisten. Die Beurteilung der PT-Methoden und deren Einfluss auf Krankheitsleben, Lebensqualität und Erhalt der Berufstätigkeit werden diskutiert.

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SPASTICITY | C

RARE COMPLICATIONS IN A CASE OF INTRATHECAL BACLOFEN APPLICATION

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Background: Intrathecal application of baclofen is an established therapy in the treatment of spinal and supraspinal spasticity. When the therapeutic effect does not live up to expectations, various causes should be excluded applying a given algorithm.

Case study: We performed an intrathecal baclofen evaluation on a 56-year-old male suffering from severe spastic paraplegia as a result of a thoracic herniated disk. Oral antispastic medication was insufficient. After positive results of the trial, a permanent pump system was implanted. Postoperatively, cephalgia due to CSF leakage developed; dysfunction of the catheter and pump were ruled out via radiological examination. Because of persisting symptoms, surgical exploration was performed, revealing catheter microleakage at the spinal entry site: implantation of a special catheter followed. The patient reported complete remission of the headaches, but subsequently developed a conus-cauda syndrome. Vesicular electrostimulation improved the voiding disturbance, and the alleviation of spasticity was satisfactory. Three months later the patient complained of severe pain spreading to the legs and recurrent spasticity. Magnetic resonance imaging revealed arachnoiditis; however, several intrathecal applications of cortisone gave no relief of symptoms. During the first application of

cortisone, baclofen was overdosed due to an incorrect refilling of the pump. A further surgical exploration revealed the presence of granuloma, so that catheter revision was again necessary, however, without lasting beneficial effect on the patient's complaints. Next, X-rays revealed a subdural, epirachnoidal position of the tip of the catheter in a radicular recessus. Despite surgical correction of the catheter position, no further therapeutic success was achieved. Four months later, the patient requested removal of the pump.

Conclusion: Intrathecal application of baclofen is an accepted therapy for severe spinal and supraspinal spasticity. In case of insufficient reduction of spasticity, however, common and rare complications must be taken into consideration.

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SPASTICITY | C

RELIABILITÄT DER KLINISCHEN SPASTIKMESSUNG BEI PATIENTEN NACH SCHWERER HIRNSCHÄDIGUNG: VERGLEICH DER ASHWORTH-SKALA MIT DER TARDIEU-SKALA

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Einleitung: In letzter Zeit gewinnt die Tardieu-Skala modifiziert nach Held (MTS) neben der in der Anwendung weit verbreiteten modifizierten Ashworth-Skala (MAS) zur klinischen Evaluation der Spastik zunehmend an Bedeutung. Erste Untersuchungen bei Kindern zeigten eine bessere Reliabilität der MTS im Vergleich zur MAS. Die Reliabilität der MTS bei Erwachsenen mit Hirnschädigung ist dagegen noch nicht untersucht. Ziel der vorliegenden Arbeit war es daher, die Intrarater- (= Test-Retest) und die Interrater-Reliabilität der MAS und MTS für die großen Gelenke von Patienten mit Hirnschädigung zu vergleichen.

Methodik: 30 Patienten nach schwerer Hirnschädigung und Bewusstseinsstörung (Komaremissionskala <16 Gesamtpunkte) wurden rekrutiert. Vier erfahrene Untersucher erhoben bei jedem Patienten sowohl die MAS als auch die MTS an zwei aufeinanderfolgenden Tagen an Schulter-, Ellbogen-, Hand-, Hüft-, Knie- und Sprunggelenken beider Körperseiten. Die Reliabilität wurde mit Hilfe von Kappa-Koeffizienten (k) berechnet. Zum statistischen Vergleich der Reliabilität beider Skalen wurde der Wald-Test angewendet.

Ergebnisse: Die Intrarater-Reliabilität beider Skalen war moderat bis gut (MAS: k=0,47-0,62; MTS: k=0,52-0,87) und signifikant höher bei der MTS im Vergleich zur MAS am Ellbogen-, Hand-, Hüft-, Knie- und Sprunggelenk (p<0,05). Die Reliabilität am Schultergelenk war bei beiden Skalen vergleichbar (p>0,05). Die Interrater-Reliabilität über alle Rater beider Skalen war schlecht bis moderat (MAS: k=0,16-0,42; MTS: k=0,29-0,53) und ebenfalls signifikant höher bei der MTS im Vergleich zur MAS am Schulter-, Ellbogen-, Hüft-, Knie- und Sprunggelenk (p<0,05). Die Reliabilität am Handgelenk war bei beiden Skalen vergleichbar (p>0,05).

Diskussion: Die Ergebnisse dieser Studie legen nahe, dass die MTS eine höhere Intrarater- und Interrater-Reliabilität im Vergleich zur MAS aufweist. Daraus wird gefolgert, dass die Validität beider Skalen als eingeschränkt zu beurteilen ist. Zur Konstruktvalidität postulieren die Autoren, dass die MTS eher das geschwindigkeitsabhängige Phänomen Spastik (definiert nach Lance), die MAS vorrangig Widerstand bei passiver Bewegung („Hypertonia“) misst.

Für die klinische Routine (Evaluation des spastischen Phänomens) sowie für weitere wissenschaftliche Untersuchungen wird empfohlen, neben der Ashworth-Skala auch die Tardieu-Skala zu verwenden.

P70 SPASTICITY | C
THE INFLUENCE OF CONTRACTURES AND VARIATION IN MEASUREMENT STRETCHING VELOCITY ON THE RELIABILITY OF THE MODIFIED ASHWORTH SCALE IN PATIENTS WITH SEVERE BRAIN INJURY

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Objective: To determine the influence of contractures and different stretching velocities on the reliability of the modified Ashworth Scale (MAS) in patients with severe brain injury and impaired consciousness.

Design: Cross-section observational study.

Setting: A rehabilitation centre for adult persons with neurological disorders.

Subjects: 50 patients with impaired consciousness due to severe cerebral damage of various aetiologies.

Measurement protocol: Three experienced and trained medical professionals rated each patient in a randomised order once daily for two consecutive days. Shoulder, elbow, wrist, knee, and ankle spasticity were assessed by the use of the MAS with different stretching velocities. The presence of contractures was assessed by a goniometer.

Main outcome measures: Retest- and interrater reliability (kw= weighted kappa) of the MAS.

Results: The retest reliability of the MAS was good (shoulder joints (kw 0.74), elbow joints (kw 0.74), wrist joints (kw 0.72), knee joints (kw 0.72), ankle joints (kw 0.77) and the interrater reliability was moderate (shoulder joints (kw 0.49), elbow joints (kw 0.52), wrist joints (kw 0.51), knee joints (kw 0.54) ankle joints (kw 0.49)). The presence of contractures significantly influenced the reliability of MAS in shoulder and wrist joints. No influence of stretching velocity on the reliability of the MAS was found.

Conclusion: In patients with impaired consciousness due to severe brain injury the MAS has good retest-, but only limited interrater-reliability. The presence of contractures may influence reliability of the MAS, but stretching velocity does not.

P71 SPASTICITY | C
INTERMITTENT BACLOFEN OVERDOSE DUE TO PARTIAL OBSTRUCTION OF THE INTRATHECAL CATHETER

A.R. Wajid, P.L. Archer, F. Jamil (Oswestry, Wakefield, UK)

Objective: To report a case of intermittent baclofen overdose due to partial obstruction of the intrathecal catheter.

Study design: A case report of a patient with spinal cord origin spasticity treated with intrathecal baclofen.

Methods: We present the case of a 43-year-old male with incomplete paraplegia following resection of a spinal tumour diagnosed in 1993. A baclofen pump was inserted to treat severe spasms and this was effective for first two months, but then the spasms returned and after multiple dose increases it was eventually discovered that catheter had become disconnected from the pump. This was fixed but problems with spasm remained. Various investigations did not reveal any problem with the pump or catheter, however the patient had multiple episodes of headache, drowsiness, nausea and sometimes coma for which he required care in ICU on more than one occasion. Results: The level of baclofen in the CSF was found to be very high (1368 mcg/ml) during one of these episodes suggesting that the patient's symptoms were most likely due to baclofen overdose. Careful history revealed that his spasms were unaffected by dose increases in intrathecal baclofen, but if he leant forward in his chair, to do gardening or mechanical repairs, he would subsequently develop symptoms of baclofen overdose and become completely flaccid. The pump was removed, he was restarted on oral baclofen, and he has not experienced any further episodes of baclofen overdose.

Conclusion: Problems with intrathecal drug delivery systems have been widely documented in the past, however this case shows that even if all the imaging and investigations are normal care must be taken when increasing a patient's baclofen dose when there are features in the patient's history to suggest a drug delivery problem. The exact nature of the problem is not known in this case but a partial obstruction secondary to granulation tissue could be one explanation.

P72 STROKE | C
LONG-TERM FUNCTIONAL OUTCOME AND HEALTH-RELATED QUALITY OF LIFE OF PATIENTS WITH VASCULAR HEMIPLEGIA

R. Bossy, J.-C. Gerster, R. Frischknecht (Lausanne, CH)

Objective: The aim of this study was to determine whether stroke patients were able to maintain the level of functional independence reached during inpatient rehabilitation. Additionally their health-related quality of life was recorded at the time their long-term functional outcome was assessed.

Method: The study included all patients with vascular hemiplegia admitted to our rehabilitation ward over a period of 3 years, if they had had a full functional independence assessment (Functional Independence Measure – FIM) at discharge and if they were still living in the country at the time of the follow-up. The functional independence of the patients was assessed at their place of living 1 to 4 years after stroke and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) Questionnaire administered at the same time.

Results: Out of the 36 patients eligible for the study 30 lived at home and 6 stayed in nursing homes. The follow up assessment took place 500 to 1473 days after stroke. Functional outcome at the end of the inpatient rehabilitation was slightly better for cerebral haemorrhage compared to cerebral infarction. Age, sex and the side of the stroke did not affect the outcome significantly. After discharge from hospital the patients maintained or improved their level of functioning except those staying in a nursing home that showed a decreased functional independence. Patients on continuous physiotherapy tended to show better FIM scores compared to their functional assessment at discharge. No correlation was found between measured and self-perceived changes of functional independence after discharge from inpatient rehabilitation.

All patients considered themselves in rather good health except the aspects related to their physical disability. Interestingly patients with better FIM scores rated the extent of their functional disability higher than those with lower FIM scores. Out of 8 patients discharged from hospital before the age of retirement only 2 were able to resume part-time work.

Conclusion: The level of functional independence achieved during inpatient rehabilitation was found to be maintained or improved over periods of 1 to 4 years after stroke except for patients discharged to nursing homes. Continuous ambulatory physiotherapy tended to be associated with functional improvement. The patients considered themselves in rather good health except for the physical consequences of their stroke.

P73 STROKE | C
OUTCOME OF IN-HOSPITAL REHABILITATION AMONG PATIENTS WITH ANTERIOR VERSUS MIDDLE CEREBRAL ARTERY STROKE: A MATCHED CASE-CONTROL STUDY

M. Frank, S. Engelter (Basel, CH)

Background: Stroke of the anterior cerebral artery (ACA) territory is a relatively rare condition with distinct neurological features. Little data exist on rehabilitation prognosis and outcome in these patients.

Methods: Based on our stroke rehabilitation register we identified all patients with ischemic stroke confined to the ACA territory (n=16). In a single-center retrospective case-control study we selected 32 middle cerebral artery (MCA) stroke patients from our register matched for age, onset-admission interval (OAI), disability on admission and lesion side. We compared both groups for initial neurologic deficit, Functional Independence Measure (FIM) total score and subscores at discharge, length of stay (LOS), discharge destination, sociodemographic factors, stroke aetiology and risk factors.

Results: On admission, paresis of the leg and depression were more pronounced in ACA patients, whereas sensory involvement, dysarthria, facial paresis and hemianopia were less frequent. There were no differences in sociodemographic factors, OAI, LOS, stroke aetiology and risk factors, and discharge destination. After in-hospital rehabilitation (mean 93,5 ± 44,2 days after stroke onset), ACA patients showed a trend towards less gain in total FIM score and locomotion and towards higher rate of urinary incontinence. In left hemispheric ACA patients, communication abilities showed a better recovery than in left MCA patients (p=0,05).

Conclusion: In our patients, overall outcome after in-hospital rehabilitation did not differ significantly between ACA and MCA stroke patients with comparable initial functional deficit. Independent walking was achieved only in a minority of ACA patients and micturition problems persisted in many. On the other hand, initial aphatic symptoms tended to show good recovery in ACA patients.

P74 STROKE C SLEEP ARCHITECTURE, SLEEP APNEA AND OUTCOME IN NEUROREHABILITATION (NR) AFTER STROKE

C. Haider, H. Zauner, E. Steingassner, A. Gaßner (Großgmain, A)
Background: The role of sleep in brain plasticity resp. in learning and memory is gaining more interest in clinical research.

1. There is experimental support for two contradictory hypothesis: REM sleep serves an important role vs. REM sleep serves no role in memory processing and consolidating.
2. Amount of S2 sleep is a good indicator for regenerative sleep, because external stimuli are mainly rejected, thus preventing overstimulation.

Setting: inpatient rehabilitation

Methods and subjects: Measurements: Barthel Index (BI), Basic and extended activities of daily living (BADL, EADL), Rivermead Motor Assessment (RMA), Tinetti Test (TT), Apnea-Hypopnea-Index (AHI), Percentage of REM sleep (REM%)

Subjects: consecutive cohort of 22 stroke patients: 13 patients severe disabled (BI at admission beyond 30), 13 men. Median age 64 years (range 26–79). Time since onset of signs and symptoms to beginning of NR 7 weeks (2–14). 12/22 patients: REM depressant drugs (selective serotonin reuptake inhibitors) in low dose.

Results and conclusion: Correlation analysis between sleep parameters (AHI, REM sleep, central apneas) and motor outcome parameters (TT, RMA, BADL, EADL): n.s. (p>0.05)

1. Amount of all types of apneas/hypopneas does not predict outcome.
2. Amount of central apneas/hypopneas is not associated with outcome.
3. Amount of REM-sleep is not associated with motor learning (TT, RMA, BADL, EADL) except testing the subgroup of severe sleep disordered patients (AHI>30).
4. Amount of S2-sleep in severe disordered patients shows a significant correlation with parameters of improvement in neurorehabilitation.

P75 STROKE | C DIFFERENCES BETWEEN ACUTE AND CHRONIC APHASIC PATIENTS – IMPLICATIONS FOR TREATMENT AND REHABILITATION

W. Schupp, Ch. Lederhofer, B. Seewald, I. Haase (Herzogenaurach, Enzensberg, D)

Objectives: In a project to evaluate a telerehabilitation program and setting (Evolving (R) therapy) we monitored samples of acute and chronic patients being admitted for inpatient rehabilitation.

Goals and Methods: To detect possible differences in effectiveness of telerehabilitation between acute and chronic aphasics we examined and listed up biological and medical data like type and cause of aphasia, concomitant disorders and risk factors, medication schemes and proved these data for differences by nonparametrical analyses.

Results: 59 acute and 16 chronic aphasic patients could be consecutively included. The chronic had been of younger age on an average. They suffered significantly more from territorial brain infarctions (cortical and subcortical lesions combined), but less from arterial hypertension or diabetes mellitus, showed more additional sensorimotor deficits, speech apraxia and dysarthria. Acute aphasics had more psychic disturbances. These facts were also reflected in their medication schemes. Only in depression there was an inverse correlation between diagnosis made and drugs given.

Conclusion: Territorial brain infarctions are more often causes for chronic aphasia. Acute aphasic disturbances due to microangiopathic infarctions have a good long term prognosis. Depression in chronic aphasics is often not treated by drugs.

P76 STROKE | C INPATIENT STROKE REHABILITATION IN 4 EUROPEAN REHABILITATION CENTRES – DO WE ALL HAVE THE SAME PATIENTS' EXPERIENCES FROM THE CERISE PROJECT?

W. Schupp, L. De Wit, W. Jenni, E. Dejaeger, H. Beyens, P. Berman (Herzogenaurach, D; Leuven, B; Nottingham, GB; Zurzach, CH)

Objectives: CERISE (Collaborative Evaluation of Rehabilitation In Stroke across Europe) is a project to evaluate the outcome of inpatient stroke rehabilitation in four European centres, particularly with respect to the impact of physiotherapy and occupational therapy and the internal and external organisation of the rehabilitation process.

Goals and Methods: To detect possible differences in the effectiveness of rehabilitation in the four centres, we carefully monitored demographic and medical data, functional status and medication schemes at admission to the rehabilitation centre and at discharge. At 2, 4 and 6 months after stroke, recovery of motor function and emotional status was recorded. Recruitment is now nearly complete in all centres. In September 2003, nearly half of the completed dataset at recruitment was available. We compared the recruitment profiles between the four centres using non-parametric statistical analyses as the parameters showed a skewed distribution.

Results: The centres in Germany and Switzerland admit comparable patients, with respect to the severity of stroke at admission. In both centres a greater number of less severely disabled patients are admitted, in contrast to patients admitted to the centres in Belgium and Great Britain. The patients admitted to the rehabilitation centre in Great Britain are significantly older. The risk factors for stroke and the concomitant disorders do not show large differences, but the medication schemes at admission do differ in some aspects.

Conclusion: The preliminary results show that there are differences in the patient populations receiving inpatient stroke rehabilitation in the four centres with respect to age and stroke severity at admission. This might reflect different strategies to organise and finance acute treatment and rehabilitation for stroke in these countries.

P77 STROKE | C
THE COMPARATIVE ANALYSIS OF VARIOUS PROGRAMS FOR THE TREATMENT, INCLUDING BOTULINUM TOXIN, OF SPASTICITY OF UPPER LIMB MUSCLES AT PATIENTS AFTER STROKE

S.E. Khatkova (Moscow, RU)

Objective: In work the task was put to carry out comparison of efficacy and safety of various programs for the treatment of post-stroke spasticity of the arm muscles, including using botulinum toxin Type A.

Methods: 87 patients after stroke with expressed upper limb muscles spasticity, to 25 from which botulinum toxin Type A (Dysport in a dose 500–1000 UI) has been injected, have been investigated. Various groups of comparison on which carried out different medical and rehabilitation programs (peroral myorelaxants, massage, the medical gymnastics, programmed myostimulation – separately and in various combinations) have been generated. Initial characteristics (age, a degree of a muscle tonus, base therapy) were identical in compared groups. A muscle tonus was estimated on Modified Ashworth Scale and by means of functional tests. Standard statistical criteria were applied.

Results: It has been shown, that medicamental therapy alone (central myorelaxants – baclofen, etc.) in most cases was not effective at all. In groups with application of the combined methods for the treatment a reduction of a muscle tonus was observed more often ($p < 0,05$). The best results are revealed in a group of patients with Dysport injection in a combination with a complex of rehabilitation procedures – medical gymnastics, programmed multichannel electro stimulation, massage ($p < 0,01$). Not serious side-effects caused by botulinum toxin injection were found.

Conclusions: The most effective method for the treatment of post-stroke spasticity of upper limb muscles is complex therapy using botulinum toxin Type A in combination with medical gymnastics, programmed myostimulation and massage.

P78 STROKE | C
DISTRIBUTION OF WEAKNESS IN THE UPPER AND LOWER LIMBS POST-STROKE

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Objective: To assess the distribution of weakness in the upper and lower limbs and proximal and distal joints post-stroke, and the factors associated with weakness.

Method: Design: Prospective cross-sectional hospital -based survey.

Setting: In-patient stroke services of two NHS trusts over 12 months.

Patients: Consecutive sample of 75 patients (37 (49%) men, mean age 71.5 (sd 12.2) years, 46 (61%) left hemiplegics) with first-time anterior-circulation stroke who could consent and participate in testing.

Main outcome measures: Weakness (Motricity Index, MI).

Analysis: The difference in weakness between the upper and lower limbs was tested using a paired t-test. Patterns of weakness were tested by subtracting the score for the upper limb from that of the lower limb. A positive score would indicate that the lower limb was stronger than the upper limb and a negative score would indicate that the upper limb was stronger than the lower limb. An ANOVA tested differences between the proximal and distal joints. The factors associated with weakness were assessed using linear regression analysis. Weakness was the dependent variable; the independent variables were patient demographics (age, sex, pre-morbid disability), stroke type (infarct or haemorrhage) and side of stroke.

Results: Mean MI score was 58.5 (sd 39.6) and 69.1 (sd 33.6) for the upper and lower limb respectively. This difference was significant at $p < 0.0001$ (95% CI -4868, -0199). Most patients (39, 52%) had the same score for the arm and leg (+/- 10). When there was a difference, the lower limb was most frequently the stronger. There was no significant difference between the proximal and distal joints in either the arm or the leg ($p < 0.993$ and 0.961 respectively). The severity of weakness was not associated with the subjects' age, sex nor type or side of stroke.

Conclusions: Most patients had an equal degree of weakness in the arm and leg but when there was a difference, the arm tended to be weaker than the leg. In contrast to traditional teaching, proximal joints were not more severely affected than distal joints. Patient demographics, stroke type or side do not influence the degree of weakness.

P79 STROKE | BS
A NEW METHOD TO QUANTIFY BALANCE CONTROL MECHANISMS IN STROKE PATIENTS

E. van Asseldonk, F.C.T. van der Helm, H. van der Kooij (Enschede, NL)

Stroke patients often suffer from an impaired balance control, which limits or delays the recovery of gait and functional independence. In many studies the final outcome of the disturbed balance control is assessed by using parameters like weight distribution and the amount of body sway. Although these parameters characterize the disturbed control they don't elucidate the underlying disturbed physiological mechanisms of balance control and don't make clear the contribution of the paretic leg and non paretic leg to balance control. The physiological mechanisms of balance control include the intrinsic mechanical properties of the musculoskeletal system and the reflexive feedback pathways and can be identified by using a combination of perturbation experiments and closed loop identification schemes (1). The aim of this study is to identify the balance control of the whole body of stroke patients and of the paretic leg and non paretic leg separately to determine their contribution to overall balance control.

A stroke patient stood on a motion platform and a multisine signal in forward backward direction was applied to the platform to perturb the balance of the patient. Full body motion and ground reaction forces were measured. In separate trials the ground reaction forces of the total body, the paretic and non paretic leg were measured. From the platform movements and calculated centre of mass movement and ankle torques the frequency response functions of controller dynamics were determined. The frequency response functions were used to uniquely identify the sum of the intrinsic stiffness and neural position feedback gain (reflexive stiffness), the lumped neural time delay, the neural velocity feedback gain (reflexive damping) and the intrinsic damping for the whole body, paretic and non paretic leg by using a parametric model of balance control and a fitting procedure.

The results show that patients have an increased stiffness and reflexive damping compared to healthy controls (1). The stiffness and reflexive damping of the whole body can almost solely be attributed to the non paretic leg. These preliminary results show the feasibility of this new method to get a better quantification and understanding of the disturbed physiological mechanisms of the paretic leg and the compensatory mechanisms in the non paretic leg in balance control of stroke patients.

Literatur:

1. Van der Kooij, et al. IEEE International Conference on Systems, Man & Cybernetics 2004

P80 STROKE | C
“DEGAS” – DEUTSCHE GANGTRAINERSTUDIE ZUR EVALUATION DES GANGTRAINER GT I IN KOMBINATION MIT PHYSIOTHERAPIE IM VERGLEICH ZUR PHYSIOTHERAPIE ALLEINE BEI AKUTEN SCHLAGANFALLPATIENTEN

C. Werner, M. Pohl, M. Holzgraefe, G. Kroczeck, J. Mehrholz, Wingendorf I, G. Hölig, S. Hesse (Berlin, Seesen, Bad Rodach, Kreischa, D)

Gefördert im Rahmen des BioFuture-Programms des BMBF und von Reha-Stim, Berlin

Absicht: multizentrische Studie zur Evaluation des GT I in Kombination mit Physiotherapie vs. Physiotherapie alleine bei nicht-gehfähigen Schlaganfallpatienten im Akutstadium, die Nettotherapiezeit sollte sich in beiden Gruppen entsprechen.

Methodik: Vier Zentren rekrutierten 150 nicht-gehfähige, hemiparetische Patienten nach erstmaligem supratentoriellen Insult (Intervall < 60 Tage, Barthel Index 25–60), in zwei Gruppen A und B randomisiert.

A erhielt jeden Werktag 20 min GT plus 25 min Krankengymnastik (KG), die Kontrollgruppe 45 min KG für jeweils 4 Wochen. Inhalte der KG waren u. a. das Üben des Gehens in der Ebene und auf der Treppe neben tonusregulierenden und das Gehen vorbereitenden Übungen.

Primär abhängige Variablen waren die Gehfähigkeit (FAC, 0–5), die maximale Gehstrecke (m) und die ADL-Kompetenz (BI, 0–100), sekundäre die Ganggeschwindigkeit (m/s), und der Rivermead Mobility Index (0–15), erhoben von zwei sich gegenseitig kontrollierenden Ratern pro Zentrum vor Therapie, nach 2 und 4 Wochen sowie nach 6 Monaten. Die Gruppenzugehörigkeit war bekannt.

Ergebnisse: (n=124, Stand 05.04): Beide Gruppen vor Therapie vergleichbar, nach Studienende und Follow-up signifikant besseres Ergebnis der Gruppe A in allen abhängigen Variablen: Studienbeginn nach 4 Wochen nach 6 Monaten

FAC-A (Median): 1.0 (0–3), 4.0 (2.5–5), 5.0 (4–5)

FAC-B (Median): 1.0 (0–3), 2.0 (0.75–3) 3.5 (1.75–4.5)

BI-A (Mittelwert): 38.5 (±12.3), 72.8 (±19.6), 82.3 (±22.8)

BI-B (Mittelwert): 35.8 (±11.0), 56.4 (±20.7), 66.0 (±29.3)

ST-A (Mittelwert): 31.3 (±40.3), 129.9 (±108.8) 180.8 (±149.8)

ST-B (Mittelwert): 25.0 (±37.7) 79.9 (±94.5) 105.5 (±126.3)

Zusammenfassung: Die Kombination aus repetitivem Gangtraining auf dem elektromechanischen Gangtrainer GT I plus Physiotherapie scheint der alleinigen Physiotherapie in der Gangrehabilitation akut hemiparetischer Patienten überlegen, vorbehaltlich der Endauswertung. Die Nettotherapiezeit entsprach sich in beiden Gruppen, so dass ein spezifischer Effekt der repetitiven Lokomotionstherapie anzunehmen ist. Das voraussichtliche Ende der Studie ist Sommer 2004.

P81 STROKE | C
ARMTRAINER BI-MANU-TRACK (AT) VS. EMG-GETRIGGERTE ELEKTROSTIMULATION (ES) IN DER REHABILITATION DER SCHWER BETROFFENEN OBEREN EXTREMITÄT NACH AKUTEM SCHLAGANFALL

C. Werner, A. Bardeleben, M. Pohl, J. Mehrholz, S. Hesse (Berlin, Kreischa, D)

Absicht: die Rehabilitation der schwer betroffenen obere Extremität ohne distale Willküraktivität nach Schlaganfall ist häufig unbefriedigend. Überprüft werden soll in zwei Zentren, ob die Therapie akuter Patienten mit dem computergesteuerten AT der ES als positiv evaluiertem Verfahren überlegen ist. Der AT erlaubt eine bilaterale distale Therapie.

Methodik: 50 Patienten, Fugl-Meyer Motor Score (FM, 0–66) < 18, Intervall < 60 Tagen, 2 Gruppen A oder B, in A werktägliche

AT-Therapie (1000 Repetitionen pro Sitzung) über 6 Wochen, in B ES der paretischen Handstrecker. Das Therapiesetting entsprach sich in beiden Gruppen. Der Fugl-Meyer Score (FM, 0–66) war die primäre Variable und wurde mit Hilfe standardisierten Videos von einer unabhängigen Therapeutin ausgewertet, nach 6 Wochen und 3 Monate später. Die Faustschlusskraft der paretischen Hand (N) war sekundäre. Die übrige Therapie entsprach sich in beiden Gruppen, die funktionelle Therapie der betroffenen Hand spielte dabei nur eine untergeordnete Rolle.

Ergebnisse: Beide Gruppen entsprachen sich vor Therapie, alle Patienten beendeten ohne NW die Studie. Der FM der A-Gruppe war signifikant höher zum Studienende und Follow-up. Gleiches traf auf die Faustschlusskraft zu.

Diskussion: Der AT erwies sich in der motorischen Rehabilitation der hochparetischen oberen Extremität von akuten Schlaganfallpatienten als hochüberlegen. Er ist eine Option für dieses bis dato häufig unbefriedigende und nicht selten vernachlässigte Feld der Schlaganfallreha. Das repetitive bilaterale üben zweier distaler Bewegungen scheint als Konzept vielversprechend.

P82 STROKE | C
“FREE-WALK” ORTHESE IN DER GANGREHABILITATION HEMIPARETISCHER PATIENTEN: ERSTE KLINISCHE ERFAHRUNGEN

C. Werner, A. Bardeleben, S. Hesse (Berlin, D)

Die „Free-Walk“ Orthese (Otto Bock) ist eine modifizierte Knie-Sprunggelenkorthese, die im Gegensatz zu konventionell starren Modellen eine Knieflexion in der Schwungbeinphase und damit einen physiologischen Bewegungsablauf gestattet. In Kombination mit der durch eine Orthese per se gewährten Sicherheit kann die extrem leichtgewichtige und individuell anpassbare Orthese sich somit eignen, die Gangqualität hemiparetischer Patienten zu verbessern. Dies um so mehr, als die Entriegelung bzw. Sperrung des Kniegelenks folgende selektive Bewegungen erfordert: Streckung und Vorverlagerung der Hüfte gegen Ende der Standbein- und selektive Streckung des Kniegelenks gegen Ende der Schwungbeinphase. Beide Segmentbewegungen sind fester Bestandteil der physiotherapeutischen Gangschulung.

Die bisherigen Erfahrungen und ganganalytischen Untersuchungen zeigten:

- nach entsprechender Schulung sind bereits gehfähige hemiparetische Patienten in der Lage, die Orthese funktionell zu nutzen, und „natürlicher“ zu gehen, indem die klassische Zirkumduktion mit Bügeleisengang (frühes Anheben des hinten stehenden Beines und Vorführung mit semiflexiertem Kniegelenk) vermieden werden konnte. Die Patienten schützten vor allem, dass das Gangmuster mit der Orthese weniger „krank“ und stigmatisierend wirkte. Voraussetzung jedoch war eine ausreichende Gewichtsübernahme und die Fähigkeit zur selektiven Kontrolle, dann konnte eine Schulung erfolgreich sein. Hochspastische Patienten waren überfordert.
- Nicht-gehfähige Patienten konnten das Potential der Orthese in der Ebene nicht im vollen Umfang nutzen, das Kniegelenk blieb meist arretiert und die Patienten profitierten ausschließlich von Stabilisierung des Sprung- und Kniegelenks mit vermehrter Gewichtsübernahme.
- Auf dem Gangtrainer GT I waren nicht-gehfähige Patienten mit therapeutischer Führung dagegen in der Lage, das Knie selektiv zu beugen und zu strecken.

Zusammenfassend zeichnet sich ein Potential der „Free-Walk“ Orthese in der Gangrehabilitation hemiparetischer Patienten ab, zum einen zur Verbesserung der Gangqualität ausgewählter bereits gehfähiger Patienten, und zum anderen zur Unterstützung der repetitiven Lokomotionstherapie. Weitere Untersuchungen sind angezeigt.

P83 SWALLOWING DISTURBANCES | C
EFFECTIVENESS OF INTERPHARYNGEAL ELECTROSTIMULATION IN PATIENTS WITH POSTSTROKE DYSPHAGIA

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Objective: To study effect of the interpharyngeal stimulation on the improvement in swallowing of the patients with the poststroke dysphagia.

Background: Dysphagia is the common reason of the reduction of functional recovery and quality of life in the poststroke patients. The exhaustion, aspiration, pneumonia and dehydration are the potential complications of dysphagia, which can lead to death.

Design/methods: Twenty one patients (mean age 56 yrs, mean duration of disease 12 month) with the poststroke dysphagia were studied. Before the treatment all patients were on the tube-feeding. The original construction electrode having the form of pharynx was used for the stimulation of the pharynx muscles poster wall, soft palate and the root of the tongue with bipolar impulses of 0,2 mc duration. The course of the treatment consisted 10–15 sessions. Patients were evaluated before and after the course of the interpharyngeal electrostimulation used the neurological and endoscopies examination with different types of bolus. Besides, the electrodiagnostic of nn. hypoglossi, the transcranial magnetic stimulation of mm. digastri vent. ant. were used at 4 patients.

Results: After the course of the interpharyngeal stimulation the full recovery of the swallowing function was recorded in 46,7% poststroke patients. There were the disappearance of the aspiration, the recovery of adequate protection of larynx and recovery of pharynx clearance during the endoscopes examination and the decrease of duration of the negative phase?-reply (increase to simultaneity of involvement of the muscular fibers, the expansion of the amplitude caused motor reply), the appearance of the current reinnervation during the needle myography, shaping of other kind of swallowing moving. The partial recovery was recorded in 39% and the absence of improvement was existent in 3 patients.

Conclusion: The interpharyngeal stimulation demonstrated to be a safe and effective treatment for patients with poststroke dysphagia. It had a higher rate of success. The use of the interpharyngeal stimulation in the different periods after the stroke reduces the period of the recovery of the swallowing function. The indirect and retrograde endoscopes and electroneuromyography examinations are the mobil and helpful methods of the assessment of the treatment of dysphagia.

P84 SWALLOWING DISTURBANCES | C
WEANING FROM NON-FENESTRATED TRACHEOSTOMY CANNULAS

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Objective: Many patients in neurological rehabilitation have been supplied with tracheal cannulas. We investigated whether weaning from non-fenestrated cannulas is possible, and with what advantages and disadvantages as opposed to fenestrated cannulas.

Method: a retrospective review of data on 153 patients over a period of seven years. Forty-one females and 112 males between the ages of 2 and 79 years at the time of onset were included in the investigation. Diagnoses included stroke (n=33), traumatic brain injury (n=62), cerebral hypoxia (n=28) and other neurological diseases (n=30). Forty patients (26%) had fenestrated, 113 (74%) non-fenestrated cannulas at the time of admission to our hospital.

Results: A total of 102 patients (67%) were successfully decannulated during their stay in our hospital, 68 (67%) of these having non-fenestrated cannulas. Average length of wearing the cannula was 85 days with fenestrated and 88 days with the non-fenestrated cannulas. Fourteen patients (33%) with fenestrated cannulas

developed granulations at the site of the fenestration, some of which necessitated surgery.

Conclusion: Weaning from non-fenestrated cannula tracheostomy tubes is no more difficult and results in fewer complications as compared to weaning from fenestrated tubes.

P85 SWALLOWING DISTURBANCES | C
NEUROGENIC DYSPHAGIA: OUTCOME AFTER TREATMENT OF 1380 PATIENTS

Ch. Ledl (Bad Aibling, D)

The management of swallowing disorders plays an important role in the rehabilitative process after neurologic damage. The main goals are to guarantee sufficient and safe nutrition and to prevent secondary complications as pneumonia, bronchospasm, malnutrition or dehydration. The literature differs slightly on the incidence of dysphagia but it is no overestimation to assume a 50 percent probability of swallowing disorders in acute stroke patients.

Since 1994 a data base on dysphagia outcome was constructed at the Neurological Hospital Bad Aibling, Germany. We included patients in the acute phase and in the early rehabilitative phase who suffered from severe dysphagia and who were dependent on a feeding tube. Dysphagia was diagnosed via a clinical bedside examination as well as by a fiberoptic and/or a videofluoroscopic swallowing evaluation. Until the year 2002 we registered 1380 patients.

Most frequent diagnoses were ischemic stroke (38,4% of the sample), haemorrhages (25,7%), traumatic brain injuries (15,6%) and peripheral neurogenic disorders (5,4%). The mean age of the patients with swallowing disorders was 59,3 years. On average they were admitted to the hospital 34 days (median) post onset of their neurologic disorder with a Barthel score of five (median). Length of stay amounted to 87 days (median). At the onset of therapy 71,2% of all patients were nourished exclusively via feeding tube. 28,8% could eat selected consistencies and/or limited quantities orally but were still dependent on a feeding tube. After therapy, 59,8% of all treated persons were fully oralized, 16,2% were partially oralized and 24% had still to rely on a feeding tube only. 32,7% of our patients had been tracheotomized at admission or needed tracheostomy shortly thereafter. In the course of therapy it was possible to decannulate 64,1% of these patients.

The success of treatment is significantly influenced by the etiology of the neurogenic disorder, the latency of therapy onset after brain damage, age, length of stay at the hospital (treatment duration) as well as by the degree of overall handicap. Overall outcome worsened as a consequence of reduction of treatment duration which was seen in neurologic rehabilitation centers during the last years. Nevertheless our data prove that for all patient groups substantial improvements can be yielded and that even for those patients suffering from hypoxic brain damage at least decanulation seems to be a realistic goal of therapy.

P86 SWALLOWING DISTURBANCES | BS
CLINICOPATHOLOGICAL CORRELATIONS IN SPINOCEREBELLAR ATAXIA TYPE 3 (SCA3)

U. Rüb, Ch. Schultz, R. de Vos, E. Brunt, H. Braak, Th. Deller (Enschede, Groningen, NL; Frankfurt, D)

Spinocerebellar ataxia type 3 (SCA3) is an autosomally dominantly inherited and life-threatening ataxic disorder which belongs to the group of CAG-repeat or polyglutamine diseases. The clinical picture of SCA3 frequently includes various oculomotor symptoms and dysphagia in addition to the well-known and progressive ataxic symptoms. Although ingestive dysfunctions leading to

dysphagia and aspiration pneumonia represent vital complications of SCA3 and other neurological disorders, no descriptions of clinicopathological correlations exist in this field of research. Therefore, we performed a clinicopathological examination in clinically diagnosed and genetically confirmed Dutch and German SCA3 patients (n=6; number of expanded CAG repeats in the diseased allele: 65 to 75). According to the results of our study, SCA3 is the first neurological disorder in which a detailed correlation between malfunctions during the three-phase process of ingestion and brainstem lesions could be established. Thick tissue sections stained for lipofuscin granules and Nissl material revealed the degeneration of the external cuneate and raphe interpositus nuclei, the reticulotegmental nucleus of the pons, the nuclei of the vestibular complex, and all brainstem nuclei involved in the preparatory phase of ingestion and lingual and pharyngeal phases of swallowing (motor, principal and spinal trigeminal nuclei; facial nucleus; parvocellular reticular nucleus; ambiguus and dorsal motor vagal nuclei; solitary nuclei; hypoglossal nucleus). In view of their known functional role, damage to the external cuneate and raphe interpositus nuclei, the reticulotegmental nucleus of the pons and the nuclei of the vestibular complex offers an explanation for the patients' upper limb ataxia, writing problems, slowed and dysmetrical horizontal saccades, saccadic smooth pursuits, impairments of the optokinetic nystagmus and vestibulo-ocular reaction, and truncal and postural instability. In addition, the lesions in the ingestion-related lower brainstem nuclei are well-suited to explain the clinical symptoms of SCA3 patients related to the preparatory phase of ingestion and lingual and pharyngeal phases of swallowing. Our findings represent a first step to improve our knowledge with respect to ingestive malfunctions underlying dysphagia in SCA3 and other neurological disorders and their pathoanatomical correlates. Improvement of this knowledge may have direct and important consequences for rehabilitative

P87 SWALLOWING DISTURBANCES | C
WAS PASSIERT MIT SCHLUCKGESTÖRTEN PATIENTEN NACH DER ENTLASSUNG?

W. Schlaegel (Burgau, D)

Fragestellung: Üblicherweise werden schluckgestörte Patienten mit einer Empfehlung betreffend Trachealkanüle bzw. Ernährung aus der Rehabilitation entlassen. Besonders bei pflegebedürftigen Patienten, die in der Regel zu Hause oder im Pflegeheim versorgt werden, wird diese Empfehlung selten überprüft und aktualisiert. Regelmäßige Nachuntersuchungen sollen Aufschluss geben, welchen Verlauf diese Patienten nach der Entlassung zeigen.

Methode: 84 Patienten wurden nach den Kriterien „relevante Schluckstörung bei gleichzeitiger Pflegebedürftigkeit (FIM ≤ 54P.)“ rekrutiert und sollen über 4 Jahre in 12-monatigen Abständen klinisch und laryngoskopisch nachuntersucht werden. Zwischenergebnisse (Stichtag 20. Juli 2004): Von den 84 Patienten sind nach der Entlassung 16 (19%) nach durchschnittlich 128 Tagen (max. 395/min. 10) verstorben. Auffällig hierbei ist der hohe Anteil der Trachealkanülen-träger: 10 von 33 mit Trachealkanüle entlassenen Patienten sind bereits verstorben, die Mehrzahl davon (9 von 10) in einem Pflegeheim, nur ein Patient zu Hause. Soweit recherchierbar stand der Tod in den meisten Fällen mit der Folge eines Aspirationsgeschehens in Zusammenhang.

Bis zum Stichtag waren zur 1. Nachuntersuchung (12 Monate nach Entlassung) 44 Patienten vorgesehen, tatsächlich konnte diese bei 22 durchgeführt werden. Davon traten bei 8 Patienten (36%) während des 1. Jahres nach Entlassung Symptome auf, die vermutlich im Zusammenhang mit Bronchopneumonien nach Aspiration stehen. 13 Patienten (59%) stellten sich mit einem im

Vergleich zur Entlassungsempfehlung veränderten Trachealkanülen- oder Ernährungsmanagement vor. Bei der Untersuchung konnte in 14 Fällen (63%) eine Besserung der Schluckfunktion konstatiert werden.

Zusammenfassung: Schluckgestörte Patienten haben im Vergleich zu allen entlassenen Patienten eine höhere Mortalität, auffällig hoch ist die Sterblichkeit von Patienten, die mit einer Trachealkanüle in ein Pflegeheim entlassen wurden. Versuche der oralen Nahrungsaufnahme, abweichend von der Empfehlung bei Entlassung, werden eher im häuslichen Bereich als in Pflegeheimen unternommen, eine Besserung der Schluckfunktion trat häufiger bei den zu Hause versorgten Patienten auf. Bei jedem dritten der nachuntersuchten Patienten lag der Verdacht auf eine aspirationsbedingte Bronchopneumonie im ersten Jahr nach Entlassung nahe.

P88 SWALLOWING DISTURBANCES | C
DYSPHAGIE UND STIMMQUALITÄT: STEIGERUNG DER EFFEKTIVITÄT KLINISCHER DYSPHAGIEDIAGNOSTIK DURCH ERGÄNZENDE PHONETISCHE MESSUNGEN

P. Wiltig, H. Masur (Bad Bergzabern, D)

Der Nachteil in der klinischen Dysphagiediagnostik liegt in einem hohen Prozentsatz falsch positiver und falsch negativer Ergebnisse, die Vorhersagbarkeit von Aspirationen liegt lediglich bei 42–66%. Apparative Untersuchungen sind häufig nicht verfügbar, mit einem hohen Zeit- und Finanzaufwand verbunden und nicht mit allen Patienten durchführbar.

Der Zusammenhang zwischen Sprech- und Schluckstörungen wurde bisher nur unzureichend untersucht. Einzelne Studien deuten darauf hin, dass Sprech- und Schluckstörungen bei neurologischen Patienten häufig koinzidieren. Deglutition und Phonation repräsentieren zwei unterschiedliche biologische Funktionen, teilen sich jedoch dieselben anatomischen Strukturen. Untersuchungen über das glottale Verhalten bei der Phonation können daher wichtige Erkenntnisse über die Schluckfunktion liefern. Deshalb wurde folgende Untersuchung durchgeführt:

100 Kontrollpersonen, 40 Patienten ausschließlich mit Dysarthrophonien, 40 Patienten mit Dysarthrophonien und Dysphagien und 5 Patienten ausschließlich mit Dysphagien wurden aufgefordert, die angehaltenen Vokale /a, e, i, ä/ jeweils dreimal zu produzieren. Die Untersuchung der Stimmqualität dieser Vokale umfasst akustische Analysen (Grundfrequenzanalysen, Spektralanalysen, Perturbationsmessungen und Untersuchungen zum Signal-Rauschverhältnis), elektrolottographische Analysen (Öffnungs- und Geschwindigkeitsquotient) und perzeptive Analysen der Stimmqualität. Darüber hinaus werden mit den neurologischen Patienten klinische Untersuchungen der Dysphagie und Dysarthrophonie und bei Bedarf röntgenologische Untersuchungen des Schluckaktes durchgeführt.

Korrelationsmessungen zeigen für die Patienten mit Dysphagien höhere Perturbationswerte, niedrigere Werte im Signal-Rauschverhältnis, höhere Standardabweichungen der Grundfrequenz und niedrigere Geschwindigkeitsquotienten bei reduzierten glottalen Verschlüssen. Die Ergebnisse der Diskriminanzanalyse zeigen, dass eine Erhöhung der Prädiktionskraft von Aspirationen möglich ist. Mit einer Auswahl der analysierten Parameter konnte die Gruppenzugehörigkeit in 80% der Fälle korrekt ermittelt werden. Diese Ergebnisse unterstreichen den Zusammenhang von Schluckstörungen mit Aspirationen und speziellen Aspekten der Stimmqualität. Akustische und elektrolottographische Untersuchungen stellen damit eine sinnvolle nicht-invasive, kostengünstige und zeitsparende Ergänzung zur Untersuchung und Verlaufskontrolle von Dysphagien dar.

P89 TRAUMATIC HEAD INJURY | C
SYMPTOM-ORIENTED BIO-FEEDBACK TRAINING

G. Köchl, L. Saltuari (Hochzirl, A)

Objective: The ever-increasing number of bio-feedback tools available for use in neurological rehabilitation necessitates close analysis of the software possibilities. Programs which specifically target neurological symptoms and which allow for documentation of the course of treatment present therapeutic advantages.

Methods: Using surface electrodes, we obtained electromyographic recordings of the agonist and antagonist muscles, e.g. biceps and triceps brachii. The waveforms were generated during (1) passive assisted movement, (2) active movement and (3) active isometric contraction.

Results: The waveforms of patients with central nervous system motor disturbances differed clearly from those of healthy volunteers (n=15). The EMG results correlate with the patients' clinical findings. The existence and intensity of neurological symptoms such as hypertonus, motoneuron recruitment deficits, or lack of coordination are represented in simple graphics. Based on the findings, the therapist can set up individual bio-feedback treatment programs and document the course of treatment.

Discussion: Interpretation of abnormal motor control function via surface EMG opens up the possibilities of orienting a bio-feedback program to the symptoms which the patient presents, thus optimizing the use of electrical stimulation in neurological rehabilitation.

P90 TRAUMATIC HEAD INJURY | C
NEUROBEHAVIOURAL DEFICITS AFTER SEVERE TRAUMATIC BRAIN INJURY

M. Lippert-Grüner, J. Kuchta, T. Rommel, N. Klug (Köln, D)

Introduction: For the outcome of patients after severe skull-brain-injury it is crucially important that after the conclusion of acute medical treatment, or in so far as this is possible already during this treatment, a start should be made with a targeted, individually adapted, intensive rehabilitative treatment, which should take the patient smoothly to the best possible re-integration in his family and the social and occupational groups he belongs to. While during the past few decades rehabilitative treatment has focused heavily on the treatment of sensomotoric deficits, it was not until the development of targeted neurological rehabilitation that increasing importance was attached to the treatment of neuropsychological and behavioural deficits.

Material and Methods: In a prospective study the behavioural peculiarities in a group of 49 patients with severe skull-brain-trauma (GCS \geq 8 marks for over 24 hours) (age 33.6, range 16–64, m.w. 4.1) were investigated with the help of the Neurobehavioural Rating Scale, 6 (n=46) and 12 (N=41) months after the trauma. The group investigated were unconscious for approximately 9.8 days (range 2–55 days) on average. An early rehabilitative treatment was started with all patients at the neurosurgical intensive care unit already during the acute illness phase. The length of this treatment, which varied from individual to individual, was about 3–4 hours a day. Over 90% of the patients were able to undergo further treatment either as in-patients or out-patients, this treatment lasting 12 weeks on average.

Results and conclusions: Our research shows that six as well as twelve months after the trauma took place a wide spectrum of behavioural deficits can be observed.

There is no doubt that also the healing in the form of regression of physical symptoms is responsible for a decrease in tolerance vis-a-vis behavioural deficits as well as a change in the personalities of those affected. Experience shows that these deficits are also

rather less easily accepted and tolerated when compared with the physical consequences of a skull-brain-injury.

In conclusion it may be pointed out that, also a year after a severe skull-brain-trauma, behavioural deficits – unlike sensomotoric deficits, which keep improving – persist to a considerable extent and often become increasingly intensive with the increase of mobility and confrontation with the family and social environment. They are of vital importance for the patient's re-integration in both his family and his social and occupational environments and therefore deserve special attention and consideration in planning adequate therapy during the sub-acute and chronic rehabilitation phase.

P91 TRAUMATIC HEAD INJURY | C
STELLENWERT DES BILDNERISCHEN ARBEITENS IN DER NEUROREHABILITATION FÜR PATIENTEN NACH SCHWEREM SCHÄDEL-HIRN-TRAUMA

M. Murg, E. Gebharter, W. Oder (Wien, A)

Im Prozess der Neurorehabilitation nach schwerem Schädel-Hirn-Trauma (SHT) werden neben den Kerntherapien (Physiotherapie, Ergotherapie, Logopädie, orthoptisches Explorations- und Fusionsstraining und symptomorientiertes Hirnleistungstraining) kreative Therapiemaßnahmen als therapiorientierte Freizeitgestaltung eingesetzt, wo Patienten die Möglichkeit haben ihre Kreativität zu entfalten und Erlerntes zwanglos einzusetzen.

In dieser Studie wurden insgesamt 650 Bilder von 50 Patienten nach Schädel Hirn Trauma mit den neurologischen, psychologischen und orthoptischen, sowie mit den bildgebenden Befunden (CCT, MRT) verglichen und dabei die Indikationsstellung und Anwendbarkeit des bildnerischen Arbeitens in der Neurorehabilitation von Patienten mit visuellen Wahrnehmungsstörungen überprüft und erarbeitet.

Als theoretische Basis dienten die neurowissenschaftlichen Erkenntnisse von *Semir Zeki* – „art is a function of brain“, die praxisorientierten Veröffentlichungen von *Karl Heinz Menzen* und vor allem die neuen pädagogisch-didaktischen Ansätze im bildnerischen Explorieren mit Patienten nach SHT von *Elisabeth Gebharter*.

In diesem Vortrag wird das zusätzliche diagnostische Potential des bildnerischen Arbeitens besprochen. Die erarbeiteten spezifischen therapeutischen Interventionen, werden anhand von komplexen Beispielen von Bildern, die unter den Bedingungen von Gesichtsfeldeinschränkungen, Augenmotilitätsstörungen, visuellen Aufmerksamkeitsstörungen und Agnosien entstanden sind besprochen. Vergleichsdemonstrationen der bildnerischen Arbeiten von Patienten mit visuokonstruktiven Störungen mit den CCT/MRT Befunden geben auch neurotopographisch Einblick in die unterschiedlichen Ausprägungen dieser Störung. Da die Bilder der Patienten über einen Zeitraum von bis zu einem Jahr gesammelt wurden, kann die Remission der jeweiligen Symptomatik im Verlauf anschaulich und individuell dokumentiert werden.

Thromboembolieprophylaxe nach Schlaganfall/TIA

Clopidogrel als Monotherapie ausreichend

Nach einem zerebralen Ischämieereignis lässt sich die Thromboembolieprophylaxe mit Clopidogrel nicht durch die zusätzliche Gabe von ASS optimieren. Der marginale Nutzen wird durch das erhöhte Risiko für Blutungskomplikationen wieder aufgehoben. Das ist das unerwartete Ergebnis einer weltweit in 28 Ländern durchgeführten Multizenterstudie mit dem Akronym »MATCH«.

»MATCH« steht für »Management of Atherothrombosis with Clopidogrel in High-risk Patients with Recent Transient Ischaemic Attack or Ischaemic Stroke«. Kriterien für den Einschluss waren ein ischämischer Schlaganfall (IS) bzw. eine transitorische ischämische Attacke (TIA), die nicht länger als drei Monate zurückliegen sollten, sowie mindestens ein weiterer Hinweis auf eine klinisch manifeste Atherosklerose (IS/TIA oder einen Myokardinfarkt innerhalb der letzten drei Jahre, symptomatische KHK/AVK oder Diabetes mellitus).

Add-on-ASS bringt keinen Zusatznutzen...

Die klinischen Charakteristika weisen die 7.599 MATCH-Teilnehmer als Hochrisikopopulation aus: In 78% der Fälle lag eine Hypertonie, in 56% eine Hyperlipidämie und in 68% ein Diabetes mellitus vor. 45% der Patienten hatten eine IS/TIA- und 5% eine Myokardinfarkt-Anamnese. 12 bzw. 10% litten an KHK- bzw. AVK-Symptomen. Das Durchschnittsalter lag bei 66 Jahren. Die Mehrzahl der Patienten war – wie angestrebt – sehr früh in die Studie

eingeschlossen worden: 19% innerhalb von sieben Tagen und weitere 50% zwischen dem achten und dreißigsten Tag nach IS (79%) oder TIA (21%).

Alle Studienteilnehmer erhielten Clopidogrel (Iscover®, Plavix®) in einer Dosis von 75 mg/Tag zusätzlich zur individuell erforderlichen Basistherapie. Dann erfolgte die Randomisierung doppelblind zu entweder ASS (75 mg/Tag) oder Placebo. Primärer Endpunkt war der Eintritt eines der folgenden Ereignisse: Tod vaskulärer Genese, ischämischer Schlaganfall, Myokardinfarkt oder stationär behandlungsbedürftige ischämische Komplikation.

Wie Studienleiter Prof. Christoph Diener, Essen, berichtete, wurde die MATCH-Hypothese nicht erfüllt. Innerhalb des durchschnittlichen Beobachtungszeitraums von siebzehneinhalb Monaten hatten im Clopidogrel/ASS-Arm 15,7% der Patienten und im Clopidogrel/Placebo-Arm 16,7% den primären Endpunkt erreicht (Intent-to-Treat-Analyse). Das entsprach einer relativen Risikoreduktion von 6,4%, die nicht statistisch signifikant war.

...proviziert jedoch mehr Blutungskomplikationen

Zwar war der positive Trend zugunsten der dualen Throm-

bozytenfunktionshemmung bei allen Komponenten des primären Endpunkts und in allen Subgruppen konsistent (Abbildung), doch der geringe Nutzen von Add-on-ASS wurde durch das höhere Risiko für – vor allem gastrointestinale und intrakranielle – hämorrhagische Komplikationen wieder »neutralisiert«. Die Inzidenz von lebensbedrohlichen (2,6 versus 1,3%) und anderen schweren Blutun-

		n	Event rate (%)	
			A+C	P+C
Qualifying event	IS	5994	16.0	17.0
	TIA	1605	14.7	15.6
Qualifying event to randomization	< 1 w	1441	15.6	18.7
	1 w – 1 m	3754	15.3	16.7
	> 1 m	2404	16.3	15.7
Age (years)	< 65	3062	13.0	15.3
	≥ 65	4537	17.4	17.7
Gender	female	2821	14.8	15.0
	male	4778	16.2	17.7
Hypertension	no	1654	13.6	15.0
	yes	5945	16.3	17.2
Diabetes	no	2402	17.0	16.5
	yes	5197	15.1	16.8
Previous IS	no	5618	15.2	16.4
	yes	1981	17.1	17.7
Qualifying or prior IS	no	1104	16.4	16.8
	yes	6495	15.6	16.7
Prior TIA	no	6157	15.1	15.8
	yes	1442	18.4	20.5
Qualifying or prior TIA	no	5254	15.6	16.3
	yes	2345	15.9	17.8
Previous MI	no	7236	15.5	16.5
	yes	363	20.1	21.2
Angina pectoris	no	6660	15.1	16.4
	yes	939	19.7	19.3
Prior cardiac or vascular surgery	no	6253	14.9	16.3
	yes	1346	19.6	18.7
PAD	no	6823	15.3	15.9
	yes	776	19.1	24.0
Overall		7599	15.7	16.7

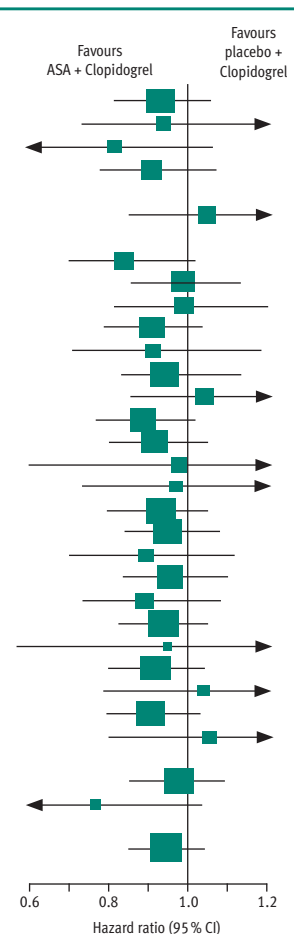


Abb.: Subgruppenanalyse der MATCH-Studie (nach Diener)

gen (1,9 versus 0,6%) war im Kombinationsarm statistisch signifikant höher ($p < 0,001$) als unter der alleinigen Prophylaxe mit Clopidogrel. Welche Schlussfolgerungen lassen sich aus diesen Studienergebnissen ziehen? Prof. Marc Orgogozo, Bordeaux, geht davon aus, dass bei einem Hochrisikokollektiv, wie es die in MATCH eingeschlossenen Patienten repräsentierten, mit Clopidogrel allein bereits der maximale – überhaupt mit der Thrombozytenfunktionshemmung mögliche – präventive Effekt erreicht worden sei. Prof. Donald Easton, Providence, bezeichnete die Monotherapie mit Clopidogrel als die derzeit empfehlenswerteste Strategie, um Patienten nach IS/TIA vor einem weiteren thromboembolischen Ereignis zu schützen – selbstverständlich auf der Basis einer optimalen, den individuellen Erfordernissen entsprechenden, antihypertensiven, lipidsenkenden und antidiabetischen Therapie.

Wie soll man denn nun im klinischen Alltag bei einer »MATCH-entsprechenden« Patientenklientel vorgehen? Diese Frage stellt sich vor allem in Hinblick auf die höheren Kosten einer Clopidogrel- im Vergleich zu einer ASS-Prophylaxe. Man gehe davon aus, so Diener, dass bei Patienten mit kurz zurückliegendem IS/TIA die Wahrscheinlichkeit für ein Ischämieereizidiv je nach Art und Zahl der zusätzlichen Risikofaktoren zwischen 3 und 20% pro Jahr liege. Zur Prophylaxe setze er dann Clopidogrel statt ASS ein, wenn das Rezidivrisiko die Marke von 7% pro Jahr überschreite.

G. Kiel

Pressekonferenz und Symposium »Stroke Prevention« (Veranstalter: Sanofi-Synthelabo/Bristol-Myers Squibb) bei der 13th European Stroke Conference am 12. und 13. Mai 2004 in Heidelberg

Häufig unerkannt

Hormonstörungen nach Schädel-Hirn-Trauma

Nach Unfällen mit Hirnverletzungen kommt es häufig auch zu einer Schädigung der Hypophyse. Die Folge sind komplexe Störungen des Hormonhaushaltes, die relativ leicht übersehen werden können, warnt die Deutsche Gesellschaft für Endokrinologie (DGE).

Als wichtigste Hormondrüse des Körpers steuert der Hypophysen-Vorderlappen (HVL) andere Hormondrüsen wie die Nebennierenrinde oder die Schilddrüse, er beeinflusst die Funktion der Fortpflanzungsorgane und bildet Wachstumshormone.

»Bisher ging man davon aus, dass eine HVL-Insuffizienz aufgrund einer Schädigung des Hypophysen-Vorderlappens eine seltene Komplikation des Schädel-Hirn-Traumas ist«, so Prof. Dr. G. Stalla, München. Die Hypophyse ist aufgrund ihrer Lage im Bereich der Schädelbasis besonders verletzungsgefährdet. Autopsien von Patienten, die an einem Schädel-Hirn-Trauma verstorben sind, zeigen in bis zu 86% der Fälle Schäden an der Hypophyse.

Doch erst neuere Untersuchungen konnten zeigen, dass diese Beschädigungen in mindestens 30% der Fälle eine HVL-Insuffizienz zur Folge haben. Auf Deutschland bezogen sind dies bis zu 80.000 Fälle im Jahr – von denen die meisten bisher unerkannt bleiben.

An HVL-Insuffizienz denken

Störungen der Hypophyse sind schwer zu erkennen, weil die Beschwerden sich langsam entwickeln und häufig unspezifisch sind. So kann ein Mangel an Wachstumshormonen beim Erwachsenen zu Leistungsabfall und Konzentrationsstörungen führen. Eine Störung der Schilddrüse kann Depressionen, Müdigkeit und Lethargie zur Folge haben. Der Ausfall verschiedener Sexualhormone

äußert sich manchmal nur in einem Verlust der Achsel- und Schambehaarung. Andererseits kann ein völliger Ausfall der Kortisonbildung in der Nebennierenrinde für den Patienten lebensbedrohlich sein.

Die Deutsche Gesellschaft für Endokrinologie fordert deshalb alle Ärzte, die Patienten mit Schädel-Hirn-Trauma behandeln, auf einen breit angelegten Hormonstatus zu erheben. Das ist auch lange Zeit nach dem Unfall noch wichtig. Denn die HVL-Insuffizienz macht sich manchmal erst drei bis zwölf Monate später bemerkbar.

Deutsche Gesellschaft für Endokrinologie (DGE), www.endokrinologie.net

Schlaganfall-Sekundärprävention

PROFESS: Ergebnisse der MATCH-Studie führen zu Änderung des Studiendesigns

Das Studiendesign für die bislang größte Studie zur Apoplex-Sekundärprävention ist geändert worden. Grund für diese Änderung waren Ergebnisse aus der MATCH-Studie, die der Hauptstudienleiter Prof. Dr. Hans-Christoph Diener auf der 13. European Stroke Conference in Mannheim bekannt gegeben hatte.

In der MATCH-Studie hatte die Kombination von Clopidogrel und Azetylsalizylsäure im Vergleich zur Monotherapie mit Clopidogrel nicht zu einem signifikanten Rückgang vaskulärer Ereignisse oder erneuter Klinikeinweisungen bei High-Risk-Patienten geführt. Die Kombination bewirkte aber eine Zunahme lebensbedrohlicher Blutungen (inklusive intrakranieller Ereignisse). Der Lenkungsausschuss der PROFESS-Studie zog daraus die Konsequenz, das bisherige

Studiendesign dahingehend zu ändern, dass in dem Studienarm, in dem die Patienten Clopidogrel, ASS und Telmisartan (Micardis®) oder Clopidogrel, ASS und Placebo erhalten hätten, der Wirkstoff ASS abzusetzen ist. Damit würde in der PROFESS-Studie Clopidogrel mit der Kombination Dipyridamol plus ASS (Aggrenox®) verglichen.

An der PROFESS-Studie sollen 15.000 Patienten in 30 Ländern teilnehmen; 2.000 Patienten wurden bereits ran-

domisiert. Auch die bereits aufgenommenen Patienten sind informiert, dass ASS im Clopidogrel-Studienarm abgesetzt werden muss.

Boehringer Ingelheim, Ingelheim

www.schering-deutschland.de
besser, bunter, informativer

Das Internetportal der Schering Deutschland GmbH wurde in den letzten Monaten optisch und inhaltlich komplett überarbeitet und aktualisiert. Es vermittelt Wissenswertes über das Unternehmen und seine Indikationsgebiete. Bequeme Links führen zu speziellen Informationen und Serviceangeboten. Ärzte und Apotheker können sich die aktuellen Fachinformationen direkt aus dem Netz herunterladen.

Parkinson-Syndrom

Cabergolin lindert nächtliche Symptome

Dopaminagonisten gehören heute zur wichtigsten Standardtherapie des Parkinson Syndroms. Im Rahmen der Veranstaltungsreihe »Cabaseril – Medical Training Parkinson« berichtete Prof. Dr. W. Oertel, Marburg, über aktuelle und zukünftige Therapieoptionen und die nächtliche klinische Symptomatik des Morbus Parkinson.

Der Morbus Parkinson ist gekennzeichnet durch den Verlust pigmentierter Neurone in der Substantia nigra und der daraus folgenden Degeneration der nigrostriatalen Projektionsbahnen, den Dopaminmangel an den Rezeptoren des Corpus Striatum und der Neurotransmitterimbalance mit gesteigerter Aktivität in striatalen Projektionsneuronen. Die dopaminerge Stimulation mit exogenem Levodopa ist weiterhin der therapeutische Goldstandard. Das Problem dieser hochwirksamen Therapie ist allerdings, dass es langfristig zur Entstehung von motorischen Komplikationen und Fluktuationen kommt. Nach fünf Jahren der Behandlung leidet jeder zweite Patient unter »Wearing-off/End-of-dose«-Akinesen. Hinzu kommen motorische Komplikationen wie On/Off-Phänomene, Dyskinesien oder schmerzhafte Dystonien. Lediglich 10% der Patienten bleiben nach 10 Jahren von diesen Beschwerden verschont.

Die Pathophysiologie des Wearing-off-Phänomens erklärt sich aus dem Absinken der endogenen Dopamin-Produktion im Krankheitsverlauf und der nachlassenden Dopamin-Speicherkapazität der dopaminergen Neuronen. Die exogene Zufuhr von L-Dopa reicht dann nur mehr in der Peakkonzentration aus, um klinisch eine On-Phase zu bewirken (Abb. 1).

Dyskinesien entstehen durch Läsion der dopaminergen nigrostriatalen Projektionsbahn und sind vom Ausmaß der striatalen dopaminergen Denervation und somit dem Erkrankungsstadium abhängig. Sie werden wahrscheinlich durch die pulsatile Gabe hoher Levodopa-Einzeldosen in besonderer Weise gefördert. Deshalb gelang mit der Einführung der Dopamin-Agonisten ein wichtiger Schritt zur Verbesserung der Therapieoptionen. Sowohl durch den frühen Einsatz als Monotherapie als auch als Komedikation verhindern Dopaminagonisten den problematischen Effekt der pulsatilen L-Dopa Gabe.

Die heute zur Verfügung stehenden Dopaminagonisten unterscheiden sich im wesentlichen durch ein unterschiedliches Rezeptorbindungsprofil und durch ihre Halbwertszeit (Tab. 1). Cabergolin (Cabaseril®) zeichnet sich durch die längste Plasmahalbwertszeit von 65 Stunden aus, Dadurch kann mit einer Einmaldosis der Plasmaspiegel über 24 Stunden nahezu konstant gehalten und das Risiko für motorische Komplikationen signifikant gesenkt werden. In einer Langzeitstudie über 6 Jahre traten Wearing-off-Phänomene um 34% und Dyskinesien um 57% seltener als unter Levodopa Monotherapie auf. Darüber hinaus wurde der L-Dopa-Bedarf unter gleichzeitiger Gabe von Cabergolin deutlich reduziert¹.

Pharmakologisches Profil

	D ₁	D ₂	D ₃	HWZ
Bromocriptin	-	++	+	6
Cabergolin	+	+++	++	65
α-Dihydroergocryptin	±	+++	?	15
Lisurid	±	+++	+++	3
Pergolid	+	+++	+++	20
Pramipexol	0	+++	+++	10
Ropinirol	0	+++	++	6

Tab. 1: Dopamin-Agonisten

Schlafstörungen als Frühsymptom

Da Dopaminagonisten im Gegensatz zu L-Dopa schon früh im Krankheitsverlauf eingesetzt werden können, ist es um so wichtiger, die frühen Symptome der Erkrankung zu erkennen. Deshalb hat die Arbeitsgruppe um Oertel ein Screeningverfahren zur Früherkennung des Parkinson-Syndroms entwickelt. In einer Erprobung an 1.353 Teilnehmern wurde festgestellt, dass die Erkrankung im Frühstadium oft unterdiagnostiziert bleibt².

Nach Oertel gehen Schlafstörungen oft als Frühsymptom lange den motorischen Erscheinungen voraus. Auch leiden etwa 70% der manifesten Parkinson-Patienten unter Schlafstörungen. Da die meisten Medikamente eine kurze Halbwertszeit aufweisen, lässt ihre Wirkung in der Nacht nach, und es kommt zu Bewegungseinschränkungen, Dystonien, Panikattacken oder einer Harninkontinenz. In zwei Vergleichstudien konnte Cabergolin eine Verbesserung der Schlafqualität belegen. Das Medikament wirkte besser gegen nächtliche Behinderungen als der Dopamin-Agonist Pergolid und eine L-Dopa Retard-Formulierung. Im Vergleich zu Pergolid besserten sich die Scores hinsichtlich dystonischer Schmerzen, nächtlichen Aufwachens und morgendlicher Dystonien signifikant³. In der Vergleichsstudie mit L-Dopa erzielte Cabergolin signifikante Verbesserungen gegenüber den Ausgangswerten für schmerzhafte nächtliche und frühmorgendliche Akinesen, Dystonien und Muskelspasmen⁴. Auch in diesen Studien erwies sich Cabergolin als gut verträglich und zeigte vergleichsweise seltener die für Dopamin-Agonisten typischen Nebenwirkungen wie Übelkeit und neuropsychiatrische Beschwerden.

Dr. C. Brors

Literatur beim Verfasser

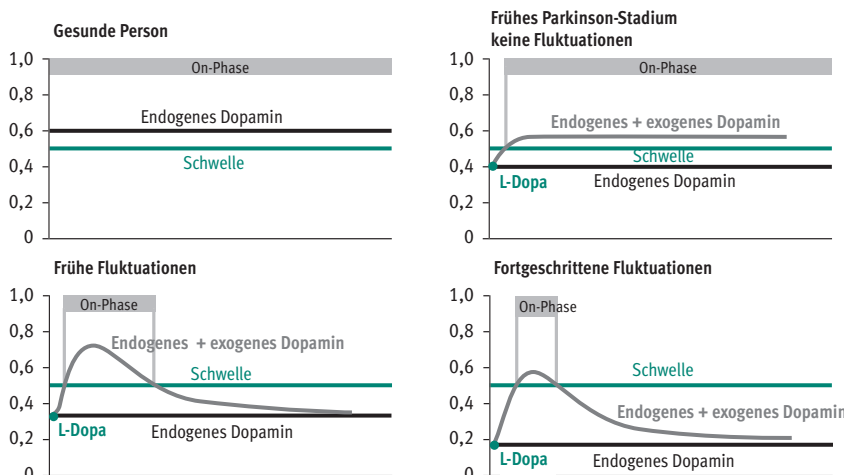


Abb. 1: Pathophysiologie des Wearing-off-Phänomens (nach H. Baas et al. 1995)

VRT-Seehtaining ermöglicht ambulante Rehabilitation

Steigerung der Sehleistung bei Gesichtsfeldausfällen

Das computergestützte Visuelle RestitutionsTraining »VRT« von NovaVision AG dient der Behandlung neurologisch bedingter Gesichtsfeldausfälle, die aufgrund einer Sehnerv- oder Hirnschädigung auftreten. Grundlage dieses Trainings ist die Neuroplastizität der an das geschädigte Areal angrenzenden Sehrinde.

Pro Jahr erleiden in Deutschland mehr als 450.000 Menschen einen Schlaganfall oder eine unfallbedingte Schädel-Hirn-Verletzung; rund 15.000 Menschen erkranken an einem Hirntumor. Auch wenn Auge und Sehnerv vollkommen intakt sind, treten bei ca. 20% dieser Personen in der Folge neurologisch bedingte Sehstörungen auf. Häufigstes Symptom einer solchen Sehstörung sind der Ausfall einer Hälfte des Gesichtsfeldes auf beiden Augen (Hemianopsie) oder »schwarze Flecken« (Skotome) im Gesichtsfeld (Abb. 1).

Menschen mit Gesichtsfeldausfällen können ihre Umwelt zwar weiterhin erkennen, sehen aber nur noch Ausschnitte von dem, was sie vorher als Gesamtbild im Blickfeld hatten. Die Folge davon sind Probleme im Alltagsleben der Betroffenen wie:

- Schwierigkeiten beim Lesen;
- Unbeabsichtigtes »Anrennen« von Personen oder Gegenständen;
- Nicht-Erkennen von kritischen Situationen (z. B. im Straßenverkehr).

Bis vor einigen Jahren galten Gesichtsfeldstörungen aufgrund der hohen Spezifität in der Organisation des visuellen Systems als irreversibel. Inzwischen haben neurophysiologische Forschungen gezeigt, dass durch ein wiederholtes regelmäßiges Sehtraining eine begrenzte Wiederkehr der Sehfunktion in ausgefallenen Bereichen des Sehfeldes erreicht werden kann.

Auf der Grundlage dieser Erkenntnis wurde ab 1992 an der Universität Magdeburg ein computergestütztes Sehtraining entwickelt – das Visuelle RestitutionsTraining (VRT). Mehr als 70% der Patienten haben durch das »VRT« der Firma NovaVision AG eine deutliche Steigerung der Sehleistung erreichen können. Grundlage für diese Behandlungserfolge ist wahrscheinlich die gezielte Anregung von intakten Gehirnzellen, die in der Nachbarschaft der

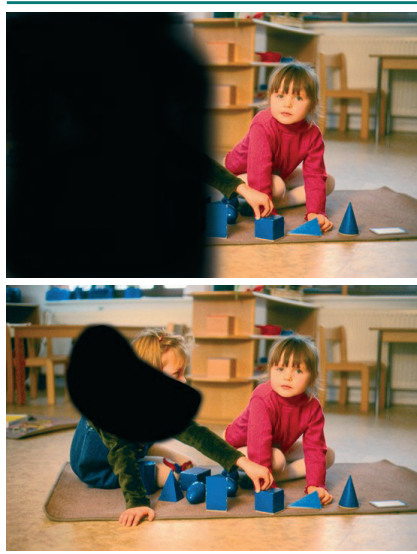


Abb. 1: »Hemianopsie« (oben), »Skotom« (unten)

Hirnschädigung liegen. Diese Hirnzellen können offensichtlich durch eine wiederholte Stimulation ausgefallene Funktionen teilweise übernehmen und so im Rahmen der Neuroplastizität eine partielle Wiederkehr der Sehfähigkeit ermöglichen.

Diagnose der visuellen Residualfunktionen

Durch eine exakte Vermessung des 30° Gesichtsfeldes wird festgestellt, ob es im geschädigten Gesichtsfeld Gebiete mit Seh-Restfunktionen gibt; diese sind in der Regel im Übergangsbereich zwischen intaktem und defektem Gesichtsfeld zu finden.

Durch Überlagerung wiederholt erhobener Untersuchungsergebnisse kann diagnostiziert werden, an welchen Stellen ein Lichtpunkt nur gelegentlich gesehen wurde: Dies ist der breite, graue Übergang zwischen intaktem und defektem Gesichtsfeld, der nur Seh-Restfunktionen (Residualsehen) aufweist. Die Diagnose bildet die Grundlage für die Erstellung des individuellen Trainingsprogramms. Die Gebiete des Residualsehens sind die

Basis des zukünftigen Trainingsbereiches, durch das die neuronalen Funktionen reaktiviert werden sollen.

Aber auch einzelne Programmparameter wie Größe, Form, Farbe, Präsentationsdauer der Lichtpunkte etc. werden auf die Bedürfnisse jedes einzelnen Patienten abgestimmt. Durch den ambulanten Ansatz des VRT ist ein stationärer Aufenthalt nicht notwendig.

Die Visuelle RestitutionsTherapie

Der Patient sitzt vor dem Computermonitor. Während sein Blick beständig auf einen Fixationspunkt gerichtet ist, erscheinen an definierten Stellen des Computerbildschirms Lichtpunkte – auch in Bereichen außerhalb des zentralen Gesichtsfelds. Die Positionen dieser Lichtpunkte werden so gewählt, dass sie vor allem auf Zonen mit Seh-Restfunktionen treffen. Der Patient hat die Aufgabe, diese Lichtpunkte zu erkennen und mit Tastendruck zu bestätigen. Wichtig ist, dass während des Trainings stets der Fixati-



Abb. 2: Patient bei VRT-Seehtaining

onspunkt angeschaut wird und die Augen nicht bewegt werden. Eine Kontrolle findet statt, indem der Patient auf jede Veränderung des Fixationspunktes mit Tastendruck reagiert (Abb. 2).

Durch die Verbindung von systematischer Lichtstimulation mit einer aktiven Wahrnehmungsaufgabe (Bestätigung des gesehenen Lichtpunkts durch Tastendruck) werden die Zonen mit Seh-Restfunktionen gezielt aktiviert. So wie ein Muskeltraining die Funktion der Muskeln stärkt, so stärkt das Sehtraining die neuronale Aktivität von Hirnzellen in teilgeschädigten Bereiche.

D. Fernholz

NovaVision AG

Zentrum für Sehtherapie, Hansapark 1,
39116 Magdeburg, www.novavision.info

Selbstständigkeit erhalten

Kommunikation fördern

Um den gestiegenen Anforderungen und Bedürfnissen von Menschen mit eingeschränkter Kommunikationsfähigkeit gerecht zu werden, wurde 1999, gemeinsam mit anderen Partnerfirmen, der Verbund REHAVISTA® gegründet. Ziel war und ist es, individuelle Produkte für diese Zielgruppe zu schaffen.

Zur Philosophie des Unternehmens gehören:

Beratung: Aufgrund der Beobachtungen und Einschätzungen von Ergotherapeuten und Sozialpädagogen wird in einem Beratungsgespräch eine Versorgungsstrategie für den Betroffenen entwickelt. Erst im zweiten Schritt geht es dann darum, aus dem Angebot an Kommunikationsgeräten das richtige für den Betroffenen herauszusuchen. REHAVISTA® arbeitet unabhängig von den verschiedenen Herstellern, um nicht eine behinderte Person an ein Gerät anpassen zu müssen, sondern das Gerät an die Person.

Erprobung: Das Gerät kann in vertrauter Umgebung und in Ruhe getestet werden. Erst dort kann sich zeigen, ob Adaptionsen notwendig sind oder andere Bedienelemente besser geeignet wären.

Versorgung: REHAVISTA® übernimmt die Beantragung des Hilfsmittels bei einem Kostenträger, wie z. B. der Krankenkasse, einer Unfallversicherung oder dem Sozialamt. Wenn die Kostenübernahme geklärt ist, kann das Hilfsmittel geliefert werden.



SPOK21 – Das mobile Sprechgerät bietet dem Anwender auf der Basis von Schriftsprache eine flexible Kommunikation in jeder Situation. Der modulare Aufbau gestattet eine optimale Anpassung an die individuellen Bedürfnisse des Anwenders. Die Bedienung ist einfach und kann auch von älteren Menschen ohne PC-Erfahrung schnell erlernt werden. Der Anwender kann entweder mittels Schrift oder Sprache kommunizieren: Das große Display zeigt in drei Schriftgrößen bis zu 240 Zeichen an. Ein zweites Display zeigt auch dem Gesprächspartner gegenüber den geschriebenen Text. Per Tastendruck kann der geschriebene Text über die hochwertige synthetische Sprachausgabe gesprochen werden – sowohl in einer männlichen als auch einer weiblichen Stimme. SPOK21 speichert über 600 Aussagen, die durch Einteilung in unterschiedliche Gesprächssituationen schnell abgerufen werden. Eine USB-Verbindung zum PC ermöglicht sowohl das Sichern der eigenen Daten als auch die Übertragung ganzer Texte. So können auch unterwegs Texte erfasst und später am heimischen PC weiterverarbeitet werden.

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Begleitung: Die Versorgung mit einem Hilfsmittel zur Kommunikationsunterstützung ist kein statisches Ereignis, sondern ein dynamischer Prozess. Die persönliche Situation kann sich im Laufe der Zeit verändern. Motorische Fähigkeiten verlagern sich, die Kommunikationsbedürfnisse erweitern sich.

Gutachten und Fachdienstliche Stellungnahmen

Für eine Versorgung mit einem Hilfsmittel aus den Produktgruppen »02 Adaptionshilfen« und »16 Kommunikationshilfen« des Hilfsmittelverzeichnisses der Krankenkassen ist neben einem Rezept oder einer Verordnung sowie dem Angebot von REHAVISTA® ein ärztliches Gutachten oder eine Fachdienstliche Stellungnahme seitens Ergo-, Logo-, Physiotherapie, Schule, Sozialdienst usw. sehr hilfreich. Es sollte u. a. beinhalten:

□ Diagnose; bei progredienten Erkrankungen: Verlaufsform der Diagnose

□ Beschreibung der motorischen, sensorischen und kognitiven Fähigkeiten

□ bisherige Möglichkeiten (der Kommunikation/der PC-Bedienung/der Umweltsteuerung)

□ Ziel der Versorgung durch das Hilfsmittel ist die Erweiterung der individuellen Möglichkeiten und der Selbstständigkeit sowie der Äußerung der Grundbedürfnisse

D. Fernholz

REHAVISTA® GmbH, Pulsstr. 7, 14059 Berlin, Infoline: 08 00-734 28 47, info@rehavista.de

Nachgefragt ...

Herr Neumann, das Unternehmen REHAVISTA® schafft »individuelle Lösungen für individuelle Menschen«. Was steckt dahinter?

Unsere Hauptaufgabe liegt in der individuellen Anpassung einzelner Produkte an die individuellen Gegebenheiten des Behinderten. Ein einfaches Beispiel: So benötigt der eine Betroffene eine normale Tastatur, der andere eine mit besonders großen Tasten und der dritte eine, bei der die Buchstaben nach Häufigkeit angelegt sind und nicht nach der gängigen Reihenfolge. Die ITEL GmbH, die zum Verbund REHAVISTA® gehört, entwickelt seit ca. 20 Jahren auch eigene Geräte, wie z. B. »SPOK21«.

Seit 2003 ist »SPOK21« auf dem Markt. Worin liegt die Besonderheit dieses Sprechgerätes?

Hauptsächlich in der Mobilität, d.h. der Benutzer kann mit dieser flexiblen Kommunikationshilfe in jeder Situation auf der Basis von Schriftsprache kommunizieren. Außerdem verfügt »SPOK21« über einen modularen Aufbau, wodurch sich das Gerät an die individuellen Bedürfnisse des Anwenders anpasst. Und schließlich bietet »SPOK21« eine neuartige Sprachausgabe mit hoher Qualität.

Welche Zielgruppe sprechen Sie mit »SPOK21« an?

Primär sprechen wir alle Erwachsenen an, die ihre Sprache verloren haben, über Schriftsprache aber noch kommunizieren können, also v.a. Anwender mit ALS, MS oder nach einem Schlaganfall.

Woher beziehen Sie die Produktideen?

Wir bekommen viele Anregungen von Therapeuten oder den Anwendern bzw. deren Angehörigen.



Holger Neumann (Geschäftsführer RehaVista)

gen. »SPOK21« wurde entwickelt, weil viele Anwender ein mobiles Sprechgerät mit besserer Sprachausgabe, einem größeren Display und einer größeren Tastatur forderten.

Wie hoch sind die Anschaffungskosten?

Der Preis liegt bei € 3.130,-. Diese Kosten werden als »zertifiziertes Medizinprodukt der Klasse I« von den Krankenkassen übernommen. Damit ist »SPOK21« derzeit das einzige Gerät seiner Klasse im Hilfsmittelverzeichnis der Krankenkassen.

Seit einiger Zeit werden »Brain-Computer Interfaces« vor allem bei »Locked-in-Patienten« eingesetzt. Inwieweit stellen diese Kommunikationshilfen für Sie eine Konkurrenz dar?

Sobald diese Kommunikationshilfen im praktischen Alltag einsetzbar sind, würden wir sie gerne in unser Vertriebsprogramm aufnehmen. Derzeit stellen sie aber keine Alternative zu unseren Sprechgeräten dar.

Das Gespräch führte Dagmar Fernholz mit Holger Neumann auf der RefaFair in Berlin am 2.9.2004

Bewegungstherapie bei Schlaganfall

Wie kann sich der Patient an den Therapiefortschritten beteiligen?

Pro Jahr tritt bei 2,7% der Männer und 2,1% der Frauen ein Schlaganfall auf. Der Apoplex stellt ein Krankheitsbild dar, das eine große Abhängigkeit vom Lebensalter zeigt. Die Altersgruppe unter 45 Jahren weist hierbei eine Häufigkeit von 0,3 % auf, hingegen ist die Altersstufe über 65 Jahre mit 20 % überdurchschnittlich häufig vertreten. Die Altersgrenze für das Auftreten eines Apoplex scheint in den letzten Jahren aber stark zu sinken, so dass die Betroffenen immer jünger werden.

Die Schlaganfallmortalität beträgt in der Bundesrepublik ca. 10 % und ist seit 1970 um ca. 45 % gesunken. Aufgrund des starken Rückgangs der Mortalität steigt die Zahl an pflegebedürftigen und intensiv rehabilitationsbedürftigen Patienten.

Häufig sind beim Apoplex die Pyramidenbahnen des motorischen Cortex betroffen. In der Frühphase nach dem Schlaganfall kommt es zu einer schlaffen Lähmung der kontralateralen Seite. Erst in weiteren Verlauf entwickelt sich eine Spastik. Die Therapie wird deshalb in verschiedene Phasen aufgeteilt. Der physiotherapeutische Therapieansatz liegt während der Frühphase in der Kompensation des Neglectsyndroms. Während der Übergangs- und Spätphase arbeitet die Physiotherapie an:

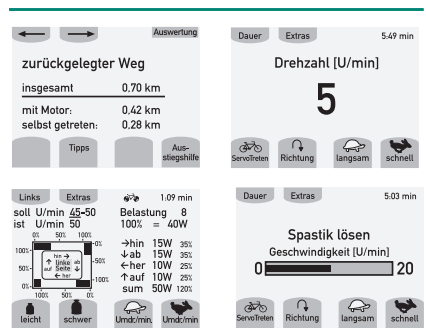
- der Verbesserung der Kopf und Rumpfkontrolle über propriozeptive Reizsetzungen
- Tonussenkung der spastischen Muskulatur
- Aktivierung der inaktiven nichtspastischen Muskulatur – Aufbau der normalen Muskelkraft
- Verbesserung des Gangbildes
- Verbesserung der Schmerzfreiheit der Schulter durch passives Durchbewegen
- Verbesserung der Gesichts-, Zungen und Mundmotorik zur Erreichung größtmöglicher Selbstständigkeit

Eine große Zahl dieser Therapieziele lassen sich ausgezeichnet mit den motorbetriebenen und softwaregesteuerten MOTOMed BewegungsTherapieGeräten des Unternehmens RECK Medizintechnik unterstützen. Sie ermöglichen es dem Patienten, selbstständig und aktiv zum Behandlungserfolg beizutragen, auch über den Zeitraum der Therapie hinaus.

Therapie mit MOTOMed in der Früh- und Spätphase der Rehabilitation

In der Frühphase der Therapie lässt sich das MOTOMed durch das passive Durchbewegen der Beine zur Wahrnehmung einer Bewegung der betroffenen Seite und durch die Aktivierung des propriozeptiven Systems einsetzen. Beim Auftreten einer Hemiparese der Beinmuskulatur lassen sich durch das assistive Durchbewegen mit der Funktion »ServoTreten« geringste Restkräfte aktivieren und eine Bahnung und Aktivierung des propriozeptiven Systems erreichen. Die Funktion »SymmetrieTraining« gibt dem Patienten eine visuelle Rückmeldung über den prozentualen Anteil beider Beine an der Bewegung und ermöglicht ihm die aktive Wahrnehmung der betroffenen Seite.

In der Spätphase lässt sich durch den LockerungsAntrieb an der Reduzierung des Muskeltonus mitarbeiten. Dieses Thera-



pieziell wird durch den »MOTOMed BewegungsSchutz« und das »SpastikLockerungsprogramm« unterstützt.

Eine Aktivierung der nichtspastischen Muskulatur kann hierbei wieder durch das »ServoTreten« erreicht werden. Ein passives Durchbewegen im Schulterbereich zur Schmerzlinderung und Bewegungsverbesserung lässt sich durch den Anbau eines Armtrainers an das MOTOMed erreichen.

Eine weitere sehr gute Möglichkeit zur Aktivierung der Koordination und Propriozeption stellt die »MOTOMed 4SegmenteTherapie« dar. Hier wird die komplette Kurbelbewegung in 4 Segmente unterteilt, und über jedes einzelne Teilstück erhält der Patient detaillierte Rückmeldungen. Schwachstellen werden erkannt und können gezielt auftrainiert werden.



Tägliche Bewegung ist verordnungsfähig!

Das MOTOMed stellt für Apoplex-Patienten (mit Lähmungserscheinungen und Spastik) ein verordnungsfähiges Hilfsmittel dar, das es dem Patienten ermöglicht, aktiv von einem Stuhl oder Rollstuhl aus am Therapieerfolg mitzuwirken, und dem Arzt bzw. Therapeuten eine Unterstützung zum Erreichen eines optimalen Behandlungsziels bietet.

Der Hersteller der »MOTOMed BewegungsTherapieGeräte« stellt kostenlos Testgeräte im klinischen, therapeutischen oder häuslichen Umfeld zur Verfügung. Somit kann im Einzelfall die medizinische Notwendigkeit einer Verordnung festgestellt und begründet werden.

Dipl. Sportwiss. Jörn Schramm, Bünde

Weitere Informationen oder kostenlose Testgeräte können angefragt werden bei Reck Medizintechnik, 88422 Betzenweiler, Tel. 07374/1884, www.motomed.de

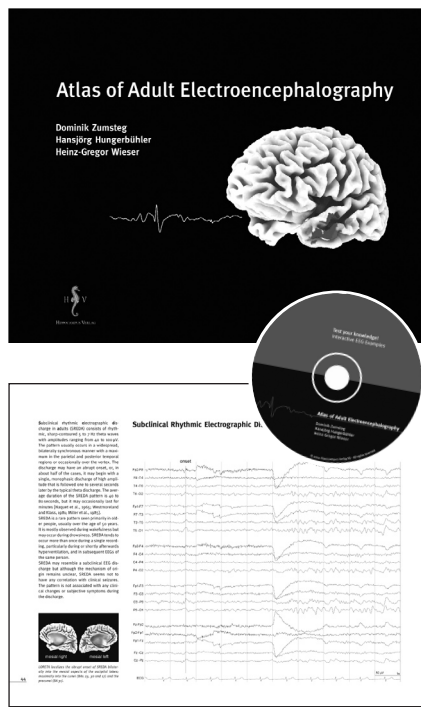
BÜCHER

Dominik Zumsteg, Hansjörg Hungerbühler,
Heinz-Gregor Wieser

**Atlas of Adult
Electroencephalography**

2004 | hardcover | 178 p. | 235 figures,
with interactive CD-ROM
€ 119,00 | ISBN 3-936817-15-4

This atlas presents an extensive selection of the most relevant normal, abnormal, and artifactual electroencephalographic (EEG) patterns of the adult. Unlike most such books, the abnormal EEG patterns are categorized here according to their morphology rather than the underlying disease process, providing a more logical



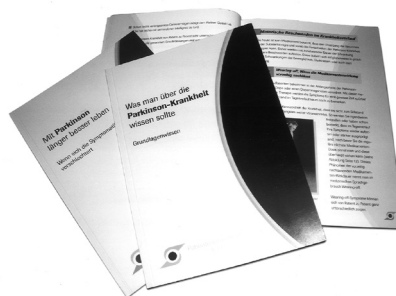
and completely electrophysiological approach to clinical EEG interpretation. An identical layout of montages, time scales, voltage sensitivities and filter settings is used throughout to facilitate development of the pattern recognition skills needed to read EEG recordings.

A unique feature is the emphasis given to the issue of non-invasive localization of neuronal generators. This emerging area is addressed by assessing the method of low resolution electromagnetic tomography (LORETA), one of the most promising source localization algorithms available to date. Attractive three-dimensional LORETA images depicting the presumed source(s) of the EEG patterns are shown to great advantage.

The atlas includes a concise introduction outlining the basic principles of digital EEG and source modeling, brief summaries of common "textbook" knowledge accompanying all EEG patterns and an interactive CD with supplementary EEG samples, all of which combine to make this a valuable and entertaining source of information not only for the neophyte but also for more advanced EEG readers.

**Neue Patientenbroschüren
Mit Parkinson besser leben**

Im Rahmen des Service-Angebots Stalevo® bietet Orion Pharma zwei Patientenbroschüren zum Thema Parkinson an. Die beiden sich ergänzenden Broschüren heben sich in Inhalt und Aktualität deutlich von anderen Ratgebern ab. Sie erklären auf anschauliche Weise die krankheitsbedingten Änderungen und wie sich Patienten und Angehörige auf die veränderten Lebensumstände einstellen können.



Die Broschüre »Was man über die Parkinson-Krankheit wissen sollte« informiert vor allem neu diagnostizierte Patienten einfühlend über das Krankheitsbild. »Mit Parkinson länger besser leben« ergänzt die Informationen vor

allem für Parkinson-Patienten am Ende des Honeymoons. Schwerpunkt ist die vorzeitig nachlassende Medikamentenwirkung (Wearing-off-Symptome). Die Broschüren können direkt bei: Orion Pharma GmbH, Bereich Neurologie, Tel.: 040/899689-85 oder über www.stalevo.de bestellt werden. Hier finden auch Patienten und Angehörige weitere Informationen.



**Für Physiotherapeuten:
33 ausgewählte Beiträge aus
NEUROLOGIE & REHABILITATION
auf CD**

**N & R Archiv Physiotherapie
1998 – 2003**

NEUROLOGIE & REHABILITATION veröffentlicht Beiträge für alle am Rehabilitationsprozess beteiligten Berufsgruppen. Speziell für Physiotherapeuten relevante Beiträge gibt es jetzt gesammelt auf einer CD.

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