

First congress held by the Swiss Society of Neurorehabilitation

Montreux, June 27/28, 1997

MILD TRAUMATIC BRAIN INJURY: NEUROPSYCHOLOGICAL COMPONENTS AND IMPLICATIONS FOR TREATMENT

Thomas Kay, Ph.D.
333 E. 34th Street, Suite 1 N
New York, NY 10016
Tel. 01 212 832 5446

Minor head injury and whiplash can occur with or without disruption of brain function. Even in the absence of brain dysfunction (concussion), symptoms from physical injuries and psychological reactions can lead to disruption of cognitive processes. When brain dysfunction does occur (mild traumatic brain injury), it may be transient or permanent.

A dilemma is posed by the fact that the vast majority of persons with minor head injury and whiplash recover well. A relatively small minority becomes permanently disabled, and this disability is often perceived as being in excess of the physical basis of the injury. The neuropsychological challenge is not to determine whether all minor head or whiplash injuries lead to brain injury, but in any given case, when a person has become dysfunctional, to identify the components that are contributing to that person's inability to function.

A model is proposed in which neurological, physical, and psychological factors interact to determine the individual's ability to function at any given moment. This is a dynamic model in which factors can modify each other, and at times create dysfunctional feedback loops that become self-perpetuating (see schematic at the end of the abstract). An important component of this model is the distinction between objective cognitive deficits (those caused directly by altered brain function, structural or not) and subjective cognitive deficits (the person's experience of their own ability to process information). To the extent that psychological factors, pain, depression, and anxiety enter the picture, the distance between objective and subjective cognitive components increases.

Central to this model is the concept of a "shaken sense of self". In most persons who suffer chronic dysfunction after minor head injury or whiplash, there is an altered sense of self that goes beyond the organic injury, and which can be at the root of the person's dysfunction. The person, due to the direct or indirect effects of their injury, has lost their sense of identity, capacity, and potency. The causes of this shaken sense of self are themselves complex, and involve the physical and neurological sequelae of the injury interacting with personality style, past experiences with trauma, illness, and nurturing; source of self-esteem; and environmental realities such as job requirements and social supports. For example, persons with a history of sexual, physical, or emotional abuse, will often have old trauma reactivated by an acute injury. Persons with intact brain functions, who have learned to cope with old trauma by constructing psychological defense mechanisms, can find their defense systems crumbling when the brain is neurologically destabilized during concussion.

Beyond the physical aspects of rehabilitation, restoring a healed and acceptable sense of self is critical to the long term rehabilitation of the person with minor head injury or whiplash who has become disabled.

In this presentation, selected research studies will be used to illustrate and document the above concepts. Clinical cases will be briefly introduced. The treatment implications of the model will be addressed. Diagnostically, the challenge is not simply to determine whether there is brain injury or not (and implicitly devalue the patient's dysfunction if there is not), but to identify the complexity of factors operating in that individual. A treatment approach needs to be developed for that individual which takes into account what components in the model are active in that person; this will differ from patient to patient. Finally, approaches to early, preventive intervention, and late intervention after disability is established, will be presented.

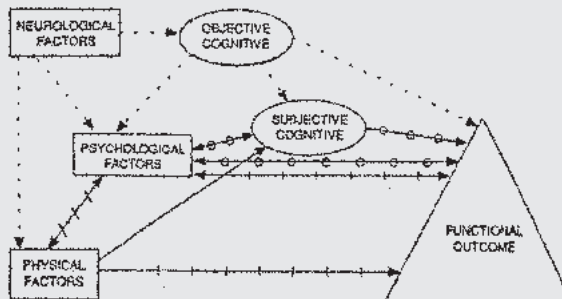


Fig 1. A neuropsychological model of functional outcome after mild traumatic brain injury

Key words:

Mild traumatic brain injury, functional outcome after MTBI, whiplash, disability

OSCILLATOR FORMATION TRAINING IN BRAIN AND SPINAL CORD LESION
S. Schölsky and G.A. Zisch*, Department of Clinical Research, Swiss Paraplegic Centre
Könwil, CH-5207 Nottwil, Switzerland, *Clinic Dübendorf.

Based on a new understanding of the functioning of the human CNS, e.g. the self-organization of brain and spinal cord, a 27 years old paraplegic patient (sub-T11) and with an additional lesion of the left frontal lobe underwent oscillator formation training to return walking. The patient had urticaria and fever episodes. The EMG motor program was already gelidolysed, many spinal oscillators were out of full functional course. The jumping on a springboard was blocked by the extensor spasticity. But by performing 1 to 2 movements of walking or running (or crawling), the spasticity relaxed, so that supported walking and running and free crawling could be used for the reorganization of the neuronal networks of the spinal cord and supraspinal centres. The patient could run under 15 kg weight reduction better than walking. The quick break of spasticity with 1 to 3 movements suggests that spasticity was partly generated by the isolated frontal lobe in cooperation with the reticular formation. After six weeks of exercising, walking, running and crawling (and other movements), the spasticity was so much reduced that the patient became able to break spasticity for jumping on springboard. With the breaking of the frontal lobe-induced spasticity, typical problems in locomotion of para spinal cord lesions turned out in the gross leg. This preliminary case report indicates that the rhythmic dynamic stereotyped movements which are especially genetically pre-determined in the neuronal network organization of the spinal cord (walking, running, crawling) are an easy start to reorganize by a rhythmic, symmetric, and genetically pre-determined network of the CNS following brain lesions, with little network reorganization necessary. Gen. Physiol. Biophys. (1996), 15, Suppl. 1, 1-22.

*Dr. Schölsky: Dr.med. habil. Dr. rer. med. Dipl.-Ing. (Hochsch. Schölsky), Leiter der Arzt. für Klinische Forschung, Schweizer Paraplegiker-Zentrum Könwil
G.A. Zisch: Dr.med. Guido A. Zisch, Chefarzt und Klinikdirektor.*

Presenting author: A. Hellmann

CONFRONTATION BETWEEN ACTIVATION AND LESION STUDIES IN MAN: the role of anterior insula in auditory motion

A. Hellmann, S. Garavito, J.-P. Valéris, G. Avoni

Division de Neuropsychologie and Institut de Physiologie, Université de Lausanne

Activation studies (Griffiths et al. 194) have shown that auditory motion (AM) activates selectively right anterior insula, posterior cingulate cortex and cerebellum. The focus on anterior insula coincides with AIA, an anatomically identified auditory area (Ricker and Clarke 1981). We have tested effect of AIA lesions (identified by Teflach coordinates) on AM perception in 6 patients with circumscribed unilateral lesions including AIA. Patients 1-3 had right and patients 4-6 left lesions. AM was stimulated by interaural intensity or phase difference. Two aspects were studied: i) motion vs non-motion discrimination, and ii) identification of direction of motion. Patients 1,5,6 were impaired in all conditions, patients 2 and 4 in one aspect of AM perception and patient 3 performed normally. In conclusion, AM perception i) can be impaired following right but also left hemispheric lesions, ii) doesn't rely exclusively on AIA. Thus, lesion of an area specialized in a given function in normal subjects does not necessarily lead to the corresponding deficit.

Alien Hand and Interhemispheric Disconnection Syndromes Following Closed Head Trauma

F. Vuilleumier,
Department of Neurology, University Hospital of Geneva, rue Michel-Du-Crest
24, 1211 Geneva 4, Switzerland.

Callosal lesions may follow closed head trauma with diffuse axonal injury and be associated with various interhemispheric disconnection signs. We describe here 7 such patients with posttraumatic callosal damage. All had a severe head injury with long-lasting coma, frequent transitory vegetative state or mutism, and marked memory impairment. Two patients presented a left-dominant alien hand syndrome with intermanual conflicts during the early stages and a persistent impairment of voluntarily control of their left hand during late stages. Tasks that requires bimanual coordination (e.g. typewriting, piano playing) were particularly impaired in both patients, while unilateral left apraxia of a mixed motor-mechanic and ideomotor type was present in one of them only. The alien hand disorder had been initially concealed by both patients for fear of being taken for insane. Other patients had various interhemispheric signs, including unilateral tactile anesthesia, agraphia, or ideomotor apraxia of the left hand; constructive apraxia of the right hand; bidirectional impairment of somesthetic and postural transfer; left-hand extinction on dichotic verbal listening, as well as left visual field alexia and anomia on tachistoscopic tests. Brain MRI showed a focal atrophy of the corpus callosum in its middle and posterior trunk portions in most cases, and total callosal destruction in one case. Cortical lesions involving the frontal lobes coexisted in two cases only, but diffuse brain atrophy was noticeable in all cases. Corpus callosum damage seem to be a marker of severe injury. Extension of callosal lesions towards adjacent midline structures, such as the fornix, could contribute to the marked memory impairment which is always associated.

Montreux, Congrès de rééducation Neurologique, juin 1997.

A Phase Model for Neurological Rehabilitation

Prof. Dr. Paul Schröde
Kliniken Schmieder
Allensbach, Germany

In recent years neurological rehabilitation has further developed to a high level of differentiation at the conceptual and organizational level. This reflects the complexity of the "organ to be rehabilitated" - the brain and its functions. A work group in the VDR (union of German pension funds) and the BMR (federal work group for rehabilitation) has worked out a phase model for neurological rehabilitation covering early rehabilitation of the most severely brain damaged patients (phase B), postacute/postprimary rehabilitation (phase C), patients continuing rehabilitation and vocational rehabilitation and reintegration (phase E). Phase F covers longterm care for patients with residual syndroms including persistent vegetative state and other severely handicapped patients. The phase model of neurological rehabilitation has sociological aspects of resource allocation to the various phases.

Paralene – eine neue Klasse von Kaliumkanalblockern zur spezifischen, symptomatischen Therapie von Muskelscheitelerkrankungen

W. Häusel, E. Koppenhaver, H. Yücel, Kiel/Deutschland

Zustörungen der Muskelscheite myelinisierter Axone bewirken die Freisetzung interstitieller, normalerweise stummer Kaliumkanäle (Chi, Ritchie (1982) J. Physiol. (Lond.) 324, 495). Die dadurch verursachten Änderungen des Axonalen Ruhepotentials sind eine wesentliche Ursache für die Behinderungen der Muskelfunktion in der betroffenen Axone (Bisuz et al. (1996) In: Neurophysiologie (Hrsg. A. Auer, Franz, Springer, Berlin). Deshalb können geeignete Kaliumkanalblocker wie z.B. 4-Aminopyridin (4-AP), die bei der myelinigen Schwäche (MS) beobachteten neurologischen Funktionsausfälle verbessern (Siefel et al. (1987) Ann. Neurol. 24, 74), allerdings für die muskuläre Bräue von 4-AP gering so daß sein breiter klinischer Einsatz bislang nicht erfolgte (Beaver et al. (1994) Neurology 44, 1054).

Voraussetzung für die Wirksamkeit von Kaliumkanalblockern bei MS ist ein erhöhter Anteil an sog. barriere-Axonen, also Axonen, bei denen die Axonhülle nicht erhalten ist. Ein solch verlässliche Anzeichen dafür ist das Vorliegen eines deutlichen Uhrtreff-Phänomens.

5-Methoxyseralan (5-MOP), bekannt von der PUVA-Therapie der Psoriasis, ist ein hochselektiver Kaliumkanalblocker (Bokrosz et al. (1994) Gen. Physiol. Biophys. 13, 309), der bereits nach einmaliger Verabreichung innerhalb weniger Stunden muskeldingelte Funktionsausfälle signifikant verbessern kann (Bokrosz et al. (1993) Neuro-Cosmetol. 13, 191). In Einzelbeobachtungen an weiteren 8 MS-Patienten (Koppenhaver et al. (1995) TW Neurol. Psychol. 9, 585) sahen wir nach 7-wöchiger Verabreichung von 5-MOP (Paralene 5[®], 0,5 mg/kg d) eine Abnahme der Spastik (n=7), der notleidenden Dreiarbeit von ungesunden Abspastika (n=4), von Paresen (n=4), von Bergsteigungen (n=3), von Hinkeverschieben (n=2) und von Blasen- und Mastdarmstörungen (n=2). Geradehin- und beidseitig war fast vollständige Schmerz- und Berührung (n=4), die beim mit der somatischen Befundverbesserungen z. korrelieren schmerzen spüren eher von der häufigsten zentralen Ursprungsorten veränderter Muskeln-Funktion (Saults et al. (1990) J. Clin. Endocrinol. Metab. 71, 670). Bei der angegebenen Dosierung ist, sofern auf Supplendat verachtet wird, in Übereinstimmung mit Literaturangaben zur Toxikologie von 5-MOP nicht mit unerwünschten Nebenwirkungen zu rechnen.

5-MOP kommt auch in hohen Dosen, Geweben und Tieren vor. Wir empfehlen darauf aufbauend eine 2- bzw. 3-wöchige 0,5- bzw. 1-mg/kg d. Teaplan und fanden bei MS-Patienten am Ende der jeweiligen Beobachtungsperiode individuell unterschiedlich deutliche, aber ähnliche neurologische Befundverbesserungen wie bei der Verabreichung der Monosubstanz (Böinger et al. (1992) Ann. Intern. Med. 24, 220).

In *in vitro*-Experimenten an isolierten, intakten myelinisierten Nervenfasern konnten wir zeigen, daß die Kaliumkanalblockierende Wirkung des 5-MOP durch geeignete Variation der Dosisleistung der Paralene noch verstärkt werden kann.

Sensitivity to semantic modalities in aphasia rehabilitation? Clinical evidences of a role of the right hemisphere.

J.-M. Annoni, MD.; M.C. Custodi, ST, Asad Khatib, PhD.; V. Debaerovis; Chr. Michel, PhD.; T. Landis, MD, PhD. Neuropsychological Unit and Brain Mapping Unit, Dept of Neurology, HCU, 1211 Geneva

The hypothesis that word-finding recovery was more supported by right hemisphere (RH)-related semantic abilities was tested in three chronic aphasic patients, who were at least at 3 years from their stroke. One patient (JHN), had both semantic and phonological residual difficulties after his fronto-temporo-insular stroke; a single case study showed a better improvement in a naming task after intensive multimodal semantically-oriented therapy than after intensive multimodal phonologically-oriented therapy.

Two other chronic aphasic patients, G.E. and E.G., had capsulo-lenticular and sylvian anterior stroke. They showed a predominance of respectively semantic and phonological residual difficulties after his fronto-temporo-insular stroke; a single case study showed a better improvement in a naming task after intensive multimodal semantically-oriented therapy than after intensive multimodal phonologically-oriented therapy.

These results support the idea that, in aphasia, word-finding improvement is more dependent of improvement in semantic abilities than phonological abilities and are consistent with a participation of the RH in his recovery. Cognitive evoked potentials support clinical results.

THE FUNCTIONAL INDEPENDENT MEASURE : ITS INTEREST ON STROKE PATIENT

J.L. ZILBERER, Division de Rééducation, GENEVE
A. CHANTREINE, Division de Rééducation, GENEVE
C. GOBELET, Service Médecine Physique et Rééducation, SION

During the year 1984, the Functional Independence Measure (FIM) was developed by C. CRANGER and al. in USA

The FIM's validation was already made all around the world, but we wanted to confirm its capacity for the Western part of Switzerland.

We tried to use the FIM as a tool to predict the outcome of a stroke patient.

During 1994 and 1995, 91 stroke inpatients were administered the FIM at admission before and at discharge after reeducation. 51 of them were reevaluated at discharge after discharge.

The main conclusions of the study are :

- that the FIM's motor subscore can predict, to a certain extent, the length of the reeducation ;
- that the FIM at admission is a good tool to predict the discharge disposition ;
- that the FIM at admission can predict the functional outcome of the patient at follow-up (mean value 18 months after discharge) ;
- that the FIM is closely related to the burden of care needed by a patient at home ;
- that the cognitive and motor subscores are additional interesting elements for the prediction of his general outcome.

Cyclic Behavior, Unusual Exuberance, and Frontal-Lobe Syndrome Post Bilthalamic CVA

Rosana Leroy, Parth Vulliamy, J.-M. Annoni, Neuropsychological Unit, Clinic of Neurology, Prof. T. Landis, Department of Clinic Neurosciences and Dermatology, Hôpital Cantonal Universitaire, Geneva, Switzerland

Different behavioral disturbances have been observed following subcortical lesions, particularly of the striatum. Following thalamic dysfunctions, however, the main impairment is cognitive in nature: amnesia, aphasia, frontal-lobe syndrome. When a behavior modification is observed, it is mainly the lack of spontaneity or "athymia". The evolution of these disturbances is largely unknown.

We present a 64-year-old patient, who after a bilthalamic CVA (first left and then right later that same day), showed an important behavior modification. These changes were characterized by, on one hand, exuberance, euphoria and excessive familiarity (rudeness, transgression of social habits and rules), and on the other hand by a cyclical alternation of behavior between exuberance and indifference.

This report is interesting for 2 particular reasons: first, it is a case of disinhibition following a left hemisphere damage; second it illustrates an evolution to "cyclic bipolar" changes.

The analysis and interpretations of the case are carried out by anatomic-clinical correlations with the thalamic nuclei or cortico-subcortical loops.