REHABILITATION: TEAM WORK AND PRACTICAL ISSUES

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COMPREHENSIVE REHABILITATION: A NEW PARADIGM

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Rehabilitation of subjects with sequelae of severe brain injury includes three different steps, depending on the time from event, evolution of neurological conditions and patient's response to therapeutic interventions.

The first stage, or **acute phase**, takes place in the critical area, i.e. in intensive care units or in neurosurgery units. Purpose of the therapeutic effort is to assist and monitor vital functions until they become autonomous and stabilized. In this phase the rehabilitation goal is to prevent pathologies and complications due to prolonged immobilization.

The second step, or **subacute phase**, starts when the patient is transferred to the subintensive and rehabilitative care units: respiration is autonomous, usually there are no reasons of concern regarding the cardiovascular system and vital functions in general, and no serious infections or other severe medical conditions are present. Subjects may be transferred from intensive units, and individual "customized" programs will be implemented at this stage for starting physical, cognitive and speech rehabilitation.

The third step, or **outcome phase**, includes the development of compensation strategies to counterbalance lost skills and abilities, in view of a successful return to family life, society, school or work. For a sound management of brain injured patients it is then essential to bring about a multidisciplinary approach within specialized centers. Goals of the rehabilitation team are the formulation and implementation of integrated rehabilitation programs for motor, cognitive, communication and behavioral impairments.

The patient's family is considered a fundamental resource and it is therefore integrated into the rehabilitation team after adequate training and steady counselling.

Family members will have the task of modulating and harmonizing the relationship between the subject and the rehabilitation team, supervising patient's conditions and anticipating problems that may occur, using a correct and pertinent information.

A primary responsibility of the rehabilitation team is to succeed, through clinical evaluations of the different components, in formulating a therapeutic program with a clear and realistic definition of obtainable goals and expected length of treatment.

Rules regarding priority, frequency and intensity of the different treatments should be set down and included in the planning.

During each multidisciplinary meeting the different technical capacities will be compared and useful information acquired to develop common strategies and ongoing training.

At the time of patient discharge from the acute rehabilitation unit it is necessary to plan the continuation and optimization of the rehabilitation project. This requires the identification of appropriate structures and specialized personnel that can reliably be entrusted with this task; a good coordination between hospital and community structures is the only way to ensure a smooth transition, and handover of the complete case documentation with description of goals and implemented therapies.

Periodic future follow-ups must be scheduled after dismissal.

Our Kite Project consists of a 22 weeks' rehabilitation course for 6-7 young patients, (16 to 30 years old) where the goal of a satisfactory return to social activities, school or work is pursued.

The course develops over five days a week, seven hours per day, with both individual and group therapies. Great importance is given to everyday life's activities and to the assistance that both individuals and group need in solving the usual difficulties involved in a social relationship. The milieu is demedicalized and subjects often go into the community (to the post office, to the supermarket, to the bank, etc.), in order to relearn routine activities such as the use of public means of transportation, with a methodological approach of ecological type.

A close cooperation between families and work or school setting is pursued in order to optimize patient reintegration and to make colleagues and schoolmates aware of the problems the case implies.

The Kite Project includes theatre, music, drawing workshops, etc., where art therapists, occupational therapists and pedagogists try to recreate a correct management of the patients' free time, promoting new or old interests, hobbies and sports activities.

At the end of each 22 weeks' course a "Graduation Party" is organized, where the course attendants with their families celebrate their "return to society".

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PRACTICAL PSYCHOTHERAPY FOLLOWING BRAIN INJURY

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Traditionally, the rehabilitation of traumatically brain-injured patients has focused on avoiding medical complications and teaching patients to recover motor, language, and cognitive functioning. Patients' personal reaction to their brain injury has received little or no attention. In fact, given the significant cognitive impairments often associated with such injuries, it has often been assumed that any discussion of patients' emotional or motivational disturbances might be ineffective. Memory problems, for example, might be so profound that patients could not benefit from individual or group psychotherapy sessions aimed at discussing personal reactions to such important cognitive losses.

Attitudes, however, have changed, and perhaps a new paradigm for rehabilitating traumatically brain-injured patients is developing (Prigatano et al., 1986; Prigatano, 1999). Increasingly, the need to address a patient's personality in the context of any form of comprehensive brain injury rehabilitation is being recognized. Yet doing so represents a dilemma because patients' personality characteristics are always a mixture of both their premorbid state and the changes directly or indirectly produced by their brain injury. Clinical neuropsychologists are often more comfortable assessing cognitive deficits and have relatively little to say about patients' psychodynamic characteristics or how brain injury has affected personality characteristics specifically. Yet, evidence suggests that patients are better able to return to a productive lifestyle when personality difficulties are addressed (Prigatano et al., 1994; Klonoff et al., 1998; Brooks et al., 1987).

Over the last 20 years, efforts to develop holistic approaches to brain injury rehabilitation have emphasized the role of psychotherapy or psychotherapeutic interventions in helping patients to adjust to the long-term consequences of their brain injury (Prigatano and Ben-Yishay, 1999). Psychotherapeutic approaches are important for helping patients to reconstruct a productive lifestyle in the face of the limitations induced by their brain injury.

First, this presentation defines psychotherapy in practical terms. Second, examples of both helpful and unhelpful psychotherapeutic interventions will be given. Third, how to identify when psychotherapeutic interventions are likely unnecessary in light of patients' premorbid adjustment characteristics and present psychosocial support system is discussed.

Years ago, Carl Jung used the term ' practical psychotherapy' when discussing how to help patients deal with the inevitable losses associated with the middle stages of life. Regardless of their age at the time a brain injury is sustained, patients are automatically propelled into a "second stage of life". Psychotherapy helps patients understand how they have been affected and how to cope with residual impairments. The endeavor is highly individual but guidelines are available.

In broad terms, what has been termed the 'hero's journey' is the essential ingredient of psychotherapeutic interventions with brain dysfunctional patients and is described in terms of clinical examples. The 'hero's journey' also requires individuals to relate to symbols that endow their existence with a sense of meaning. In Western culture, the symbols of work, love, and play may be especially helpful for patients dealing with the inevitable losses imposed by brain injury (Prigatano, 1991). In this respect, it is extremely important to recognize that the humanities have as much to offer about how to live life well and wisely as do scientific approaches for understanding brain-behavior relations. The Renaissance has influenced Western attitudes about psychotherapy; how this influence is reflected in clinical work with brain dysfunctional patients will be highlighted.

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EMERGING INTERNET AND COMMUNICATION TECHNOLOGIES AND THEIR ROLE IN NEUROREHABILITATION

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The emergence of Internet-based computer technologies over the past decade has opened new avenues for assessment, treatment and medical training, while providing opportunities to reach previously underserved patient populations. This presentation provides an overview of current Internet-based practice models for acquired brain injury in the U.S., with a special focus on the following areas: (a) Tele-rehabilitation models, offering face-to-face therapeutic interactions via 2-way video and pc, (2) Palm-based models, offering highly portable cognitive cueing and treatment interventions, (3) patient and family training models, using Internet-based home exercise and family training modules, and (4) clinical training options offered via Internet-based educational providers. The presenters are currently developing a low-cost palm-based treatment program to assist brain-injured patients in community reentry and a comprehensive neurorehabilitation clinical training curriculum offered over the Internet. They will share their experiences with these projects and offer practical suggestions for implementing Internet-based modalities into everyday clinical practice, and will discuss the expansive opportunities available to clinicians and researchers as wireless and broadband technologies become more widespread worldwide.

DEVELOPMENT OF A COMMUNITY REHABILITATION TEAM

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Objectives:
1. To outline important principles in delivery of rehabilitation to TBI individuals.
2. To discuss interdisciplinary teamwork in this context.
3. To discuss positive aspects and difficutlies experienced in forming a community team.

Traumatic brain injury presents unique challenges to its survivors, their relatives and those involved in assisting their rehabilitation. Traditional models of service delivery often fail to meet all their needs. Clinicians frequently feel highly stressed and inadequate. Important principles in the delivery of rehabilitation to individuals with traumatic brain injury will be discussed. One of these is interdisciplinary teamwork, which is "person-focused", rather than "discipline -focused". The inclusion of the injured individual and family as equal members of the rehabilitation team is an essential ingredient to such a team, in order to maximize their motivation towards and involvement in the therapeutic process. However this is not always easy to achieve. There has also been an increasing emphasis upon the need to focus assessment, goal-setting and therapeutic intervention on the individual in the context of everyday life and participation in life roles in the community. This has presented a new set of challenges to the rehabilitation team. Clinicians also face increasingly stringent requirements for financial accountability and demonstration of the effectiveness of interventions. Our experiences in establishing a community-based rehabilitation team will be discussed, highlighting both positive aspects, and the difficulties posed by such a model of care.

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SEXUAL CHANGES ASSOCIATED WITH TRAUMATIC BRAIN INJURY

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Objectives:
1. To document changes in sexual behaviour, affect, self-esteem and relationship quality following traumatic brain injury.
2. To examine the causes and interrelationships of these changes.

Outcome studies have shown that people with traumatic brain injury (TBI) have significant relationship difficulties and experience changes in sexuality. However, the frequency, nature and causes of sexual difficulty remain poorly understood. This paper will present results of a study of TBI individuals, which aimed to document changes in sexual behaviour, affect, self-esteem and relationship quality, and their interrelationships.

To date 114 individuals with TBI have completed this questionnaire (83 males) 1-5 years post-injury. The mean age was 32.6 years and mean PTA duration 26.8 days (range = 1-120 days). Their responses have been compared with those of a group of 119 controls, of similar age and gender.

More than 30% of TBI individuals indicated a decrease in the importance, opportunities and frequency of sexual activity and decreased sex drive, negative changes in their ability to give their partner sexual satisfaction, to engage in sexual intercourse, their enjoyment of sexual activity, their ability to stay aroused and to climax. The frequencies of reported changes were significantly higher than reported by the controls. Decreased self-confidence, sex appeal, higher levels of depression, and decreased communication levels and relationship quality with their sexual partner were also reported by more TBI participants. The most common contributing factors noted by participants included fatigue, decreased mobility, low self-confidence, difficulties communicating, pain, decreased sensitivity, sex drive and behaviour problems. Analysis of responses by gender indicated very few differences between males and females. Factors associated with sexual problems will be explored. Implications of all findings will be discussed.

THE NEUROCRECER METHOD FOR THE REHABILITATION OF MOTOR CONTROL THROUGH COMPUTERIZED BIO-FEEDBACK

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Most of the patients sustaining accquired brain injury present problems for the control of movement: spaticity, posture and balance disorders, mobility disorders and problems for the control of upper and lower extremities. All of these physical problems together with cognitive and behavioral problems after brain injury limitate independence and rise the suffering of the patients and their families. When patients come seeking for rehabilitation the first goal they have is to obtain physical independence together with the recovery of cognition and behavior. More than 500 000 cases of stroke are registered yearly in the USA. Due to success achieved in curing brain insults over 50 percent of patients do not die. 60 percent of these people left with severe physical sequelae impeding them to be independent. Only in the USA 2,5 million people need rehabilitation treatment to restore their motor functions. On the other hand, the number of babies born with such a heavy pathology as infantile cerebral palsy is increasing against the background figures of falling death rate.

Motor control is a whole process including sensitive, perceptual, cognitive, and motor abilities. In acquired brain injury patients is very important to obtain progresses in cognitive functioning to gain or increase motor control. The aftereffects of motor disorders are hard to cure by traditional methods only; the maintenance and treating patients of this type is costly for state and community; this is why a great interest has developed for the application of the EMG-BFB methods of the rehabilitation of patients suffering from motor pathologies. Specialists in the area of rehabilitation medicine fully recognize the need for using EMG-BFB methods. According to the data provided by the National Institute of Neural Diseases (USA) the EMG-BFB method is a highly effective rehabilitation method. Its main area of application is the rehabilitation of motor functions. Biofeedback is a procedure to provide the patient with information about the current state of one of his/her physiological function, using external artificial (acoustic, visual or tactile) information to make the patient conscious about his/her physiological functions in order to learn how to control them. Any physiological function may be (and is) approached as a controlled parameter. In neurorehabilitation there are two main applications:

1. "Direct" application of EMG-BFB methods for rehabilitating motor functions (paralyses, pareses, motor dysfunction, etc).
2. "Non-direct" application of the EMG-BFB methods to achieve relaxation state.

The NeuroCrecer Method

The restoration of simple movements is the primary strategy in rehabilitating patients with motor dysfunctions. The NeuroCrecer method of rehabilitation is conceived as the most progressive, effective and non-invasive strategies for rehabilitating patients suffering from motor pathologies. The method is design to increase the effectiveness in the application of BFB-technologies through the study of physiological mechanisms and working out optimal strategies for the use of BFB in the different forms of motor disfunctions (1, 2). The fundamentals of the NeuroCrecer method rely on electronic computerized sophisticated feedback signal allowing the patients to know about the processes what happen in their muscles in the act of performing a movement (3, 4). The clinical effect of training the patient in how to do it is considerably higher when the FB-signal information is optimal as far as the patient's perception is concerned.

In working with children or adults characterized by the low motivation level special training methods are used, per example to watch a film of the patient's choice on the TV screen of the NeuroCrecer set. Its videosignal is controlled by the muscle of the patient through the computer

Fig.1 Biofeedback computerized system for total functional muscular training NEUROCRECER is a complex equipment consisting of the following parts: Video-system: a TV-set (1) and a Video-player (2), PC-computer (3), Interface block (4), Two-channel EMG amplifier (5).

The NeuroCrecer method is intended to be used, at least, in the following:

a. Restoring subtle manipulatory movements (abductive and adductive functions)
b. Restoring walking functions and equilibrium
c. Training in relaxation.
d. Minimization of the tremor and hyperkineses signs.

We will present a videotape showing a 24 years-old patient who had a stroke nine

years before, with a post-stroke severe cerebellar ataxia. The patient is treated according to the computerized NeuroCrecer rehabilitation method. Results show that after six month the patient can independently control his gait for increasingly long distances with the help of a cane, which had not been achieved after years of conventional or traditional treatment.

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MOTOR DEFICITS AND OUTCOME AFTER TBI

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The Traumatic Brain Injury Model Systems have been collecting data on individuals admitted to level 1 trauma centers followed by acute inpatient rehabilitation since 1989. Data have been collected prospectively from acute care and rehabilitation hospital records and annually with in-person or telephone survey. Acute trauma factors and impairment levels have been shown to impact functional outcomes in multiple areas, including self care, mobility and community reintegration. This presentation will review previously published and some yet unpublished data in these areas.

In 1996, Englander et al demonstrated that individuals with motor strength less than antigravity (< 3/5) and moderate to severe incoordination, measured at rehabilitation admission, were more likely to need physical assistance with mobility and self care at rehabilitation admission, discharge and to a lesser extent at one year post injury. Although individuals with either lower (21%) and upper (11%) extremity fractures had longer lengths of stay in acute care and rehabilitation, only those with LE fractures had a higher likelihood of requiring physical assistance for self care and mobility at admission and discharge from rehabilitation (n=637 acute and rehabilitation; n=270 at one year).

Greenwald et al (in press) found that individuals of age < 50 years were more likely to have normal sitting (p=. 001) and standing balance (p<. 05) on rehabilitation admission. Admission Glasgow Coma Score (GCS), length of coma, posttraumatic amnesia (PTA) and acute care LOS were each associated with impaired sitting and standing balance (p<. 01). The presence of any midline shift or brainstem compression on CT scan was also associated with impairments in standing balance (p=. 05) but not sitting balance at rehabilitation admission. (n=908

Preliminary analysis of a larger group of individuals (n=2300) indicates that those individuals with severely impaired sitting balance on rehabilitation admission are 20% more likely to need supervision or physical assistance with bed to chair (p=. 007) or toilet transfers (p=. 01), ambulation (p=. 016) on rehabilitation discharge than those with mild or no impairment with sitting balance. They are 15% more likely to need supervision or physical assistance with grooming (p=. 018) and upper body dressing (p=. 04). Curiously, individuals with impaired sitting balance were not more likely to require supervision or physical assistance with feeding, bathing, lower body dressing, toileting or tub transfers at rehabilitation discharge. At one year, there were no differences in any of the self care or mobility items as measured by the FIM regardless of the level of sitting or standing balance impairment at rehabilitation admission.

Individuals with TBI generally have steady improvement in their mobility and self care. It is not surprising that those participating in acute rehabilitation programs become capable of these skills by the time they are discharged regardless of their level of physical impairment on rehabilitation admission, as this type of care is what such programs emphasize. It is nevertheless useful to try to predict which individuals will be able to perform self care and mobility skills and those who will not so as to help them and their caretakers plan for the future.

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PARKINSON-LIKE SYNDROME IN SURVIVORS OF TRAUMATIC COMA

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Introduction

Survivors from traumatic coma generally show a transient or persistent extrapyramidal syndrome consisting of hypomimia, not estinguishable glabellar reflex, seborrhea, hypersalivation, parkinsonistic posture, rigidity and akinesia (Gerstenbrand 1967).

In normals, blink reflex habituates after few stimulations, whereas in Parkinson's disease there is a reduced tendency to habituate after repetitive stimulations (Kimura 1973, Matsumoto 1997, Bentivoglio 1997).

"HABITUATION" of the blink reflex is defined as the significant reduction of the amplitude or lack of the R2 after a series of stimuli at a 1,5 Hz- 1,0 Hz frequency of stimulation.

"RECOVERY CYCLE" is defined as the reduction of the R2 amplitude with inhibitory curve, after conditioning stimulus+ test stimulus.

Patients

We studied 30 patients with a mean age of 26.7 years (range 15-38), suffering from severe traumatic brain injury (GCS < 8 in the first 48 hours) and surviving from prolonged coma (coma duration of at least 7 days). The inclusion criteria were the presence of at least 3 extrapyramidal symptoms such as bradykinesia, rigidity, parkinsonian posture, syalorrhea, seborrhea, reduced swinging of upper limbs during gait, dysarthria, hypomimia or not estinguishable glabellar tapping test (inability to inhibit blinking in response to a tap over the bridge of the nose - Meyerson sign).

Methods

- Series of 8 electrical stimulations.
- Frequecy of stimulation: 0.3 - 0.5 - 0.7 - 1.0 1.5 - 2.0 - 3.0 Hz.
- Stimulation site: supra-orbital foramen.
- Stimulation intensity: double of the excitability threshold of the R2.
- Registration site: orbicularis muscle of the eye ipsilateral to the stimulation.

Analyzed Parameters

- mean latency of R1 and R2 (ms)
- "habituation"= lack or significant amplitude reduction of the R2.
- "recovery cycle"= % R2-test amplitude/R2-conditioned (expressed as percentage)

Results

- A decreased habituation of the Blink Reflex was found in 26 out of 30 patients: at 1.5 Hz in 8 patients, at 2 Hz in 3 patients. The majority of the patients (16 out of 30) showed a blink reflex habituation at 3 Hz. The patients studied showed a significant reduced habituation in comparison with a group of normal subjects, age and sex matched.
- Only in 4 patients the blink reflex habituated at a frequency lower than 1 Hz as

observed in normal subjects.

- The few patients (4 out of 30) with normal Blink Reflex habituation showed a focal rather than diffuse brain injury.

Discussion

In the majority of the patients the reduced habituation of the Blink Reflex seems to confirm the presence of a Parkinson-like syndrome in survivors of severe traumatic brain injury with prolonged post-traumatic coma. Although post-traumatic parkinsonism is poorly recognized in the Anglo-American literature (Adams 1976), survivors from post-traumatic coma, generally suffered from diffuse axonal injury which may resemble vascular parkinsonism (multi-infarctual encephalopathy).

Conclusions

Blink Reflex habituation might be a useful neurophysiological parameter in patients with severe traumatic brain injury and Parkinson-like syndrome, at least in patients with diffuse axonal injury. This reflex may be evaluated also after L-Dopa treatment, in order to select patients "responders" to L-Dopa substitution. A comparison with patients suffering from vascular parkinsonism might be also of some interest.

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COGNITIVE REHABILITATION OF LANGUAGE AND EXECUTIVE DYSFUNCTION: TREATMENT INTERVENTIONS AND EFFECTIVENESS

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Introduction

Cognitive rehabilitation (CR) has been defined as a systematic, functionally-oriented service of therapeutic activities that is based on the assessment and understanding of an individual's neurobehavioral deficits (Cicerone, et al., 2000). Various models of CR have been proposed including those that incorporate restorative, environmental, adaptive and compensatory strategies. Restorative procedures attempt to facilitate restitution of function through direct practice and rehearsal (Sohlberg & Mateer, 1989). Environmental restructuring techniques emphasize modification of settings and contexts that are likely to precipitate maladaptive behavior (Mayer, Keating & Rapp, 1986). Adaptive strategies address the cognitive, behavioral and emotional manifestations of brain injury by providing a therapeutic "milieu" in which symptoms can be expressed and treated (Prigatano, et al., 1984). Cognitive compensatory strategies aim to establish new patterns of behavior to replace those that have become dysfunctional as the result of neurologic injury (Cicerone & Giacino, 1992). CR interventions, therefore, can be considered along a continuum with intrapersonally-mediated treatments on one pole and environmentally-mediated procedures on the other.

Despite the general acceptance and broad use of cognitive remedial interventions for the acute and chronic sequelae of traumatic brain injury, CR has come under close scrutiny during the last 5 years. Although the primary impetus for this was motivated largely by reimbursement issues, forces within rehabilitation have begun to question and critique CR treatments as well. Over the last three years, two large-scale efforts designed to investigate the efficacy of CR were completed in the U.S. The first study was commissioned by the federally-funded Agency for Health Care Policy and Research (Carney, et al., 1999) while the second was initiated by the Brain Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine (ACRM) (Cicerone et al., 2000). Both studies found clear evidence supporting the efficacy of CR and proposed guidelines for use of these procedures. At the same time, both investigations found that the strength of supportive evidence for rehabilitative interventions was highly variable across cognitive domains. In view of these findings, researchers and practitioners have been encouraged to develop a

common methodology for studying the effectiveness of CR so that domain-specific parameters for treatment can be developed.

Session Overview

This session will review the nature and effectiveness of CR interventions designed to remediate language and executive deficits caused by acquired brain injury. Part I will provide an outline of the evidence-based approach to investigating treatment effectiveness. This approach utilizes three levels of recommendations based on the strength of available empirical evidence. Practice Standards are derived from well-designed (ie usually prospective, randomized, controlled trials) and are associated with a high degree of clinical certainty. Practice Guidelines are based on controlled studies that yield reliable data but are not necessarily randomized or prospective. Guidelines are associated with moderate clinical certainty. Practice Options are premised on uncontrolled studies and have uncertain clinical significance. Following this introduction, the ACRM guidelines for treatment of language and executive dysfunction will be summarized.

Part II will discuss the results of a study concerning the effectiveness of an intensive holistic CR program (average length of treatment = 6 mths) provided to a group of 19 severely brain injured individuals (initial GCS </= 8). Cognitive, behavioral, emotional and social functioning was monitored across treatment and changes in performance within these areas was determined. Functional recovery averaged 70% across areas of impairment. Remediation of executive dysfunction required the greatest number of treatment sessions, relative to impairments in orientation, attention, memory, communication, visuoperceptual abilities and problem-solving.

Part III will discuss and demonstrate (through videotaped vignettes) the use of functional skills training in natural contexts for remediation of pragmatic language deficits. Deficits in pragmatic language have been reported to interfere with psychosocial functioning on a long-tern basis (Marsh, 1999). Individuals with inadequate social skills are likely to experience failure in many areas of their lives, including academic, vocational, and interpersonal relationships (Strain, Guralnick & Walker, 1986). Utilization of the community and its supports allows individuals with brain injury to experience the natural consequences of inappropriate or appropriate pragmatic use of language. It has also been suggested that clinicians may serve a more important function within a support role, such as a coach or mentor, during this process (McCombs, 1988). Supporters of functional approaches to pragmatic language intervention empasize the need for training through actual situations in natural contexts as often as possible (Valletutti & Dummett, 1992). The lives of individuals with chronic injuries are likely to be impacted on a long-term basis by the supports identified in their communities (Ylvisaker & Feeney, 1998). Training of social skills within a group context also allows individuals to receive feedback and encouragement from many sources, such as peers (Hartley, 1995). Incorporating group intervention

into a pragmatic language program may improve relationships and foster development of stronger feelings of support among group members (Hill & Carper, 1985). This presentation will discuss the key elements of conducting social skills training in natural contexts.

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REHABILITATION OF THE EXECUTIVE FUNCTIONS THROUGH THE COMBINED METHOD

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A significant number of neuropsychological alterations, neurobehavioral as well as neurocognitive and emotional, which are observed in patients with head traumas are directly or indirectly due to lesions to the frontal lobe. According to Levin, Goldstein, Williams and Eisemberg (1987) and Bowen (1989), around 43% of primary focal lesions are produced in the frontal and temporal regions, and diffuse axonal lesions in the same areas reach 48%. In a study by our group we found that 80% of patients with severe brain injury who underwent an integral and intensive program showed cognitive and neurobehavioral disorders associated with the prefrontal cortex (León-Carrión, Machuca, Murga and Domínguez-Morales, 1999). These statistics make it clear that a very significant number of patients who request neuropsychological rehabilitation after having suffered a brain injury will show executive deficits associated with the prefrontal cortex. Although most of the patients with deterioration in the frontal lobe will retain their basic premorbid knowledge (Mateer, 1997), these will present problems for planning, programming, for the execution of plans, for the ability to resolve problems, for categorizing, for the ability to maintain adequate cognitive flexibility, for inhibition/activation processes etc, (see León-Carrión and Barroso y Martín 1997; Fuster 1989). Executive functions are generally indispensable for independent functioning.

The executive deficits which frontal patients present are of significant relevance to activities in everyday life. However, they are not so obviously visible in the normal everyday activities of subjects as they are in attentional or memory disorders, or emotional disorders. Furthermore, frontal patients usually appear as normal subjects in standardized psychometric tests because many of them do not have problems when it comes to carrying out structured tasks as the problems appear when they themselves have to organize or structure.

The prefrontal cortex is not in itself homogenous, but it has several areas which contribute to different functions. The lateral zone plays an important role in the working memory, attention, language and in the planning and sequencing of behavior. The dorsolateral area is involved in the working memory, the sequencing of behavior, and spatial processing. The main role of the orbitofrontal area is in the processes of inhibition. The ventromedial area is associated with decision making. The caudal area is especially involved in the attentional processes. Given this functional variability of the prefrontal cortex, the rehabilitation of the executive deficits presented by these patients is complex because a lesion which affects them may have repercussions on different functional cerebral systems. In a study by León-Carrión and cols. (2000), in which he studied the necessary time for recuperation from neurocognitive deficits after

acquired brain injury, when such patients undergo neuropsychological rehabilitation, it was observed that the capacity for planning, the executive functioning and associated functions of the prefrontal cortex are those that require the greatest number of rehabilitation sessions.

Our current work aims to demonstrate the efficiency of the combined method in the rehabilitation of executive deficits which are presented by patients with head traumas.

The combined method has been proposed by León-Carrión and cols, (2000). This method combines neuropsychological treatment with adequate use of pharmacology. The basic fundament of the combined method is that the rehabilitation of the superior psychological functions, as well as emotional disorders, follow the principles of physical and functional restoration. To recuperate functionality, one must simultaneously tackle the physical injury and the consequential neuropsychological deterioration which is associated with this physical injury. One must intervene pharmacologically (and/or in necessary cases neurosurgically), at the same time as applying the neuropsychological techniques which are specific to this disorder.

We will present data and cases of patients who have undergone the combined method to treat the executive functioning problems.

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PRAGMATIC LANGUAGE - A KEY COMPONENT IN COMMUNITY RE-ENTRY REHABILITATION PROGRAMS

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Objectives:
1. Participants will be able to discuss key components of social skills training and their value in natural contexts.
2. Participants will be able to discuss various models of intervention, with particular emphasis on functional skills training.

Individuals with a brain injury often display impairments in many areas of language. However, it has been noted that deficits in pragmatic language can significantly affect psychosocial functioning on a long -term basis (Marsh, 1999). Persons with inadequate social skills are likely to experience an increase in failures in many areas of their lives, including academic, vocational, and interpersonal relationships (Strain, Guralnick, & Walker, 1986). Utilizing the community and its supports allow persons with a brain injury to experience the natural consequences of inapporpriate or approrpiate use of pragmatic language. It has also been suggested that clinicians may serve a more important function within a support role, such as a coach or mentor, during this process (McCombs, 1988). Supporters for functional approaches to pragmatic langauge intervention emphasize the need for training through actual situations in natural contexts as often as possible (Valletutti & Dummett, 1992). For persons many years post their injuries, their lives are likely to be impacted on a long-term basis by the supports identified in their community (Ylvisaker & Feeney, 1998). Training of social skills within a group context also allows for persons to receive feedback and encouragement from many sources, such as other peers (Hartley, 1995). Incorporating group intervention into a pragmatic language program may likely improve relationships and and develop a stronger feeling of support among group members (Hill & Carper, 1985).

Implementation of a pragmatic language program using a combination of group intervention and existing functional training models will be discussed. Successes and challenges of using community supports and training family members will also be addressed.

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REHABILITATION OF EXECUTIVE FUNCTIONS FOLLOWING TRAUMATIC BRAIN INJURY: THE ROLE OF ORBITO-FRONTAL BRAIN STRUCTURES AND PRE-MORBID CHARACTERISTICS

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Traumatic brain injury (TBI) is not a disease. However it is a dramatic experience, both for the injured person as well as for the family members. TBI is a sudden, physical event which compromises the rest of many people's life, for ever. It represents one of the most common life events in younger generations.

TBI cannot easily be associated to other neurological adversities, having very little in common with current notions of neuro-anatomic circuitry and/or neurobehavioral deficits, mostly related to "focal" cerebral damage.

TBI does not follow anatomical criteria of cerebral vascolarization, nor can it be associated to degenerative damage as in dementia. It follows instead physical rules as dictated by the type of injury, the modality of the impact as well as the severity of the damage within the skull, altering the biochemistry and the neuro-anatomical structures following certain specific directions. The "diffuse" injury infact is more pronounced in correspondence of those brain areas which receive the most severe friction against the "bones" and "protuberances" within the anterior and middle fossae. **Frontal** and **temporal** areas remain primarily involved and, among these, the **orbital** (basal) aspects of the frontal lobes (against the "roof" of the orbit) and the **temporal pole** (against the wing of the sphenoid bone). Corpus callosum and brain stem are also very frequently damaged following TBI due to their position and to their weak reliance on "anatomical strings" which prevent them to move significantly following the impact.

The typology of cerebral damage and the areas of main sufferance then are easily understood based upon anatomical patterns of friction and/or physical rules. What are NOT known instead are other aspects of the problem, starting with neurophysiological and neuropsychological criteria as well as *pre-morbid* personality or "*biological*" risk factors of the individuals who suffer any given TBI.

Rehabilitation of cognitive functions then, doesn't only depend upon "preserved" or "spared" areas of functioning, rather to the specific knowledge about the physical mechanisms which underlie the injury itself as well as more remote aspects of neuropsychological and "biological" patterns which regulate human behavior, even of the head-injured victim. Further, following TBI, we often disregard the *pre-morbid characteristics* of "that" injured brain as well as more biological information about maturational and restorative processes, pharmachological or neuro-developmental aspects of each individual brain. Given this scenario, fronto-temporal areas of the brain receive the most important damage following TBI, irrespective of the victim, his/her age, or other anatomical considerations. The severity of the damage may vary according to other rules of physics: the direction, the modality of the impact, the speed of the vehicle, as well as the acceleration-deceleration mechanisms which follow any brain trauma.

The pattern of recovery then, follows certain directions, some of which are dictated by

anatomical and physical components. Behavioral characteristics of the injured person, both pre-morbid as well as post-injury, however, may have significant importance in the recovery process as well. This apparently materialistic approach to TBI rehabilitation is the very essence of the rehabilitative efforts which we describe later.

Orbital and fronto-polar areas of the brain represent the newest association cortex which regulates human behavior; these same areas of the brain organize attentional processing, executive capacity, learning abilities, emotional as well as social skills and abstract reasoning. As a consequence, any rehabilitation effort necessitates an integration of competences among different disciplines (physiatry, neurology, psychology, rehabilitation, pharmachology, nursing, vocational counsellors, etc.).

These same areas are always damaged following TBI, although to a different degree, according to other non-cognitive aspects of the impact itself. Neurocognitive rehabilitation then needs to *start* from the brain (how it works and how it is damaged) and *moves* to behavior, very intimately related to damaged biological substrates.

Since brain and behavior are very closely related and, since TBI mostly involves anterior association (hetero-modal) cortex (the site and ultimate regulator of complex thought), we need to develop a rehabilitation program which relies on: "ecological" (real-life) experiences, competitive and pragmatic aspects of daily living, including all aspects of psychological and emotional integration.

This paper describes the results of one of such rehabilitative efforts. Ten TBI victims were evaluated with a standard neuropsychological battery, including tests of attention, concentration, verbal and spatial learning, clustering, visual scanning, executive and abstract thinking. They were all enrolled in a Rehabilitation program for three months (each session lasting one and a half hour, twice weekly) and later re-examined.

Training Program: Feuerstein's Instrumental Enrichment Program (IEP) was used for all twenty sessions. It consisted of 14 paper and pencil instruments, progressively more difficult, which explore different cognitive functions and triggering responses, both verbal and motor, which resemble situations, activities, experiences usually encountered during real life, contributing to improve and deepen the thinking processes of our students.

Conclusions: TBI is a challenge, both for the victim, the family and the professionals. Its complexity, its incidence, have attracted numerous disciplines including neuroscience. Rehabilitation "Centers" have mushroomed everywhere. No specific models though could be proposed for the TBI victims. Any exclusive approach needs to be "interdisciplinary", where a "case-manager" serves to integrate any single professional competence into a whole.

TBI rehabilitation needs to be "practical", oriented toward recovery of cognitive and social-emotional aspects of impaired behavior, starting from the knowledge of brain-behavior relationships. Pharmachological products, if used with knowledge and wisdom, offer an opportunity to modify the cerebral substrate and make it more sensitive to behavioural and cognitive approaches during rehabilitation training session.

The rational combination of cognitive rehabilitation and drug treatment represents yet the best and more fruitful approach to TBI rehabilitation.

POST-TRAUMATIC HEADACHE: PRACTICAL INTERDISCIPLINARY APPROACHES TO DIAGNOSIS AND TREATMENT - AN OVERVIEW

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Objectives:

1. Review the basic sub-types of PTHA.
2. Discuss etiologies of head pain.
3. Examine the clinical history for PTHA.
4. Address specific exam techniques for PTHA.
5. Delineate medical treatment strategies for headache sub-types.
6. Define chronic pain emotional and behavioral assessment strategies.
7. Identify psychological and behavioral strategies for modulating pain and functional interference.

This overview lecture will examine the etiology, diagnosis, as well as, the medical and psychological treatment of post-traumatic headache (PTHA). The major categories of headache pain in patients with TBI will be reviewed including musculoskeletal and myofascial, neuritic and neuralgic, tension, vascular/mixed, dysautonomic and other more uncommon etiologies. Sources of head and neck pain will be examined as well as mechanisms of PTHA. Assessment of PTHA relative to history (pre- and post-injury) and physical exam findings will be reviewed. Details regarding clinical presentations as well as medical and psychological treatment strategies will be discussed. An algorhythmic approach to PTHA care relative to diagnosis and treatment will be proposed.

LEVEL: Intermediate to Advanced

QUALITY OF LIFE OF 60 SEVERELY TRAUMATIC BRAIN INJURED (TBI) PATIENTS

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Objectives:
Quality of life is a subjective concept, and evaluation contributes complementary information useful in the long-term management of severely TBI patients.

Patients and methods: from November 1999 to July 2000, two teams, from Mulhouse and Suresnes, studied 60 severely TBI adults (average age 33.8 years), with a handicap severe or moderate at theGlasgow Outcome Scale, more than 2 years after the accident, by means of two quality of life scales: the SF36, the most frequently used generic scale, a new scale, the QOLBI, and the EBIS mini-document for evaluating brain injury. Both scales were used, not only for the patient, but also for a close member of his/her family/entourage, who was asked his/her opinion of the patient's quality of life.
Results: the statistical analysis shows the superiority of QOLBI, a specific tool, on the SF36, in the information given, the differences in appreciation between the patient him/herself and his/her entourage, the interest of quality responses, the usefulness of such a step to re-categorise the objectives of long-term management.
Conclusion: a specific evaluation of quality of life of severely TBI patients must be part of their evaluation some time after the accident.

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MULTIDISCIPLINARY APPROACHES IN THE MANAGEMENT OF TRAUMATIC BRAIN INJURED (TBI) PATIENTS DURING EARLY NEUROREHABILITATION WITH SPECIAL REFERENCE TO COMPLICATIONS AND EARLY OUTCOME

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Object: Due to socioeconomic, health-political, and ethical issues scientists and physicians as well as various medical associations and health organisations, being involved in the field of trauma-care and neurorehabilitation, recently published more or less specific Guidelines for the Management of Head Injured Patients (HI) regarding injury severity. Because of the lack of Class I criteria for standardised procedures we try today to follow some recommendation or even optional measures to improving diagnostic and therapeutic procedures as to lower morbidity, mortality and disability and so improving quality of life in traumatic brain injured patients (TBI) with or without concomitant multiple system injuries. Simple classification systems of HI severity and for functional recovery are necessary to evaluate and to compare the results of good practice in neurotrauma care.
Early neurorehabilitation was introduced into the acute treatment of TBI as a highly specialised multidisciplinary therapeutic concept. It's target is to minimising primary and secondary brain damage and at the same time to restoring and improving impaired brain function in respect to sensory motor, mental and cognitive capacity and neuropsychological and socio-economic outcome.

Classification of TBI severity: Level of consciousness is strongly related to location and severity of the primary brain lesion which can be easily estimated by the Glasgow Coma Scale (GCS) score: mild (15-13), moderate (12 - 9), severe (8-3) TBI. Assessment by scoring the best motor response (M 1-6) verbal response (V1 - 5) and eye opening (E 1- 4) at different times. The Abbreviated Injury Scale (AIS), with it's code 1 (minor), 2 (moderate), 3 (serious), 4 (severe), 5 (critical), 6 (maximum), points out the location, size and relative severity of the lesion assigned to each of the anatomical system regions. In HI scalp, scull, brain and vascular structures are taken into consideration. Head AIS will be scored on duration of unconsciousness when serious anatomical regions are lacking. The Injury Severity Scale (ISS) quantifies the severity of multiple system injuries of 6 defined regions of the body, including HI: 1 = head and neck, 2 = face, 3 = chest, 4 = abdominal or pelvic content, 5 = extremities or pelvic girdle, 6 = external. Therefore the magnitude of the ISS is related to the overall severity of the injury by summing up the squares of the AIS codes of the three most seriously injured systems.

Proceedings: After careful physical and diagnostic examination (GCS, AIS, ISS) immediate triage at the scene and on admission should enable the emergency personal

to make the right decision for multidisciplinary surgical and/or conservative treatment after resuscitation of the patient. Computerised Tomographie (CT) of head, spine and if suspected the body, best today with spiral CT, will demonstrate as the method of choice the primary and dangerous to life lesions so that mayor vascular lesions of chest and abdomen, and scull base can be treated within 30 minutes after admission and, after stabilisation of the systemic blood pressure, may be followed by the evacuation of intracranial epi- and / or subdural haematomas with decompression of the brain to prevent. Urgent prevention of secondary insults due to blood loss, hypotonia, cerebral hypoxaemia, depressed cerebral blood perfusion pressure (CBB) not less than 70mmHg and increasing intracranial pressure (ICP) not above 20mmHg is mandatory. Open scull fractures are treated during the second period of time (2- 4 h) in arrangement with the trauma- / emergency surgeon regarding reconstruction of long bone and pelvic girdle fractures according to the physiological conditions after resuscitation. However loss of vision because of optic nerve compression demands immediate decompression of the fractured bone components and / or local haematoma as demonstrated by coronar CT-scan. Facial bone fractures and CSF leakage are reconstructed only according to the patients brain and physiologic conditions, not to overlook a silent intracranial mass lesion or brain swelling and brain edema. In unconscious patients therefore ICP monitoring is mandatory prior extracranial reconstructive procedures. In moderate and severe HI the neurosurgeon has to be the leader of the multidisciplinary medical team because his familiar with the impaired brain function and the risk of additional lesions by secondary insults which determine the final impairment and disability.

As soon as the patient is spontaneously breathing the ICP is below 20mmHg and no serious infections complicate the course the patient should be transferred to the early rehabilitation ward, best at the same hospital, where the neurosurgeon also is responsible for the transdisciplinary treatment. Breathing and swallowing disorders, related to the severity of TBI, are very common and quite a number of neurologic and internal as well as neurosurgical complications recommend continuous monitoring and intensive care, including endoscopic bronchioscopy, gastroscopy (PEG), and different surgical and neurosurgical procedures in up to 25% of the patients.

Results: 75% of our patient's were directly transferred from our own ICU after (mean) 12 days. Initial GCS after the accident was: 3-8: n = 158; GCS 9-12: n = 55: GCS 13 - 15: n = 27 patients. Mean duration of early rehabilitation was 51 days. Discharge: n = 31 to home, 159 to further rehabilitation, 23 to nursing home, 5 patient transferred to psychiatry department.

Long term results (mean 2,6 years) of a total of n = 240 TBI: GOS 1 = 11, GOS 2 = 15, GOS 3 = 110, GOS 4 = 58, GOS 5 = 46 patients.

Comment: Every so called "mild" or "minor" TBI means a serious impact to this vulnerable organ and we have to think about it's typical sequelae. Therefore TBI with GCS 15 - 13 demands sophisticated examination and observation including CT and /or

MRI when available, or plain x-rays according to the duration of impairment or loss of consciousness initial and follow up, neurological and neuropsychological findings and physical complains not to overlook secondary mass lesions killing the HI patient. This is the only way to improving final outcome. The risk of intracranial hematoma in TBI is reported to be when orientated, alert, and no skull fracture 1 : 1000, but with fracture 1 : 50, and with addition impaired consciousness 1 : 4 in adults! Also all risk factors considered mean negligible risk of intracranial complications in children and adults. Neuropsychologic impairments, determine more than sensorymotoric deficits the final outcome in TBI and assume an appropriate concepts for early neurorehabilitation.

REHABILITATION OF PATIENTS AFTER TRAUMATIC BRAIN INJURY

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3. ***M. Faktorová***
4. ***J. Pulkertová***

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Objectives:
1. The statistical data of TBI in Czech republic.
2. The longterm individual programs of multidisciplinary rehabilitation.
3. Integration of patients after TBI, quality of life.

The number of patients after traumatic brain injury (TBI) is gradually increasing in the Czech republic. I will present the statistical data from 1996 to 1999. The TBI survivals are mostly young men 15 to 24 years old. The TBI is mostly caused by car accidents, extreme sports accidents and falls. The acute and postacute care is quite good in the Czech republic. We do not have, however, enough rehabilitation departments for a following treatment and if patients are admitted, they get only very good physiotherapy but not sufficient or none occupational therapy, psychology and speech therapy. We have established "Rehabilitation centers" as multidisciplinary teams of professionals in 1992. We are working mostly with patients with disabilities and handicaps. At present we have 18 centers and by the end of year 2000 we hope to have 40 ones. The first rehabilitation center has been established in our Department of Rehabilitation Medicine. It is specialized in a treatment of patients after brain injury. Our center has the diagnostic and the therapeutic part. The diagnostic part carries out a medical, social, psychological and vocational diagnosis. The therapeutic part is focused on psychotherapy (including nonverbal psychotherapy - artetherapy, musicotherapy, dance and movement therapy), occupational therapy, ADL training, speech therapy and physiotherapy. We have a training flat with many technical aids and also workshops (pottery, tailor, administration, woodwork and gardening). We are preparing a short and long term individual programs of rehabilitation to achieve a reintegration of the patients. We prepare for each patient an assessment for non-barrier environment, community based social support services and for a possibility of employment (in a normal open market, supported employment or shaltered workshop) or requalification (qualification).

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