



Neuropsychological aspects of the rehabilitation of patients with paralysis from a spinal injury who also have a brain injury

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In order to examine the rehabilitation process of patients suffering from a severe spinal cord injury and who also have a cerebral injury, 322 patients with paralysis from a spinal injury were subjected to neuro-psychiatric and neuro-psychological examinations. On average 20.2% of these patients showed an associated cerebral lesion. The psychological results of such cerebral lesions are summarized under the concept of the so-called *organic psychic syndrome* (OPS). In 27.7% of these patients no organic psychic syndrome resulted, and in these patients a conventional paralysis rehabilitation could be carried out. 41.6% showed very minor to moderate injuries, with 30.7% being severely disabled from the cerebral injury. Rehabilitation for these patients was modified, using new therapeutic approaches, and also traditional therapeutic methods adapted to the abilities and needs of this patient group. In 25.5% of the patients there was no substantial improvement during the treatment period of initial rehabilitation (x=12.5 weeks for the treatment of cerebral injury); but in 36.2% of the patients there was substantial improvement and in 38.3% full remission of organic psychic disorders occurred. Improvements in this sphere have a direct bearing on the rehabilitation capacity of this patient group.

Keywords: paraplegia; tetraplegia; cerebral lesion; organic psychic syndromes

Introduction

When considering the specialist literature in recent years it is apparent that a large percentage of patients with transverse spinal paralysis also have an associated head injury. The percentages range from 18% to 73%.^{1–8} Decisions of the necessity to adapt traditional rehabilitation measures for spinal paralysed patients may only be drawn on the basis of these figures with reservations. The reasons for this are twofold:- With a few exceptions⁷ there is no classification according to the type or level of severity of the head injuries. Neither injuries to the facial part of the skull nor contusion of the head or concussion of the brain with full recovery lead to secondary injuries which require special rehabilitation methods in a rehabilitation centre for spinal paralysed patients; this is in complete contrast to the situations where there are secondary injuries resulting for example from cerebral contusion. However, there are a series of studies where traumas which lead to full recovery and those which possibly cause cerebral injuries are summarized.

There are studies^{1,2,4,5,7,8} which only give an account of skull-brain traumas; a cerebral lesion associated with spinal cord paralysis does not, however, necessarily result from direct trauma (such as cerebral

contusion, cerebral compression, subdural, epidural or intra-cerebral haematoma, etc.); secondary factors, such as cerebral oedema, metabolic injury or injuries caused by hypoxia, anoxia; tertiary causes resulting from long periods spent in intensive care (with caloric deficiency, endocrine disorders, etc.); and quaternary causes such as embolic or inflammatory processes may damage the brain.

Direct trauma is usually diagnosed in the acute stage; cerebral lesions resulting from secondary causes are diagnosed occasionally and only partially. As far as tertiary and quaternary injuries are concerned, the proportion of cases diagnosed is even smaller. All patients with a serious spinal injury will have a degree, sometimes very severe, of psychological trauma as well as the physical neurological disability. The purpose of this study should not be to emphasize the well-known *psychic reactions* to a spinal cord injury, but to examine the effects of *psychic disturbances with cerebral, organic causes*, the so-called organic psychic syndrome (OPS), of spinal paralysed patients, who also have a cerebral injury.

Sample

In the rehabilitation centres of the Austrian Workers' Compensation Board (AUVA) spinal paralyzed patients, who have been diagnosed as having a cerebral

lesion, or who are suspected as having one, undergo a neuro-psychiatric and neuro-psychological examination at the outset of their rehabilitation, with follow-up examinations. The AUVA rehabilitation centre Häring (RH) is equipped for paralyzed patients, but also for the treatment of patients with cerebral lesions (Table 1).

On average over the last 3 years about a fifth of the patients beginning rehabilitation had a cerebral lesion in addition to spinal paralysis. The causes of this compound injury are found in Table 2. The distribution of the age and gender of the patients are shown in Figure 1. The causes of cerebral lesions are shown in Table 3 (diagnosis on admission).

Methods

As a standard procedure at RH all patients with spinal paralysis are examined for a possible cerebral lesion, with both neurological-psychiatric and clinical psychological examinations. The most serious problem for rehabilitation is a possible organic psychic syndrome (OPS). OPS means the psychological results of a

Table 1 Number of spinal paralysed patients with an associated cerebral lesion during the period 1993–1995

	<i>Paralysis/ initial rehabilitation</i>	<i>Proportion with an associated cerebral lesion</i>	<i>% with a compound injury</i>
1993	95	13	13.7%
1994	105	25	23.8%
1995	122	27	22.0%
Total	322	65	20.2%

Table 2 Causes of a combined injury of spinal paralysis–cerebral lesion

	n	%
Road accident	31	47.7
Fall	15	23.1
Suicide attempt	7	10.8
Illnesses	6	9.2
Other	6	9.2
	65	100

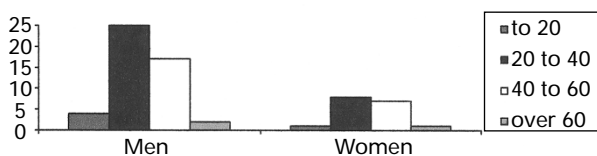


Figure 1 Age and Gender distribution of spinal paralysed patients with an associated cerebral lesion

cerebral lesion after the acute phase. The disturbances include performance disorders (memory, thinking, sensorimotor, concentration) and personality disorders (drive, emotionality, general type). The disorders found at onset of rehabilitation are shown in Table 4.

Alongside this qualitative differentiation a further breakdown was made according to the degree of

Table 3 Causes of cerebral lesions in spinal paralysed patients

	n	%
Cerebral contusion/compression	33	50.7
Sub-,epidural,intra-cerebral haematoma	14	21.5
ARDS, Hypoxia	11	17.0
Illness	4	6.2
Other	3	4.6
	65	100

Table 4 Psychic disorders with cerebral organic causes within organic psychic syndrome (OPS)

	n	%
1. Performance:		
Memory		
(Performance in storage process		
Storage, switching off and control		
function, medium long-term		
memory, verbal visual memory)		
*short term memory disorder only		
very minor or moderate grade	20	42.6
*short term memory disorder		
medium to high grade	8	17.0
Thinking		
*Order and development of thoughts	16	34.0
*Development of attitudes/views	3	27.7
*Tendency to perseveration/confabulation	8	17.0
*Deficient critical performance	3	27.7
*Deficient orientation	3	6.4
Sensorimotor		
*Delay in reaction time	2	4.3
*Impairment in sensori-motor		
adaptability	17	36.2
Concentration/ability to take stress		
*Concentration disorder	26	55.3
*Slightly abnormal tendency		
to fatigue	31	66.0
*Considerably abnormal tendency		
to fatigue	11	23.4
2. Personality:		
Drive		
Reduced drive		
Increased drive		
Ability to control drive	9	19.1
Emotionality		
Affectivity, emotional instability,		
emotional incontinence, vegetative		
labilitation	8	17.0
General type	0	0

severity, with a six level scale according to the working capacity of the patient for the purposes of occupational accident insurance in the AUVA¹¹ (Table 5). On admission/initial examination 27.7% showed no OPS despite cerebral lesions. 41.6% of the patients showed very minor to moderate cerebral impairment, 30.7% of recorded patients were severely disabled regarding cerebral damage.

Figure 2 shows the incidence of cerebral lesions in the different kinds of spinal paralysis. If Figure 2 is classified according to the severity of the OPS, Table 6 will result.

If one considers the multiple deficiencies of spinal paralyzed patients with an associated cerebral lesion as well as the very high proportion of these patients a request must be made for early rehabilitation to treat the brain disorder, which is the pre-condition for the rehabilitation of spinal paralysed patients in cumulative stages. The activities of the psychologist in a centre for spinal paralyzed patients needs to be extended in the neuro-psychological area (Table 7).

Diagnostic measurements of psychological abnormality and also of psychological normality are carried out,¹² i.e. both the extent of functional disorder and

the extent of the remaining functions are established. The neuro-psychological treatment for the present examination group took place taking account of different considerations: It is adapted to the disorders which have been indicated in tests, it establishes a connection from healthy functions to disturbed ones, the patient is active under specialist instructions, it begins at an early stage and is carried out regularly. The performance of the patient must be quantifiable; this assists the psychologist in monitoring the progress of therapy, and also the patient is able to recognize his progress with rehabilitation and find the motivation for further efforts. All treatments—psychological, medical, physiotherapy, ergotherapy, etc. must be coordinated. Different team areas work together with the

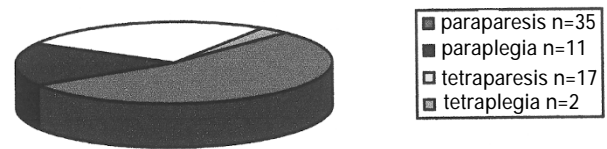


Figure 2 Incidence of cerebral lesions in paralysed patients

Table 5 Quantification of the organic psychic syndrome (OPS)

OPS	Associated impairment	n	%
no OPS		18	27.7
very minor	only minor impairment which may be compensated for during most occupational activities	12	18.5
minor	generally minor, already considerable impairment for some employees	10	15.4
moderate	considerable impairment for every occupational activity	5	7.7
medium	in most cases occupational re-integration is not possible	12	18.5
higher level	incapacity to work with remaining capacity for occasional work with light duties	5	7.7
high level	incapacity to work; also incapacity to carry out occasional simple duties; inadequate possibility for looking after oneself.	3	4.5
		n = 65	% = 100

Table 6 Connection between spinal paralysis—severity of the OPS

	Paraparesis		Paraplegia		Tetraparesis		Tetraplegia
	n	%	n	%	n	%	n
no OPS	9	25.7	5	45.5	4	23.5	—
very minor	5	14.4	1	9.1	5	29.4	1
minor	4	11.4	2	18.1	4	23.5	—
moderate	4	11.4	1	9.1	—	—	—
medium	9	25.7	1	9.1	2	11.8	—
higher level	4	11.4	—	—	—	—	1
high level—	—	—	1	9.1	2	11.8	—
							n = 65

Table 7 Psychological treatment strategies for spinal paralysed patients and for spinal paralysed patients with an associated cerebral lesion

<i>Transverse lesion</i>	<i>Additional therapies offered for transverse lesion of the spinal cord with an associated cerebral lesion</i>
<ul style="list-style-type: none"> *crisis intervention *Psychological and/or psychotherapeutic care *Information groups for patients and family members *Social skills training *Methods for the promotion of self therapy potential (autogenic training, hypnosis, bio-feedback, etc.) *Pain control training *Training for the reduction of disturbing spasticity *Neuro-muscular re-education (muscle–nerve–system, breathing, neuro-urology, etc.) 	<ul style="list-style-type: none"> *neuro-psychological diagnosis *neuro-psychological training: <ul style="list-style-type: none"> – paper pencil training – training with apparatus – computer assisted training – neuro-psychological games which may be used – practice with learning–memory-concentration strategies – training in activities relevant to every day life.

psychology department in the treatment of OPS, in particular speech therapy, work therapy and ergotherapy.

After diagnosing partial performance disorders each specific disturbance in the *performance area* is specially treated using training methods which are precisely adapted to this disorder.^{9–11} Paper pencil training, which as the case requires is set up in a way which is analogous to the tasks in the test used to ascertain mental functions; new training methods are developed in this way.¹² Apparatus training methods are also used, as well as treatment units using the Viennese determination equipment,¹⁰ the Viennese concentration equipment ‘Cognitrone’ or using performance testing equipment. Computer assisted brain performance training, for which there are nowadays a large number of programs for almost all possible specific performance disorders, is particularly motivating in its effect. Training in the group is also carried out using different games which have proved effective in the neuro-psychological treatment of patients with cerebral lesions.¹² In the case of persisting disorders special assistance is offered with which the person affected learns to compensate for specific performance disorders, and/or to cope with them in everyday life. In the context of this there is special training involving activities which are relevant in everyday life. *Personality disorders* are treated in individual and in group sessions.

Results

The duration of the initial psychological treatment of the associated cerebral symptoms of OPS was 12.5 weeks on average ($s=8.5$). This is somewhat less than the average duration of the rehabilitation of spinal paralyzed patients, which among our patients amounts on average to 16 weeks for those who are paraplegic and 24 weeks for those who are tetraplegic. It is explained by the fact that— as is shown in Table 6—the

cerebral lesion for the most part was combined with paresis (that means a shorter duration of the rehabilitation), and that psychological treatment in individual patients had come to an end before the rehabilitation of the spinal injury, when there was no longer any OPS—which is above all the case for very minor and minor organic psycho syndromes.

The results of treatment and/or the tendency for regression of OPS with envisaged psychological treatment in represented in Table 8 in its quantitative form.

In Table 8 there is a clear shift in the level of severity of OPS, the trend being towards improvement. We did not note any deterioration in any patient—for example as a result of a late complication. 25.5% of the patients experienced no substantial improvement during the initial rehabilitation. 36.2% had a substantial improvement, 38.3% full remission of the organic psychic disorders. The above statements refer to the remission of all organic psychic disorders, that is to OPS overall. If one considers the regression of particular specific disorders during initial rehabilitation, the picture results shown in Figure 3.

While organically based *personality* changes (in the areas of drive and emotionality) only slightly improved during the initial rehabilitation, an impressive recovery is shown in the area of *performance* (memory, thinking, sensorimotor, concentration).

Discussion

With the combination of a transverse lesion of the spinal cord with an associated cerebral lesion there is a combination of different rehabilitation principles. On account of the very high incidence of this compound injury, centres which are primarily set up for spinal paralyzed patients must ensure an adequate programme for this patient group. Based on the experiences which are given here the following needs arise: The rehabilitation of paralyzed patients is made

Table 8 Regression of organic psycho syndrome after neuro-psychological treatment (duration of treatment $x=12.5$ weeks, $s=8.5$)

OPS/ commencement of treatment	n	OPS/ end of initial rehabilitation treatment						
		none	very minor	minor	moderate	medium	higher	high
very minor level	12	7	5	–	–	–	–	–
minor	10	9	1	–	–	–	–	–
moderate	5	2	1	1	1	–	–	–
medium	12	–	–	4	6	2	–	–
higher	5	–	–	–	–	2	3	–
high	3	–	–	–	–	–	2	1
Total	47	18	7	5	7	4	5	1

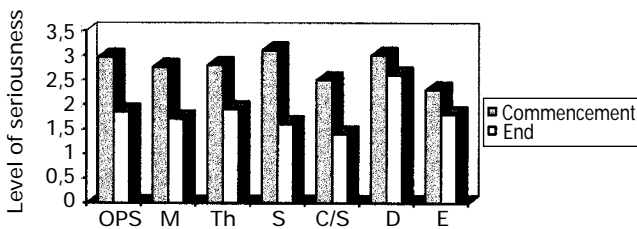


Figure 3 Regression of organic psychic disorders in particular areas of OPS following psychological treatment (Key: M–memory, Th–thinking, S–sensori motor, C/S–concentration/ability to take stress, D–drive, E–emotionality. Level of seriousness: 1–very minor, 2–minor, 3–moderate, 4–medium level, 5–higher level, 6–high level disorders/means)

more difficult because of the psychological effects of cerebral lesions such as disorders in performance and personality. The psychologist working in a centre for spinal paralyzed patients must extend his area of activity to the neuro-psychological area. The possibility of neuro-psychological treatment must follow on from an exact diagnosis made using quantitative and qualitative aspects. Such treatment needs to be specifically adapted to the particular disorders diagnosed. Using a treatment strategy of this type a good remission of performance disorders in the areas of memory, thinking, sensorimotor, and concentration can be achieved, as well as a—even if less clear—remission of personality disorders such as disturbances in drive, emotionality and general type. The therapy on offer, as it is available in a centre for spinal paralyzed patients, does not only have to be extended in particular areas, (for example the admittance of brain performance training as part of ergotherapy), it must also be adapted to the patient's abilities (for example, disorders in the area of concentration often have to lead to a shortening of the therapeutic units). Knowledge about specific psychological organic performance and personality disorders therefore lead to an optimization of the success of treatment in the area

of those with a spinal transverse lesion. However, it also awakens an understanding of the psychological problems of spinal paralyzed patients, resulting from an associated cerebral injury, which are different to the 'normal' psychological reactions resulting from paralysis from a spinal injury. Dependent on the extent of OPS and capacity to regression the rehabilitation aim must be defined differently. On condition that the stated treatment strategies are modified as necessary for this type of multiple trauma, patients with a very minor to a moderate level of organic psychic syndromes may be rehabilitated to such a degree, that the familiar rehabilitation aims for spinal paralyzed patients may be achieved. The rehabilitation aim for patients with higher to high level organic psychic syndromes must of course be defined here in another way. Occasionally these only amount to expert care, the restoration of as good a physical condition as possible and the training of family members for necessary care provision.

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