

## Neurorehabilitation

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The rehabilitation of patients suffering from diseases and injuries of the nervous system has to aim basically at the diminution or elimination of the somatic handicap and at the improvement or recovery of the mental, intellectual, familial and social disability. In the case of irreversible somatic handicaps the patient should obtain compensatory auxiliary devices and adequate occupational retraining. In very severe cases rehabilitation has to reach at least a facilitation of everyday-nursing.

Psychiatric disturbances appear either in response to the somatic handicap or on the basis of organic brain damage. Psychiatric disorders can aggravate organic lesions or cause additional functional impairments. The recovery of primary somatic disorders can be inhibited by psychogenic mechanisms. Therefore psychiatric and psychological treatments play an important role in the neurorehabilitation.

The basis of the rehabilitation program has to be a balance of all lesions and deficiencies by careful diagnostic procedures. Principally one has to distinguish the rehabilitation of patients with lesions of the central and the peripheral nervous system.

The rehabilitation of disorders of the central nervous system (CNS) deals with damages of traumatic, vascular, inflammatory, neoplastic, toxic, hypoxic and degenerative origin.

Mild brain lesions often disappear spontaneously without rehabilitation. Middle severe and very severe brain-lesions mostly cause deficiencies which require physical, mental and psychological rehabilitation.

Damages of the spinal cord and the peripheral nervous system are mostly less serious concerning the patient's personality, but frequently more disabling than disorders of the CNS.

### CLASSIFICATION OF REHABILITATION

As mentioned before neurorehabilitation concerns lesions of the CNS (brain, spinal cord) and the peripheral nervous system. Principally different types of rehabilitation can be distinguished. Patients with severe acute damages of the nervous system need the so-called actual rehabilitation. Patients suffering from slowly progressive or chronic relapsing diseases, e.g. Parkinson's disease or multiple sclerosis, undergo temporary rehabilitation. In rapidly progressive illness with malignant course the so-called palliative rehabilitation has to be applied.

### Actual Rehabilitation of Lesions of the Central Nervous System.

#### Rehabilitation of Brain-Injured Patients

Middle severe and severe brain injuries cause focal and diffuse brain lesions. The severity and the prognosis of the brain damage depend on the location of the lesions, the duration of unconsciousness (10) and post-traumatic amnesia (1,12,13), the age of the patient (7,9), the pre-traumatic functional state of the brain and the occurrence of complications (3). The rehabilitation of severely brain-injured patients is a model for the actual rehabilitation of patients with acute lesions of the CNS of any other origin. Traumatic brain lesions comprise local damages of the cortex, the white matter (often with a periventricular distribution (6), the basal ganglia, the limbic system, the diencephalon, the brain stem and the cerebellum (8).

Severely brain injured patients, especially patients suffering from a long-time coma state, the so-called apallic syndrome (2), have to be intensively rehabilitated. The different phases of actual rehabilitation are listed in Table 1 (4). The rehabilitation should start as soon after the injury as possible. In the preparation phase the patient has to be delivered from continuous cardiovascular monitoring. Complex concomitant infections and decubitus have to be under control. All primary operative measures and their consequences must be completed. In the phase of first communication the rehabilitation aims at the patient's response to simple demands like "open the eye, close the mouth" etc. In the activation phase the patient shall try simple active movements of the limbs, which can be initially achieved by utilizing the grasping and groping reflexes.

Peroral nutrition is alleviated by using the oral primitive patterns.

In the mobilization phase, the patient is trained to eat and to perform simple hygienic measures. The first foot steps should be attempted. Often brain injured patients, especially after the apallic syndrome, exhibit behavioural disturbances simulating the Klüver-Bucy syndrome (2). At the end of the mobilization phase the first intellectual and mental performance profile is advisable (11). Often neuropsychological deficiencies cannot be detected until this phase, such as impairment of visuospatial coordination, dyscalculia, dyspraxia, dysphasia and others.

The patient has to be controlled by other specialists, e.g. by the orthopedist for a check-up of the functional state of the joints (14) or the ophthalmologist for a check-up of the eyes. Secondary operations which are necessary for the acceleration of the recovery should be performed in this phase. A logopedist has to treat dysphasia and dyslexia. The physiotherapist exercises the patient's locomotion, if necessary by the help of crutches or a wheel chair.

After further progress the patient enters the therapeutic community for the stabilization phase. There 18 to 20 patients are gathered who are supervised by doctors and specialized nurses, psychologists, psychiatrists and occupational workers (5). In balancing the patient's abilities an individual rehabilitation program has to be planned. The patient undergoes special training for manual skill and cognitive and social abilities. CAT and EEG controls are obligatory.

In the integration phase the patient is integrated in the family. He remains under control of an outdoor-patient service. Mostly in this phase reactive psychiatric disorders like depression become apparent and demand psychiatric treatment. In the resocialization phase the patient is either integrated into his former occupation or undergoes retraining courses. The rehabilitation program ends in the posttreatment period (after-care phase).

In all phases of posttraumatic rehabilitation the family and close friends play an essential role in motivating and stimulating the patient. They are able to manage psychical setbacks and guarantee in the hospital an utmost familial and personal atmosphere. Step by step the family shall take over the nursing duties in preparation for the management of everyday life.

TABLE I. Phases of actual rehabilitation, especially after severe brain injury-apallic syndrome

preparation phase  
 phase of first communications  
 activation phase  
 mobilization phase  
 stabilization phase  
 integration phase  
 resocialization phase  
 after-care phase

Rehabilitation after ischemic stroke, spontaneous intracranial and subarachnoid hemorrhage

Stroke patients should usually undergo an actual rehabilitation which corresponds mostly to the rehabilitation of brain injured patients. Within the first days after the incident passive movement therapy of the paralysed limbs should be started. Subsequently the patient exercises bed-side sitting and walking by the help of crutches and other devices. Logopedists and ergotherapists have to be integrated in the rehabilitation very soon. Dietary consulting is essential for patients with vascular risk factors. Regular antispastic drug therapy and ergotherapy have to be guaranteed after dismissal from the hospital. Later a physical training program has to be planned. Social workers have to organize devices and support for home care or an admission to an old people's home.

Rehabilitation of patients after acute meningoencephalitis/ brain abscess

Meningoencephalitis can cause severe intellectual and mental disturbances. Generally the principles of rehabilitation do not differ from the rehabilitation after vascular diseases of the brain. Since inflammatory diseases of the brain mostly occur in younger patients additional occupational retraining is often necessary.

Rehabilitation of patients with transverse lesions of the spinal cord (traumatic, inflammatory, vascular and neoplastic origin)

Acute spinal cord lesions occurring as single events demand intensive actual rehabilitation. Chronic residual lesions need temporary rehabilitation. Patients with severe paraparesis or tetraparesis require different devices like a wheel-chair or crutches as well as means for the hygienic necessities. Often antispastic drug therapy is useful. Patients with neurogenic bladder disorders have to be taught in managing the micturition. The maintenance of independence in locomotion is essential. Mostly familial and social problems arise. Therefore the patient should remain in close contact with a physiotherapist and a psychologist.

The Temporary Rehabilitation of Lesions of the Central Nervous System

Prominent examples of temporary rehabilitation are Parkinson's disease and multiple

sclerosis. In the state of a decompensation of the disease the Parkinson patient needs individual physiotherapy, in view of the severe handicap and the depressive mood. In the well compensated phases the patient should receive daily physical training and group therapy, twice to 3 times a week. A familiar atmosphere facilitates close relationship and mutual help.

Patients suffering from multiple sclerosis mostly need individual physiotherapy. Therapy in a group is questionable because of very different disabilities and psychological reasons. In time young patients should attend retraining courses. Doctors, social workers, occupational workers and physiotherapists have to aim at an efficient outdoor patient service as well as at a visitation service.

#### The Palliative Rehabilitation of Diseases of the Central Nervous System

The palliative rehabilitation, applied in rapidly progressive and fatal sickness such as malignant brain tumours or amyotrophic lateral sclerosis, aims at a temporary facilitation of the handicap and an improvement of quality of the terminal life. Even in hopeless cases an adequate rehabilitation program results in considerable improvement. Psychologic assistance is very necessary.

#### Actual Rehabilitation of Lesions of the Peripheral Nervous System

The rehabilitation of the peripheral nervous system mostly concerns monopareses after traumatic nerve-damage. In all cases electrostimulation therapy has to be performed in order to prevent muscular atrophy. Passive and active physiotherapy prevents muscular, osseous and tendon contractures. Often orthopedic operations and devices become necessary.

#### Temporary Rehabilitation of Lesions of the Peripheral Nervous System

Progressive irreversible peripheral neurological diseases like muscular dystrophies, myopathies, neural and spinal muscular atrophies etc., require repeated physiotherapy as well as careful planning of the occupational and familial life.

### CONCLUSIONS

The aim of the neurorehabilitation is the patient's integration in the family and in the occupational life. In the case of severe handicap the rehabilitation aims at a maximum of independence or at least an improvement or facilitation of the patient's care. Social and familial reintegration should be the final purpose. In all cases of neurological disability the rehabilitation is necessary in order to give the patient hope and optimism and to reestablish human dignity and a good quality of life.

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