B. O. Hütter

Neuropsychological Sequelae of Subarachnoid Hemorrhage and its Treatment

With Forewords
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Foreword by Wolfgang Seeger

Neurosurgical outcome gradings usually divide the result of operative treatment into excellent, good, mild or severe deficits and lethal courses. Psychological changes were frequently overlooked or regarded only as a mild impairment. If one compares the frequency of preoperative psycho-organic syndromes as documented in the medical records with the results of sophisticated psychological testing procedures, it becomes evident that an unexpectedly large range of psychological disorders cannot be identified by means of a conventional clinical examination.

Therefore, among neurosurgeons in the last years there is a growing interest in the results of pre- and postoperative psychosomatic, psychopathological and neuropsychological investigations. This is additionally motivated by the need to differentiate illness-related from surgically induced defects as well as postoperative improvements. Physical damage such as the presence of a hemiparesis is clearly defined while non-psychologists are not so familiar with psychological changes. However, these invisible 'deficits' even if mild, are of substantial relevance for social adjustment when the patient is able to work. This becomes obvious if one resumes the social catamnesia of patients after cerebral damage marked by the rise of severe psychosocial maladjustment.

The author of this monograph has sought the scientific collaboration with neurosurgeons since he finished his academic training as a psychologist 10 years ago. From the beginning he has been particularly interested in the psychological sequelae of aneurysmal subarachnoid hemorrhage and its surgical treatment. As a first step of research, he tried to identify the sequelae of uni- and bilateral limbic damage related to the posterior parts of the gyrus rectus and the subcallosal area. It was logical to conduct the first studies on the neuropsychological consequences of the rupture and surgical repair of aneurysms of the anterior communicating artery, because this is the most frequent location of aneurysms, and the above-mentioned anatomical structures are closely related to it.

Surgical damage is frequently inevitable if the neurosurgeon prepares the neck of the aneurysm in order to clip it to prevent a new rupture. This element of surgical treatment has gained a new interest since the introduction of endovascular methods for eliminating intracranial aneurysms. The endovascular method may have the advantage not to damage the brain parenchyma if no inadvertent closure of perforating vessels close to the aneurysm occurs. Furthermore, the advent of MR tomography substantially improved the visualization of damage to the brain substance.

In earlier times the postoperative psychological changes were attributed to the local damage caused by aneurysm surgery. Meanwhile, in the age of modern microneurosurgery, this assumption cannot be upheld anymore.

The data about different aneurysm locations given in the present work clearly demonstrate that the quality and the severity of the neuropsychological impairments after subarachnoid hemorrhage are in particular dependent on the anatomical location and extent of the bleeding. In addition, the sometimes inevitable temporary clipping of perforating vessels seems to play a significant role with respect to later neuropsychological disturbances.

Since modern aneurysm surgery is performed in the acute phase shortly after the hemorrhage, the findings reported in the present work are, according to my opinion, of particular relevance. In the light of the present intensive discussion about the indication for microneurosurgical clipping or neuroradiological interventional coiling of intracranial aneurysms, the results given here in by B. O. Hütter can be regarded as an argument for the surgical intervention, in particular because the extravasated blood can only be cleared by surgery.

Therefore, this book may be an inspiration for the neurosurgical reader for a closer collaboration with psychologically trained scientists. This is important for all intracranial processes and not only for the topic of subarachnoid hemorrhage covered by this book.

Freiburg, November 1999 *Wolfgang Seeger*

Foreword by Klaus Poeck

For want of more refined instruments the outcome of neurosurgical patients is assessed mostly by means of the Glasgow Outcome Scale. This scale, however, does not reflect mild grades of cognitive impairment and, more important, psychosocial variables that have recently been termed health (or rather: sickness) related quality of life (QOL). Research into the QOL domain has been conducted mostly in an anecdotical way.

This monograph is a most valuable attempt to elucidate QOL in a well defined neurosurgical population, namely patients with subarachnoid hemorrhage (SAH) with and without surgery for aneurysms of various location and with clinical syndromes of different severity. With a view to operationalize a concept that is frequently considered as based on "soft" data, the author has developed an inventory that yields data in a controlled way, including self-report and relative-report on the patient's functioning and well-being. The stratification of patients permitted the separate assessment of the neurobehavioral consequences of bleeding and of bleeding plus surgery in relation to different aneurysm sites, mild and severe Hunt and Hess grades and, of course, the usual demographic variables.

The author has adduced a wealth of personal data, meticulously discussed against the background of the literature. The QOL findings will be of value for the neurosurgeon's decision making and serve as a rational basis for seeking the patient's informed consent. The broad scope of the monograph is highlighted by the final discussions on the extent to which patients experience SAH as a psychological trauma and on the possible impact of the reported findings on rehabilitation programs.

Aachen/Bonn, December 1999 *Klaus Poeck*

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B. O. Hütter

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List of abbreviations

A.	Arteria
AANS	American Association of Neurosurgeons
ACA	anterior cerebral artery
ACoA	anterior communicating artery
AICA	inferior anterior cerebellar artery
ALQI	Aachen Life Quality Inventory
AV-malformation	arterio-venous malformation
Babif	Basilar bifurcation
BDI	Beck Depression Inventory
BI	Barthel Index
CBF	cerebral blood flow
CCT	cranial computed tomography
C.	Cisterna
CNS	central nervous system
COPD	chronic obstructive pulmonary disease
CSF	cerebrospinal fluid
DSM-IV	Diagnostic and Statistical Manual for Classification of Mental Disorders, fourth edition
ECG	electrocardiogram
FPI-R	Freiburg Personality Inventory-Revised
FWIT	Color-Word-Interference task (Stroop test)
GCS	Glasgow Coma Scale
GOS	Glasgow Outcome Scale
HMPAO SPECT	Hydrogen-Phosphoroxyd-Single-Photon-Emission-Computed-Tomography
ICA	internal carotid artery
ICH	intracerebral hemorrhage
IES	Impact of Event Scale
IQ	intelligence quotient
IST	Intelligenz-Struktur-Test
IVH	intraventricular hemorrhage
LPS	Leistungsprüfsystem
MCA	medial cerebral artery
MFB	medial forebrain bundle
MMPI	Minnesota Multiphasic Personality Inventory
MRA	Magnetic Resonance Angiography
MRT	Magnetic Resonance Tomography
NA-SAB	spontaneous non-traumatic SAH without proven source of the bleeding
ns	not significant
PCoA	posterior communicating artery
PET	Positron Emission Tomography

PI	proactive interference
PICA	posterior inferior cerebellar artery
PTSD	post traumatic stress disorder
rCBF	regional cerebral blood flow
rtPA	recombinant plasminogen activator
SAH	subarachnoid hemorrhage
SD	standard deviation
SIADH	secretion inhibition of antidiuretic hormone
SIP	Sickness Impact Profile
SPECT	Single-Photon-Emission-Computed-Tomography
TCD	transcranial Doppler sonography
Triple "H"-Therapy	hypertensive, hypervolemic, hemodynamic therapy
WAIS-R	Wechsler Adult Intelligence Scale-Revised
WCST	Wisconsin Card Sorting Test
WFNS	World Federation of Neurological Surgeons
WHO	World Health Organisation
WIP	short version of the Hamburg-Wechsler Intelligence test
WMS	Wechsler-Memory-Scale