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## Neuropsychological Research on the Neurosurgical Treatment of Cerebrovascular Disease

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# Feature Articles

## Neuropsychological Research on the Neurosurgical Treatment of Cerebrovascular Disease

In the United States, cerebrovascular disease ranks third or fourth behind heart disease, cancer, and accidents as one of the most common causes of death. Atherosclerosis is the main cause of cerebrovascular disease as it is of cardiovascular disease, and close to 80% of all cerebrovascular disease is related to atherosclerosis. In other countries such as Japan, cerebral hemorrhage represents the major cause of cerebrovascular disease, although atherosclerosis is becoming more prominent in that country also.

Before 1970, patients had limited evaluations to determine the cause of their cerebrovascular disease. Since little was available to patients in terms of therapy, investigative procedures such as angiography were of little interest. Therapy with anticoagulants was believed to be helpful and was used on the hypothesis that cerebral infarction was embolic. However, the value of these agents has never been proved in a properly controlled, randomized study.

In the 1970s, when cerebral bypass surgery was developed for occlusive cerebrovascular disease, a therapeutic alternative became available. This advance has provided a reason for more careful studies of patients who present with cerebrovascular disease. Many causes have been discovered, and many forms of therapy are now available. Nevertheless, because controlled, randomized studies have not been published, and series are limited, conclusions must be interpreted cautiously.

The work on cerebral bypass surgery for the anterior (or carotid) circulation and the posterior circulation (vertebrobasilar) continues to gain popularity. However, there is a great need to improve methods of selection of patients for a variety of treatments.

An important factor in evaluating medical and surgical treatments is in the neuropsychological assessment of the patient to quantitate, if possible, changes which may occur as a result of various therapies. Neuropsychological approaches provide us with a more objective assessment of the changes in the nervous system than a neurologic examination; yet, the sensitivity of neuropsychological tests still remains open to question and must be critically evaluated.

Over the past decade, a substantial body of neuropsychological research dealing with outcomes of cerebrovascular neurosurgery has developed. Interest stems largely from the potential for carotid endarterectomy and extracranial-intracranial arterial bypass to reverse some of the behavioral deficits associated with cerebrovascular disease. Several single case studies have documented remarkable postoperative improvements with these surgical procedures. However, results from group studies have been less enthusiastic and more ambiguous. Methodologic problems have made it difficult to interpret these studies clearly.

The papers which follow are based on a symposium on the neuropsychological effects of carotid endarterectomy and extracranial-intracranial arterial bypass presented at the Eleventh Annual Meeting of the International Neuropsychological Society held in February 1983. This issue of the Henry Ford Hospital Medical Journal brings together researchers active in the field.

In the first paper by Drs. Ausman, Diaz, and their collaborators on "Microsurgical Techniques in Cerebral Revascularization," the epidemiology of cerebrovascular disease, indications and contraindications for surgery are discussed. An overview of the surgical techniques involved is also provided.

Dr. Shatz's paper on "Methodological Issues in Studying Treatment Effects in Patients with Cerebrovascular Disease" deals specifically with methodological problems which confront researchers in this area. This paper addresses the question of what constitutes an appropriate control group, the problem of retest practice effects, test-retest interval, and natural recovery from stroke. The problem of differential surgical effects as a function of severity of disease is also addressed.

In the third paper, "Carotid Artery Disease, Carotid Endarterectomy, and Behavior: A Critical Appraisal," Dr. Kelly critically evaluates both controlled and noncontrolled studies in the literature. A synthesis of this work suggests that carotid artery disease is indeed associated with cognitive impairment, and that, in a subgroup of patients, improvement in cognitive function is associated with surgery.

Dr. Binder's paper on "The Effects of Cerebrovascular Surgery on Behavior: What Has Been Demonstrated" reviews the literature on extracranial-intracranial arterial bypass and presents results of a study comparing medical and surgical treatment in a sample of patients with stroke or transient ischemic attack. The findings of this study do not suggest any specific effect from surgery; the observed changes are seen as consistent with either spontaneous remission or practice effect interpretation. While these results are compatible with reports of occasional dramatic effects of surgery on behavior, they do suggest that in general a significant effect of surgery in neurobehavioral function has yet to be demonstrated.

This conclusion is reinforced by the last paper in this section on "Neuropsychological Evaluation of the Results of Surgical Treatment of Cerebrovascular Disease." This paper is a summary of the symposium provided by the discussant, Dr. Schwartz.

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