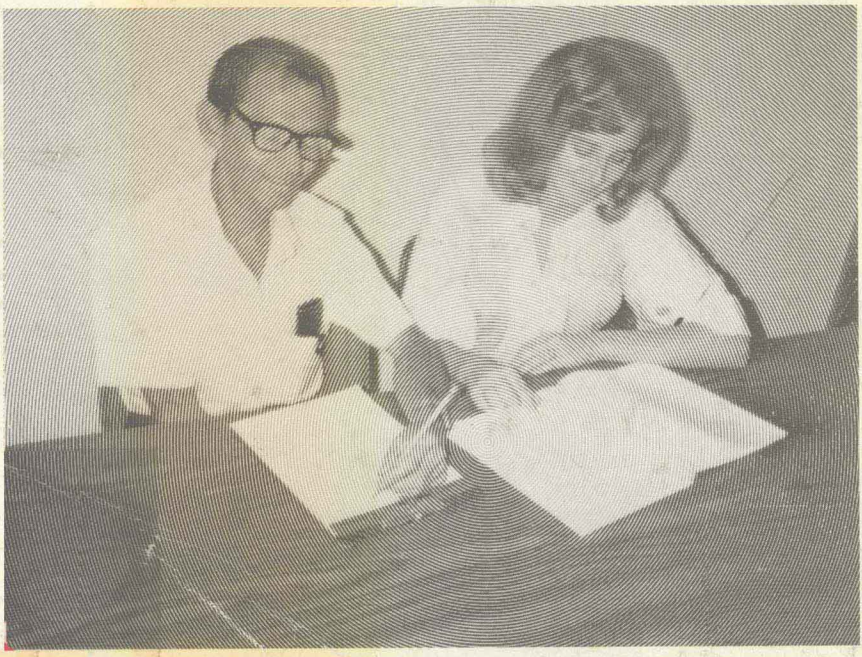
REMEDIATION OF COMMUNICATION DISORDERS SERIES

ACQUIRED NEUROGENIC DISORDERS



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FOREWORD

With the information explosion of recent years there has been a proliferation of knowledge in the areas of scientific and social inquiry. The speciality of communicative disorders has been no exception. While two decades ago a single textbook or "handbook" might have sufficed to provide the aspiring or practicing clinician with enlightenment on an array of communication handicaps, this is no longer possible—hence the decision to prepare a series of single-author texts.

As the title implies, the emphasis of this series, *Remediation of Communication Disorders,* is on therapy and treatment. The authors of each book were asked to provide information relative to anatomical and physiological aspects of each disorder, as well as pathology, etiology, and diagnosis to the extent that an understanding of these factors bears on management procedures. In such relatively short books this was quite a challenge: to offer guidance without writing a "cookbook"; to be selective without being parochial; to offer theory without losing sight of practice. To this challenge the series' authors have risen magnificently.

Thomas Marquardt has extensive clinical experience in the rehabilitation of patients with neurogenic communication disorders. He has served as a Veterans Administration trainee, was founder and coordinator of the University of Tennessee Neuropathology Services Program, and currently consults for several state and federal agencies, in addition to working with patients at The University of Texas Speech and Hearing Center. A member of that rare breed of researcher-clinicians, Dr. Marquardt is a superb teacher, a talent that is revealed in this book.

FREDERICK N. MARTIN
Series Editor

PREFACE

Acquired Neurogenic Disorders is intended to serve as a basic resource for speech/language pathologists in practice and for students in training. Physical and occupational therapists, neuropsychologists, nurses, and physicians also should find it of value in their work. The scope is comprehensive in that the major communicative disorders due to brain damage are reviewed. However, the focus clearly is on clinical procedures. An effort has been made to avoid biases in terminology and to provide as broad a review as possible of available clinical procedures. The first four chapters deal with specific topics: description, evaluation, prognosis, and treatment methods. The final chapter considers the longitudinal processes involved in treatment of the patient from referral to discharge and includes discussion of direct treatment, counseling, and structuring the communicative environment for the patient.

○ ACKNOWLEDGMENTS

This text could not have been completed without the help of patients, students, and collegues. I would especially like to acknowledge the aid of Jean Herzog in the preparation of artwork and for comments regarding content; Alice Richardson, Rick Bollinger, and John Tonkovich for materials and suggested revisions; Cindra O'Leary and Manda Van Geem for manuscript preparation; and Fred Martin, Series Editor, for commments regarding organization and style.

THOMAS P. MARQUARDT

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The disorders

○ INTRODUCTION

Neurologically impaired adults display an array of speech and language deficits, ranging from readily observable motor speech disorders to more subtle impairments of language and cognition. Rehabilitating these patients involves a series of overlapping tasks: identifying the problem, determining a prognosis, implementing a treatment program, and evaluating progress. Each stage of this process requires that a balance be struck between what is known and what is hypothesized about the patient and the disorder. Russell Brain, the eminent British neurologist, succinctly described this balance when he observed that "progress . . . depends upon the ability to ride with a foot on each of two horses, one named Fact and one named Hypothesis, and the problem always to keep them running level" (1966, p. 566). The primary goal of this book is to provide a balanced account of rehabilitation facts and hypotheses that can be used to help brain-injured adults recover their communication skills. To accomplish this purpose, both a rationale for treatment and specific procedures will be discussed.

The communication disorders to be considered are termed *acquired* and *neurogenic.* Acquired indicates that the communication deficits occurred after speech and language was developed. Neurogenic specifies that the disorders are due to damage to the nervous system.

There is no universal acceptance of diagnostic labels to describe neurogenic disorders. Perhaps the only agreement is that there is no agreement. Historically, investigators devised terms, using symptom complexes to localize speech and language functions of the brain. *Nosology* reflected the neural function inferred (e.g., *motor, sensory*) or the investigator's surname (e.g. *Broca, Wernicke*). Investigators also used descriptive labels based on the primary characteristics of the disorder (e.g., *jargon, agrammatism, phonetic disintegration*) and interchangeably used terms such as *dysarthria* for relatively distinctive neuromuscular and nonneuromuscularly based deficits. An example may illustrate the large number of terms for a symptom complex: A disorder due to anterior dominant hemisphere brain damage with a primary deficit in the ability to program articulatory movements has been variously labeled *motor aphasia, Broca's aphasia, primarily expressive aphasia, phonetic disintegration, cortical dysarthria,* and *apraxia of speech.*

Reviewing all the terminology and classification systems for communication problems due to brain damage would serve little purpose. The first task here will be to describe three frequently encountered communication problems associated with nervous system pathology: *aphasia, apraxia,* and *dysarthria.* Aphasia is a language disorder caused by injury to the dominant hemisphere responsible for processing the language code. Apraxia is a motor speech disorder resulting from damage to neural circuits of the dominant hemisphere responsible for programming speech movements. Dysarthria is a neuromuscular speech disorder characterized by weakness, paralysis, and/or incoordination.

These three terms and the parameters of the disorders they label are not universally agreed upon. They will be used because they are convenient, not because they are right or wrong; numerous therapy approaches are directed at disorders for which these terms serve as descriptive abbreviations. The behavioral variations, not the labels, are of real importance.

Aphasia, apraxia, and dysarthria are not mutually exclusive deficits, and each or all may be demonstrated by a brain-damaged patient. In fact, no one symptom is unique to a given diagnostic category. These disorders are frequently complicated by memory, orientation, judgment, cognition, visuospatial, and visuomotor deficits. Disorders of this type will be examined secondarily and only because knowledge of their characteristics is necessary to describe the entire communication impairment of the patient and because speech-language pathologists are increasingly called upon to evaluate and treat patients with nondominant hemisphere and bihemisphere lesions who demonstrate these deficits.

Chapter One will include an elementary neurological framework, some limited information on etiology, and a review of the primary characteristics of the disorder. Additional definition of these topics will evolve from the discussion of appraisal and diagnosis.

Description of communication problems is aided by test instruments used to quantify characteristics of the disorder. Whether the tests are of language, intellect, memory, cognition, or motor speech, their purpose is to provide the empirical data base for differential diagnosis—the process of labeling the disorder. This descriptive process is important because it isolates the communication problems to be addressed and because different disorders require different therapeutic techniques. Chapter Two will consider appraisal and diagnosis of neurogenic disorders. The emphasis will be on test instruments of appraisal with more limited discussion of differential diagnosis. Diagnostic decision making will be considered more fully later.

Not all patients with nervous system injury will benefit from direct treatment of their communication disorder, and it is important to determine the prognosis for recovery as soon as possible in the rehabilitation process. *Prognosis* is a prediction of treatment outcome based on factual indicants of

the patient's condition. Prognostic indicators include variables such as location and size of the lesion, presence or absence of sensory and motor impairments, age, intellectual ability, educational level, and emotional and psychological adjustment of the patient. In few other communication disorders has prognosis been as consistently neglected under the assumption that some treatment is better than no treatment and that any progress is sufficient to justify the therapeutic effort. Judicious use of prognostic indicators is of significant value in determining the procedures to be used and in devising reasonable expectations for the patient. Chapter Three will deal with predictors of treatment outcome, the efficacy of treatment, and aspects of spontaneous recovery.

Therapy approaches have both form and content. Therapy forms for neurogenic disorders are a study in contrasts, ranging from regimented programmed instruction based on operant principles to unstructured conversation used to maximize residual communicative abilities. Therapy content is determined by the disorder to be treated and the needs of the patient. Chapter Four will deal with therapy rationales and procedures.

Finally, the processes of rehabilitation from referral of the patient to termination of treatment will be considered. While the first four chapters are relatively self-contained, Chapter Five describes the multifaceted and interconnected roles of the clinician as diagnostician, prognosticator, treatment provider, and counselor.

This brief introduction has emphasized that rehabilitation of acquired neurogenic communication disorders is a dynamic process involving a continual reassessment of the diagnosis, prognosis, and treatment program. The following description and evaluation of rehabilitation facts and hypotheses should enhance the clinician's delivery of services to these communicatively handicapped patients.

○ NEUROLOGICAL BASES OF ACQUIRED DISORDERS

introduction

An elementary knowledge of functional neuroanatomy, etiologies of brain damage, and characteristics of acquired disorders are required to understand the rehabilitation process. In the following sections, a functional topography of the nervous system is developed, etiologies of brain damage are examined, and the characteristics of acquired disorders are described.

the nervous system

The nervous system can be divided into two parts: central and peripheral. The *central nervous system* includes the *cerebrum* divided into two structurally similar but functionally dissimilar hemispheres with *frontal, tem-*

poral, parietal, and *occipital* lobes; the *brain stem* including the *midbrain, pons,* and *medulla;* the *cerebellum* with anatomically but not functionally identical halves; and the *spinal cord* (Figure 1–1). The central nervous system is encased in bone, surrounded by cerebrospinal fluid and covered by meningeal layers. The *peripheral nervous system* is composed of nerves that extend from the central nervous system (Figure 1–2). The *cranial nerves* primarily subserve the head and neck, and the *spinal nerves* innervate the rest of the body. Within the nervous system are pathways that convey sensory information from the periphery to the central nervous system and motor pathways that carry impulses from the neuroaxis to the muscles and glands which serve as effector organs. Each level of the central nervous system has interconnections between the two sides, between sensory and motor systems, and between higher and lower structures. The three components of the system to be examined are the dominant hemisphere for speech and language, the nondominant hemisphere, and the motor systems.

The Dominant Hemisphere. Both hemispheres of the brain are capable of establishing verbal processes at birth, but as the organism matures, a genetically predetermined displacement assigns verbal functions to the left hemisphere and visuospatial and other nonverbal functions to the

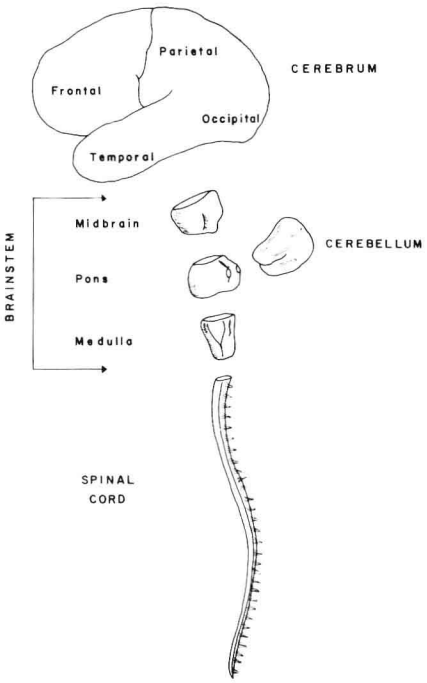

FIGURE 1–1 Subdivisions of the Central Nervous System

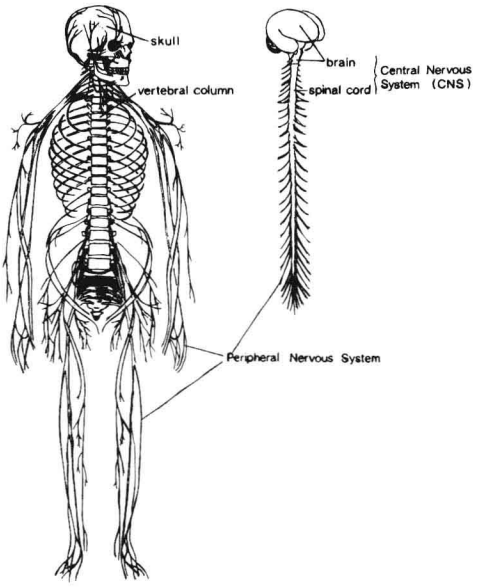

FIGURE 1–2 Central and Peripheral nervous systems. From G. Dunkerley, *A Basic Atlas of the Human Nervous System.* Philadelphia: F. A. Davis Co., 1975. Reprinted by permission.

right hemisphere. The dominance is functional, not anatomical, although the left and right hemispheres have some structural differences (LeMay and Geschwind, 1978). Consequently almost all right-handed and most left-handed individuals have left hemisphere dominance for speech and language activities.

Although the left hemisphere is generally accepted as having a preponderant role in verbal functioning, the nature of the relationship between cortical areas and function is less agreed upon. Much of the early work on localization of function was based on postmortem data. Patients with disorders due to nervous system impairment were evaluated, and their brains were examined after death in an effort to correlate behavioral characteristics with specific sites of lesion. More recently cortical mapping by electrostimulation (Penfield and Roberts, 1959), regional blood flow studies (Ingvar, 1976; Lassen, Ingvar, and Skinhoj, 1978), and large sample missile wound investigations (Luria, 1970; Russell & Espir, 1961) have been primary sources of new data. Surprisingly investigators utilizing comparable subject populations and similar behavioral measures have not reached agreement on the specificity of cortical representation of function. At one end of the spectrum are those researchers such as Geschwind (1965) who suggest that constellations of language impairments can be accounted for on the basis of circumscribed lesions. At the other end of the spectrum are investigators such as Bay (1967) and Schuell, Jenkins, and Jimenez-Pabon (1964)

who suggest that language impairments have limited, if any, localizing value.

With such incompatible conceptualizations of functional specialization of the dominant hemisphere, how is it possible to generate a principled account of topographic representation which can serve as scaffolding for descriptions of speech and language deficits? A place to begin is by noting the dynamic characteristics of cortical activity. The brain is continuously active. The level of excitation and extent of heightened activity is determined by the processing demands of the task (Lassen et al., 1978). Additionally as Lenneberg (1975) has noted, the brain has such a complex anatomical connectivity that no part is isolated functionally from all other parts. A lesion will not destroy a particular cortical area and its corresponding function but will deform the normal pattern of interaction of a whole network of activities. Damage to the dominant hemisphere, according to Lenneberg, will produce disturbances on a variety of tasks and will usually affect some more than others, depending on the site and extent of lesion.

A topographic representation of the brain requires that the dynamic aspects of its processing activity be considered. Localizing cortical representation and specifying locations of damage that cause altered activity are two different tasks; an attempt will be made, however, to define a middle ground between a strict localization of function viewpoint and the theories that suggest relative equipotentiality of the cortex.

A lateral view of the left hemisphere is presented in Figure 1–3. Structural landmarks are identified for each of the lobes. It is generally agreed that the occipital lobe mediates vision, the postcentral gyrus of the parietal lobe mediates muscle and skin senses, the precentral gyrus of the frontal lobe subserves motor activities and portions of the temporal gyri mediate audition. Large areas of the left hemisphere do not perform specific sensory or motor functions but are given over to detailed sensory analysis, motor

FIGURE 1–3 Lateral Aspect of the Left Cerebral Hemisphere