

# STROKE

AND ITS

## REHABILITATION

edited by  
SIDNEY LICHT,  
M.D.

contributors



**STROKE**  
*and its*

**REHABILITATION**

*Edited by* **SIDNEY LICHT, M.D.**

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## Preface

Quite a few knowledgeable physicians have said, and some still say, that once a person is stricken by apoplexy, he will die if coma lasts for days, and that if he survives without loss of consciousness, there is little anyone can do that vital forces will not do as well; that recovery will depend more upon the nature of the lesion and its natural history than on the efforts of a team of dedicated, trained and experienced health professionals; that when they have exercised their skills, the rehabilitated patient is too often seriously disabled and marks time in a chair, or bed, waiting for a terminal episode while being waited on.

These beliefs may be valid for some stroke victims, but even if they were true for most hemiplegics, there are those others who regardless of their number are entitled to the same expenditure of effort, invention, intervention and compassion as those with hopeless cancer and those bedridden for life with incapacitating heart disease.

Stroke does not have the heart-tug of cerebral palsy or muscular dystrophy with their carefully selected poster-children for display on television or in the market place but stroke does have a greater impact on family life than either of these. Stroke often deprives the family of its bread winner or bread baker yet stroke has not had a good "press". The sufferers look too old to be beautiful, too unhappy to make a good poster, too embarrassed to be on public display.

Stroke is a common disease and has been so for a long time. In 1861, Mushet of London published a *Practical Treatise On Apoplexy* in which he stated that among the 2,803,989 residents of London, the apoplexy rate was 52 per 100,000. A century later, the apoplexy death rate in the U.S.A. among adult white males was 72 per 100,000. In each year of the seventh decade of this century more than 200,000 people died of stroke, but in each of those years more than 2,000,000 Americans were alive after at least one stroke.

Stroke is an expensive illness. It shuts off income (if the victim was gainfully employed), usually for the rest of life. Since the onset is often associated with grave symptoms and signs, the medical and hospital charges during the first month may wipe out the life savings of low income earners and saddle the family with bills which will continue to mount when the patient returns home, unable to work and often in need of a "sitter" or re-

quiring some income-earning member of the family to remain at home as an attendant.

The hemiplegic who loses all or the greater part of his physical independence has a right to be unhappy not only because of his helplessness but because he is a burden to others as well. If in addition he is aphasic, he cannot express his concerns, cannot apologize to or thank others for their trouble and this saddens him further. It may be called "fortunate" that in some patients mental deterioration is so advanced that the patient is unable to worry about such niceties. Some patients who were fastidious before their illness will drool or become incontinent and this makes them more miserable. What was a loved father only a short time ago may become a "dirty old man". A significant number of wives and families resist suggestions that they accept once more the hemiplegic into what was his home. He contributes nothing to the operation of the household, he cannot be left alone, bedrooms and furniture must be rearranged, he may become "another person". The family does not always know how much he understands. They must be careful not to upset him by letting him know how much he has disrupted their lives. If the victim was deeply loved before the attack, if the home is architecturally adequate and the income sufficient, the patient is welcomed back into the bosom of the family. When this happens, it is a "break" for the patient for he will probably live a little longer than he would have at a nursing home. In most instances he will be happier in familiar surroundings, in the warmth of a family setting. But the gamut of disability is broad and varied. At least one-fourth of the hemiplegics who return home, are not only not a burden but may contribute to home and family life. It is for these at least that rehabilitation is worthwhile, for these that a book such as this is offered. There are many books about stroke and several books devoted in whole or in part to stroke rehabilitation, but we know of no book which tries to cover hemiplegia from "beginning to end".

The chief purpose of this volume as with the others in this series is to present under one cover as much as possible about the (title) subject as a resident in physical medicine and rehabilitation will need to know for patient care and as a source of references for further study. As in the past, we have included information which may seem tangential but which we believe the young physician should have for the trouble of turning these pages.

A resident physician cannot prescribe a rehabilitation program for the stroke victim without a working knowledge of what is contained in the early chapters. He should know about the natural history of the disease so that he may know what events are likely to occur and prevent them if possible. By knowing what may happen to the untreated patient he will have fewer surprises. A review of the pathology of stroke will explain in part the clinical picture with respect to symptoms and signs. Such information will

make examination more meaningful and diagnosis more accurate. The chapter following that on pathology is on examination and diagnosis and was written by a neurologist since the disease is a manifestation of nerve tissue deficit. The physiatrist should master the neurologic examination before he perfects the physiatric examination. Since the neurologist plays an increasing role in the management of early stroke, we asked a neurologist to outline the management of the patient from the time of admission through the period of definitive care.

The one professional person who sees the patient most often is the nurse. The role of the nurse has changed markedly during this century. This is less surprising if we consider how long it has been since the founding of professional schools. The first medical school was established before the year 1000 A.D. The first school of nursing in the U.S.A. was established in 1873. A new profession is likely to grow more rapidly than a long-established discipline. As the twentieth century began, the nurse did many menial chores of housekeeping and patient hygiene. By 1975, nurses were taking histories, performing some diagnostic procedures, suggesting therapeutic measures to physicians, and in emergencies, administering treatment including life-saving acts. The nurse who qualifies as a physician's associate may be delegated some of the responsibilities which the law has reserved for physicians. Nurses have developed specialties beyond the early distinction of surgical nurse and public health nurse. There are now neurologic nurses and rehabilitation nurses. Fortunate is the hospital that has one or both of these categories to care for stroke patients, the former for the first days after onset, the latter for the coordination of the rehabilitation efforts. As will be evident from the chapter on nursing, much of the comfort and safety of the patient depends upon the training and commitment of the nurse.

The chapters which follow that on nursing discuss the principles and practice of rehabilitation medicine by disciplines. In order to stress the importance of their interrelationship, the editor has introduced those chapters with a brief overview of the team and the disciplines represented.

We have been criticized in the past because a chapter on physical therapy was assigned to a physician rather than a therapist. We anticipate even greater criticism in this volume, for in addition, the chapter on occupational therapy was written by a physician. We have made our position known before and we shall repeat it here. The resident in physical medicine and rehabilitation should know as much about the principles and practice of physical and occupational therapy as any of its practitioners. The resident is more likely to read a discussion on these subjects by a physician, particularly a certified physiatrist. We want the resident to read about these subjects.

A textbook should tell its reader about the universally accepted but also



about methods which are used less frequently but which have a scientific, or reasonable or attractive rationale whether they "work" or not. These concepts should be presented fairly and honestly. That means some indication of the justification offered by proponents but also an indication of shortcomings, particularly in the substantiation of claims. It is not enough for a new treatment to be physiologically defensible; if the proponent infers or proclaims its effectiveness, the claim should be documented with a controlled study, naming clinical findings at the beginning and the end of a series of treatments, objectively. Soon after WW II, physicians and therapists announced schemes of treatment in hemiplegia based on neurophysiology both normal and abnormal, particularly with reference to facilitation, inhibition, positioning, reflexes, passive and active motion. This form of treatment is physical and usually administered by a physical therapist. We invited a clinician who is also a neurophysiologist to present this subject. Some readers might ask, why devote more lines to this subject than any other. They deserve an answer; here it is.

The practitioners of these methods are loyal followers of the principal proponents; notable among them are the names of Kabat, Bobath and Brunnstrom. Each of these (and others) has written enthusiastically and seductively about their method. Each has referred to some venerable scientific names and studies. Each has attracted adherents who have unfurled and waved the banner of their sect amid so many claims and counterclaims, that even though the number of rehabilitation centers which practice (usually only) one of these methods is very small, the advocates are so vocal, and above all sincere, that we have considered it important to lay the facts before readers to make up their own minds. We believe ours is the most scientific and comprehensive survey of the field available.

Another area of treatment which was resurrected a little later than that of facilitation therapy is the use of electricity in producing externally activated muscle contractions to aid the function of disabled limbs of hemiplegics. Again, this is a procedure used on exceedingly few of the world's hemiplegics but because it is of interest at the time of writing, an appendix is devoted to it.

Although the mechanical aids most frequently used by hemiplegics are canes and braces, the next most helpful for mobility in otherwise restricted stroke patients, is the wheelchair, and thus, in our opinion worthy of a chapter describing its attributes and use.

For many years, occupational therapy was practiced as just another arm of kinesiotherapy, the improvement of function by meaningful motions used in the arts and crafts, and it continues to be used that way, but something new has been added: the testing and attempts at improvement of perceptual problems, so important in patients with sensory disturbances. The chapter on occupational therapy is followed by one on communication.

For many patients, the ability to walk again is the primary desire, for others it is the return of hand function but for the more intellectual patient, to regain the loss of vocal expression is the most cherished desire. The chapter on testing and retraining the communications system is realistic in that it recognizes the magnitude of the problem and the difficulty of restoring speech.

The attitude of the patient is often decisive. Fairly often, especially early in the disease, he will cry. And, if he is depressed he is less likely to participate actively in his rehabilitation. His attitude will be influenced by many factors, some recognizable and others obscure. We invited an experienced clinician to write on the mental barriers to stroke rehabilitation. He promised to deliver a chapter by a mutually accepted date. When that date arrived, he asked for a delay of a month. He did this so many times that we finally realized that he did not intend to honor his commitment. This experience was as new as it was frustrating to the editor who hastily reviewed some of the recent literature on the subject and made a synopsis of it in the belief that some discussion of the problem was mandatory in a book such as this, and that it was not fair to the other contributors to postpone the release of the book for the length of time it would take to obtain an expert presentation.

Just as the nurse is usually the first to see the patient in the hospital, and perhaps save his life, so the social worker is often the last to see the patient before discharge and make his future worth living. The chapter on social work may surprise some readers with the scope and contributions of the social work service to stroke rehabilitation success.

What are the possibilities and potential for stroke rehabilitation? Many have the clinical impression that the following point to a poor result: old age, bilateral involvement, dementia and hypertension. On the other hand, early return of individual movements is one of the most promising signs. The question has been researched by many physicians and scientists. We invited one of the leading investigators in this field to interpret and summarize his studies. Some of these conclusions have not appeared in print previously.

People over 65, in good health, experience difficulty in finding a job. In fact, it has become customary for employment agencies to name 40 as the dividing line between young and old job candidates. Almost all stroke victims are over 40 and a majority are over 65. If previously self-employed, some may resume work; otherwise their chances are indeed slight, but for those under 50, the picture is brighter as the final chapter explains.

At the end of the book there is a Glossary of some terms used among workers in stroke-hemiplegia. Most of these terms may be found in one dictionary or another, but some may be too new, too unimportant or too local to be found in the usual places.

In 1968, it occurred to some stroke survivors, their physicians and friends to originate "stroke clubs", a joint venture for those who could find greater acceptance among others with a similar handicap than among the able-bodied. The idea which began in Galveston, Texas "caught on" and spread to other cities. Each physician who has a stroke victim under his care will decide for himself whether his patient might profit from such an experience. The local chapter of the American Heart Association will know the address of the nearest club.

There are many fine texts on stroke and its rehabilitation. Virtually all of these published before 1974 are mentioned in one of the chapter reference lists. In addition, there is the fine journal called *STROKE*, published six times a year by the American Heart Association which also publishes a concise but excellent survey of stroke theory and practice under the title of *Stroke. Modern Concepts of Cardiovascular Disease*, which is available on request.

There are many publications for use by the patient or his family. Some of these such as *Strike Back at Stroke* are available from the U.S. Government or the local branch of the American Heart Association. There are two others which we believe deserve special mention. There is a small book called *Care of the Patient with a Stroke* by Genevieve Waples Smith, a nurse whose husband suffered a stroke. In Great Britain there is an excellent, somewhat smaller book by three occupational therapists, Misses Jay, Walker and Ellison, called *Help Yourself*. Each of these is on different aspects of convalescent and home care, and each is worth recommending to the relatives of patients.

As always our books are the result of the combined efforts of many people. As always, inexcusably, we shall probably forget to mention the names of several persons who helped in the organization, writing, editing and production of this volume. Memory is a traitor.

Doctor Herman L. Kamenetz has supplied not only two chapters but many suggestions for this book. Parts of the typescript were read by Doctor Thomas P. Anderson of Minneapolis, Doctor Carl V. Granger of Boston and Doctor Thomas F. Hines of Wallingford, Connecticut. Several chapters were reviewed by Miss Mary Eleanor Brown of Morro Bay, California as well as by Miss Bridget Duckworth of Vancouver, Miss Wenona Keane and Mr. J. C. Langridge of London, England. Doctor A. Barham Carter, Consultant Neurologist to the Ashford Hospital, Middlesex, England reviewed the entire book. Elizabeth Licht copy-edited or proofread each chapter. To these and all others who helped bring this volume to fruition, my thanks.

SIDNEY LIGHT, M.D.  
Coral Gables, Florida  
November 1, 1974.

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## CHAPTER ONE

# *Brief History of Stroke and its Rehabilitation*

SIDNEY LIGHT

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### THE WORD

THE short, harsh-sounding word *stroke* is well suited to describe one of the most sudden, unexpected and dramatically disabling diseases. Other words which have been used synonymously include apoplexy, cerebrovascular accident (CVA), cerebral embolism, cerebral hemorrhage, cerebral infarct, cerebral thrombosis, hemiparesis, hemiplegia, ictus, paralysis, paraplegia and shock. It has also been called subarachnoid hemorrhage, subdural hematoma, transient ischemic attack (CIA) and little stroke. Certain uncommon forms may bear the name of a physician, for example Gerstmann's syndrome. Common to many languages is the word apoplexy derived from the ancient Greek verb which meant to strike with violence. The spelling is different in Italian, Russian and Spanish but in these and many other languages, the word begins with *apopl*. Just as apoplexy is the more erudite-sounding term in many languages, the common word is frequently a translation of stroke. In the middle ages, expressions were frequently used to indicate a superhuman origin. Because it seemed to some observers that the patient looked as though he had been struck by lightning, old medical terminology included such usage as *ictus attonitus* or *ictus sideratio*, stroke from lightning or the heavens. *Ictus* is the past participle of the Latin word meaning to strike. And, because of the association with heaven, the word stroke was used by some as an abbreviation of "stroke of the hand of God". The word stroke can be traced to the middle English *strac* and the German *streich*, each with the same semantic base as the Greek *apoplexein* (75).

## ANCIENT PERIOD

Brain damage is only minutes older than the brain. When man first roamed the earth, he fell from rocks and rocks fell on him. Stroke becomes more frequent with advancing years. In view of the number of old people mentioned in the Old Testament, we might expect to find mention of stroke there. But the Bible is short on discussions of diseases and cures, and even if it did mention stroke, scholars would argue about the meaning and translation of such words. The modern Hebrew word for stroke is *shavaz* (95). This word does occur twice in the Old Testament but is translated in the King James Version as *anguish* and by Martin Luther as *angina*. The Lexicon of the Old Testament by Brown-Driver renders the word as *cramp* or *confusion*. Professor Eli Eytan (35), a leading biblical scholar, is convinced from the context (I Samuel, 25, 38) that *shavaz* cannot be accurately translated as stroke.

The ancient Greek medical writings predate the writing of the Old Testament. They applied the word apoplexy to sudden loss of consciousness, and loss of motor power. They did not always differentiate between stroke and similar clinical pictures, any more than did some physicians for the next thousand years. Hippocrates (19) in his *Epidemics* described a patient with convulsions, paralysis of the right arm and loss of speech in what Garrison (67) believed was the first written description of aphasia. Hippocrates mentioned apoplexy several times in his<sup>1</sup> Aphorisms (47). "Persons are most subject to apoplexy between the ages of forty and sixty". (We must remember that the average life expectancy in that era was considerably less than forty and that diseases of older people were seen far less often than now.) Most familiar of his aphorisms on stroke was the pessimistic statement that moderate attacks were difficult to cure and severe attacks impossible to cure (47). Since there were virtually no autopsies, the cause of disease was usually a guess, acceptable to contemporaries because the challenger would have to come up with something more plausible, and this was not easy in the face of "authority". Hippocrates listed several causes of apoplexy but most were related to heating of the vessels of the head which attracted a flow of black bile to the head (19). Of course, if any one dared to open the skull of a dead apoplectic, he might find a collection of something not too unlike "black bile".

Galen, second greatest name in the history of physicians, believed that all voluntary power and sensation were derived from the brain and that a total abolition of these functions indicated a brain lesion (67). But apoplexy as we know it was a pathologic mystery until Wepfer. Hippocrates recog-

<sup>1</sup> According to Doctor A. Barham Carter, Hippocrates borrowed the word apoplexy from non-medical Greek in which it apparently meant astonished, thunderstruck or bereft of one's senses.

nized moderate and severe forms of apoplexy. Galen, who enjoyed classifying things medical, divided the disease into four varieties according to how severely respiration was affected.

Aretaeus believed that in apoplexy there was a diminished supply of blood to the brain (67) but failed to convince his contemporaries. Since sudden loss of consciousness can be caused by chemical rather than anatomic lesions, not all patients with "apoplexy" developed or were left with paralysis. Unilateral paralysis was known for some time, but it was Paul of Aegina (67) who first used the term hemiplegia. He also noted that in some patients the power of speech was lost and said that if it did not return in fourteen days the physician should do something about it (19).

The most remarkable of the ancient writings on apoplexy was by Caelius Aurelianus. It is believed by some that he lived in north Africa in the fifth century. Virtually nothing is known about him except his writings but these contain summaries of the medical knowledge of his era. He seems to have been selective and to have recorded statements that appealed to his reason. A surprising number of them appeal to ours as well. It is fortunate that before Latin scholarship paled, Drabkin (2) translated all the known works of Caelius.

"Apoplexy is a sudden seizure, in general without fever, and it deprives the body of all sensation; it is always acute and never chronic. . . . In some cases there is no visible indication before the coming of the attack, but in others there are certain signs that point to this disease, for example, a feeling of heaviness or pain in the head, dizziness, ringing in the ears, difficulty in making accustomed motions, quivering of the parts, words indistinctly pronounced, forgetfulness of what has just been said. . . . Now when the attack of apoplexy comes, there are these signs: loss of voice, coma following the sudden stroke, complete body immobility . . . the pulse is rapid, respiration small and complexion leaden. And there is involuntary weeping.

"If the disease becomes less severe and a recovery is indicated, in the case of patients who had lost all power of movement, certain parts can now be moved with erratic jerks. As a general proposition, some die on the first day, others survive two or three days but the rest are saved. Of the latter, some experience immediate and complete recovery, while others continue to be affected by a paralysis of one or more parts of the body. Again, some experience a small mental disturbance. That is, they either suffer some impairment of their reason, or they seemed depressed and sleepy, and, when aroused from sleep they begin irrationally". Caelius recommended treatment for the condition, and this will be mentioned later in this chapter.

During the dark ages almost nothing of significance was added to the



stroke story.<sup>2</sup> One reason for the end of the dark ages was the beginning of search for truth, and in the field of medicine, this included the desire to examine the bodies of the dead to try to learn why they had died. In the thousand years which followed the death of Galen, there were virtually no autopsies. Then, slowly, clandestinely, bodies were dissected to teach anatomy to medical students and art students. At dissections, departures from the usual were found and pathology was born. But so few autopsies had been reported that when Théophile Bonet (7) collected all known autopsy records of the medical literature he could assemble fewer than 3,000 for his book, *Sepulchretum* (the graveyard). There was no sudden burst of postmortem examinations, but among intelligent young physicians there was a growing desire to learn about the abnormal anatomy associated with diseases.

Johann Jakob Wepfer was born in Schaffhausen, Switzerland in 1620, the year that Francis Bacon published his *Novum Organum*, a landmark in the growth of thinking. The year young Wepfer qualified in medicine, the magistrates of his native town (of which his father was a Councillor) invited him to be the City Physician—a distinction usually reserved for older, experienced physicians. As a condition of acceptance he requested the right to perform autopsies on deceased citizens and this was granted. In 1658 he published his anatomical observations (96) on apoplexy which was reprinted four times during a period of sixty years (Fig. 1). It was a careful recitation of four histories of apoplexy with postmortem findings. In each instance he found cerebral hemorrhage. Wepfer denied the anatomy of Galen (based on the pig and imagination) in which it was stated that the internal carotid after penetrating the skull formed a gossamer of vessels, an imagined “*rete mirabile*”. He could not find it but he did note the anastomoses at the base of the brain which was later called the circle of Willis (even though Willis never claimed to have discovered it). Wepfer boldly stated, “I set forth that apoplexy is produced because the afflux of blood through the arteries is denied to the brain. . . . Anything therefore, which prevents the influx of blood in the brain through the carotids or the vertebral arteries . . . is capable of producing apoplexy. . . .”

Thomas Willis qualified in medicine at Oxford in 1646 at the age of 25. He became a professor of natural history there in 1660 and in 1664 published *Cerebrae Anatome* in which he coined the word neurology and de-

<sup>2</sup> The ages were “dark” in Europe. Classical mainstream Greco-Roman medicine was kept alive, in translation and tradition by physicians in Arabia, but especially Persia (Rhazes, Avicenna, Haly Abbas). Doctor Mohammed Shafii has shared with us parts of his translation of a 1431 A.D. Persian medical manuscript, *Chahar Maqala* which defines *sakta* as a disease caused by the complete obstruction of the ventricles of the brain and the canals of the soul. Of more than passing interest is the fact that the word for apoplexy, *sakta*, means silence also, in both ancient and modern Persian.