

Trends in neurosurgery

WALLACE B. HAMBY, M.D.

Department of Neurologic Surgery

NEUROSURGERY is a branch of the surgical art concerned with the treatment of lesions of the nervous system. American neurosurgery was fathered by Harvey Cushing, whose self-selected greatest achievement in a long and brilliant career as a neurosurgeon was that of learning to "stitch the galea." When that surgical step involving secure scalp closure became routine, the patient's nervous system could be entered safely for whatever surgical treatment was required. Cushing had at his command anesthesia, asepsis, simple roentgenography, and cerebral localization. His skillful employment of these adjuncts for the benefit of patients provided the impetus for the development of a surgical specialty—neurosurgery.

By 1919, Walter Dandy, another great neurosurgeon, had developed pneumoencephalography and ventriculography, technics that enormously facilitated the diagnosing of intracranial lesions, which until then had been diagnosed almost entirely by means of neurology. By 1935, Antonio Egas Moniz of Portugal had developed cerebral angiography to illuminate further the living cerebral anatomy, and particularly to encourage treating cerebrovascular lesions. In 1948, George Moore reported the discovery of a means of demonstrating transgressions of the diseased blood-brain barrier, which led to the development of isotopic encephalography. While these diagnostic adjuncts were being developed, neurophysiologists were using electrodes and progressively more sophisticated electronic recorders to trace with ever finer accuracy the neurologic pathways known earlier only in the gross form. Elaboration of some of the instruments gave rise to stereotactic surgery of the nervous system, to treat neurologic conditions previously out of reach of neurosurgeons.

In 1934, 33 years ago when my neurosurgical career began, between 50 and 75 neurosurgeons served the needs of the country in what was considered an adequate manner. The entity of protruded intervertebral disks had not yet been recognized, and automobile accidents were not yet mutilating and destroying persons in the masses as they do today. A community of about one million persons was considered the size necessary to support a neurosurgeon; subsequently the practice of neurosurgeons spread into the byways of the country. More than 1200 physicians have been certified by The American Board of Neurological Surgery. Perhaps half that many more physicians are in the practice of neurosurgery without having been

certified, and about 480 more physicians are currently in residency training programs. Nearly all of the neurosurgeons in practice consider themselves as being overworked, and a number of them are seeking associates who will help them. Apparently there still is need of more neurosurgeons; this status is in sharp contrast to that of the days immediately preceding World War II when serious consideration was given to limiting the number of physicians who were being trained in neurosurgery, to avoid a situation in which the enforced idleness of neurosurgeons might offer the temptation for them to operate in fields outside their specialty.

Neurosurgery began as a "tumor service." After the first few intracranial tumors were found and successfully removed, general surgeons briefly entered the field with enthusiasm but with little training for managing the specific problems of altered intracranial physiology. Gradually some surgeons specialized in treating lesions of the nervous system; these surgeons were the local fathers of neurosurgery. The study of tumors expanded the existing fund of neurologic knowledge and led to surgical attacks on other neurologic diseases the treatment of which previously was considered to be nonsurgical. This report outlines some of the changes in neurosurgical practice which have occurred at the Cleveland Clinic in the last 20 years, and mentions some of the reasons for them.

In 1946, 123 intracranial tumors were operated upon at the Cleveland Clinic, and in 1965, 82. This decrease reflects the larger number of neurosurgeons now in practice, making it possible for patients to receive surgical treatment in their own communities rather than being sent to distant medical centers. In 1946 the operative mortality rate in regard to patients with intracranial tumors was 28 percent, while in 1965 it was 10 percent. This improvement is attributable to greater surgical experience, better surgical facilities and technics, and to new ancillary therapies, such as dehydrating agents, hypothermia, steroid medication, and anesthetics. It also reflects the increased number of resident neurosurgeons attending the patients, resulting in a smaller service load for each resident, which permits greater attention to be given to the individual patient. Several phases in the progress of neurosurgery are indicated in the following comparison: in 1946, 20 percent of the craniotomy patients at the Cleveland Clinic Hospital required early postoperative reexploration of their surgical wounds, whereas in 1965, only 10 percent needed second procedures.

The effect of local availability of neurosurgical care is revealed in several other statistics. Operations for trigeminal neuralgia declined from 41 to 24 per year in the 20-year period. Twenty-eight tumors of the spinal cord were operated upon in 1946, and 11 in 1965. In 1946, two intracranial aneurysms were approached intracranially; whereas, 18 were operated on in 1965. This increase reflects not only the improvement in diagnosis

through the perfection of cerebral angiography, but also the greater awareness by physicians of the significance of subarachnoid hemorrhage.

In 1946, five prefrontal lobotomies were performed for mental disease. The popularity of the operation for several years was so great that in 1950, 31 of them were performed. In 1965, three lobotomies were performed—a decrease due to the introduction of new drugs into psychiatric therapy in the last 15 years.

Early experimentation with stereotactic surgery showed that its greatest clinical effectiveness would be in the treatment of parkinsonism. In 1956 at the Cleveland Clinic 23 cases of parkinsonism were surgically treated, in 1964, 79 cases, and in 1965, 27 cases.

Hydrocephalus has been a problem for surgeons since early times. With the development of plastic materials tolerated by tissues, methods were devised for the successful shunting of cerebrospinal fluid out of the cerebral ventricles into extracranial absorbing areas. In 1947, nine such operations were performed, and now each year about 30 cases of hydrocephalus are treated by shunting.

Surgery of the sympathetic nerves has declined sharply in frequency because of improved medical methods for treating arterial hypertension. In 1947, 236 sympathectomies were performed, and in 1965, 31. The improvement in vascular surgery has reduced the need for such operations upon patients having both cervical and peripheral vascular disease.

Cordotomy for the relief of body pain has had an interesting course at the Cleveland Clinic. The effects of the operation are worthwhile, permitting patients who are pain-ridden, usually because of malignant tumors, to live out their lives in relative comfort. In 1946, 17 cordotomies were performed by the standard method through a two-level laminectomy. The operation was rather extensive under the usual circumstances, and carried a 17 percent mortality toll. In 1959, only nine patients underwent the operation. A new, less traumatic technic was devised, and in 1965, 36 cordotomies were performed; there was only one operative death. My associates are now exploring and employing the percutaneous electrolytic technic. Technics are now being developed for a transdiscal approach to permit the second-level incision to be made at a lower cord level on one side.

Another innovation—hypophysectomy—has been developed in these 20 years, for the treatment of pain of hormone-dependent malignant tumors. The first Cleveland Clinic Hospital surgical hypophysectomy for cancer was performed in 1952, and 10 patients a year were so treated during the next 10 years. The technic of destroying the pituitary gland by transnasal implantation of radioisotopes, chiefly yttrium⁹⁰, and later by the cryogenic probe, was added to our armamentarium in 1963. This more benign approach has been so well accepted by patients and their re-

ferring surgeons that approximately 85 patients a year have been operated upon since 1962.

The outstanding neurosurgical discovery of the last 35 years is the entity of intervertebral disk protrusion. The recognition of this widespread disorder has largely made possible the expansion of the number of neurosurgeons to its present number. In 1946, 68 patients with intervertebral disk protrusions were operated upon at the Cleveland Clinic Hospital; in 1965, 185 patients were so treated.

In contrast to the recognition of the lesions affecting the lumbar spine, the recognition of the cervical disk protrusions developed slowly. In 1945, lumbar disk protrusions were diagnosed and operated upon six times more frequently than were those in the cervical region. By 1960, one fifth of the lesions were in the cervical spine, and by 1965, the proportions increased to one fourth.

Initially, cervical disk operations were done only via laminotomy, to remove free disk fragments from beneath nerve roots. Cervical nerve-root compression more frequently results from bony proliferation of the so-called spondyloses than from freely protruded disk material. Then, the anterior, transdiscal approach to the spinal canal was developed, and in 1960, 25 percent of the cervical disks were so approached; in 1965, 70 percent of the operations were performed by this technic.

The question has often arisen concerning the desirability of fusing the spine at the time of removal of the lumbar disk protrusion. In 1946, of 58 patients operated upon, 9 (15 percent) underwent fusion of the affected spinal levels. Later, interbody fixations were performed almost routinely after removal of disk protrusions. In 1956, of 157 patients, 87 (55 percent) were so treated. The effects of this more complicated operation were so unproductive that by 1965, of 135 patients only 10 (7.9 percent) were treated with fusion. From these figures it appears that spinal fusion after removal of lumbar disk protrusions should not be performed routinely, but only in a small number of selected patients whose spines are so unstable that they should undergo fusion at the time of the primary operation.

CONCLUSION

Neurosurgery is primarily an art, and as such it serves the individual patient. The science of neurosurgery is developing steadily, as experience increases, as there is improvement in skill and technics, and as our knowledge concerning the nervous system broadens. The goal of neurosurgery remains that of curing or alleviating the neurologic disorders of patients.