A neuropathologist's perspective on the celebration of the 2000th operation of Harvey Cushing

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Dr. Harvey Cushing was one of the founding fathers of modern neurosurgery in the English speaking world along with William MacEwen and Victor Horsley. Of this triumvirate, Cushing had not only the most impact in neurosurgery, but he also exerted lasting influence upon all the clinical neurological sciences. I shall restrict my remarks to certain aspects of his creative personality, and more specifically to his great influence upon the field of neuropathology. I shall also briefly mention the clinical history and results of his 2000th operation, and finally I will relate a few enlightening anecdotes told me by his associates and colleagues after he joined Yale University in 1933 as Sterling Professor of Neurology.

Contributions on Brain Tumors

We can better appreciate Dr. Cushing's contributions by temporarily placing ourselves in the beginning of this century. There were virtually no guidelines in neurosurgical operative techniques. Control of hemorrhage, prevention of infections, and prognosis for neurosurgical patients was essentially a guessing game, especially since the pathology of the tumors of the central nervous system was for all practical purposes unknown. Most pathologists used Virchow's classification of brain tumors, which was based upon a combination of gross and microscopic observations. Virchow discriminated between soft, cellular, medullary, hard, fibrous, and teleangiectatic gliomas. In addition to the gliomas, he accepted the existence of myxomas and sarcomas of the brain. However, these terms had a totally different meaning than they do today as is evident by Virchow's own descriptions. "If the network increases and accumulation of slime material occurs," he stated, "so we have a transition of a soft glioma to a myxoma; if, however, the cells increase in number, so that the network becomes narrow, we are faced with the appearance of a true medullary glioma which in turn can be transformed into a medullary sarcoma." Such ideas of Virchow dominated pathology, while Harvey Cushing was helping to create a new discipline, neurosurgery. Little attention was paid by the scientific community to a small paper published in 1910 by Ribbert on the derivation (Ableitung) of the neuroepithelium and glioma, in which the author discussed for the first time disturbances of the histogenesis of the neuroepithelial tissues. These humbly stated ideas culminated in an excellent paper by Ribbert in 1918 on spongioblastoma and glioma, in which the author takes into consideration histological as well as histogenetic factors. At the same time, Strauss and Globus published independently their own observations on fast-growing brain tumors, which they called spongioblastomas.

These papers, however, were two isolated instances of the progress in the understanding of brain tumors. The term "glioma" was a generic name in Dr. Cushing's time, and indicated for all practical purposes merely "a brain tumor." Cushing, however, had the insight to recognize the intellectual poverty of this classification and was very unhappy about this designation. He and Bailey stated "we are at a loss to know how it could be that a patient from whose cerebellum a large tumor diagnosed 'glioma' was removed as long ago as 1906, might prove to be living and well, and the father of a family and a wage earner 19 years later, whereas another patient from whom a 'glioma' happened to be removed in like fashion, supposedly in its totality, might survive for a scant six months before a rapid recurrence took place."

The setting in Peter Bent Brigham Hospital was perfect to solve such questions. Cushing was a dynamic and tireless neurosurgeon with excellent and voluminous material, and was also totally dissatisfied and frustrated with surgical pathologists. He had by that time his own laboratory and attracted associates like Percival Bailey and Louise Eisenhardt, who helped him skillfully to unfold the pathology of the brain tumors, enabling prognosis to be made on a sound basis. In 1926, Bailey and Cushing published the monograph "A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis." This was one of the most fundamental monographs, since it represented the first serious attempt to classify brain tumors on a histological basis, and correlated the life history of each
type of tumor. Research on brain tumors may be
classified historically into two major periods, before
and after this publication. Over 50 years have passed
and one may have justifiable disagreements as to the
importance of histogenesis in the delineation of the
different types of gliomas. Yet the different groups of
gliomas, such as astrocytomas, oligodendroglialomas,
glioblastomas, and medulloblastomas, as classified by
Bailey and Cushing, survived as operative entities.
Additional classification has been proposed, yet these
are but variations and modulations to the theme set up
in Cushing's department.

There is still an ongoing debate about Cushing's
real contribution to the monograph on the classifica-
tion of the tumors of the glioma group, and doubts
are still expressed, in all probability with some truth,
whether Cushing was himself skillful with the
microscope. It is important, however, to keep in mind
that the excellent neurosurgical material was his as
well as the meticulous postoperative observations,
clinical follow-up reviews, and postoperative sur-
vivals. He was, in addition, very unhappy with the
pathological generic diagnosis of "glioma," as already
stated, and most certainly was not inhibited in clearly
expressing his dissatisfaction and frustrations to all
around him, clinicians as well as pathologists. That
clarity of expression was related to me on numerous
occasions by the late Louise Eisenhardt.

The monograph of Harvey Cushing with Louise
Eisenhardt on Meningiomas: Their Classification,
Regional Behavior, Life History, and Surgical End
Results is correctly regarded as Dr. Cushing's greatest
clinical monograph. This study was commenced in
1915 and it represents over 20 years of meticulous and
scholastic work. In the foreword on meningiomas,
Cushing wrote that his monograph on "the tumors of
Nervus acusticus" was an outgrowth of the present
work on meningiomas, since the eighth nerve tumors
were thought at first to be of meningial origin. On
numerous occasions Louise Eisenhardt stated to me
how much Cushing liked his investigations on menin-
giomas. Yet, he was very critical of his own favorite
research subject. He stated that fine histological
differences in the various types of meningiomas,
although very important from an academic viewpoint,
had little influence upon the clinical treatment.

Harvey Cushing was an innovator and in many
aspects much ahead of his time. Very little is men-
tioned and few details are available on the introduc-
tion of tissue-culture techniques under the stimulus of
Harvey Cushing in his laboratory for the investi-
gation of brain tumors. Buckely, one of his associates
in the late 1920's, reports that the tissue-culture
method in Cushing's service was "part of the examina-
tion of each brain tumor." And Kredel, another
associate, stated that one of Harvey Cushing's in-
terests was to find out "whether the primitive me-
dulloblast could undergo differentiation into both
spongioblasts and neuroblasts." The technical dif-
ficulties in tissue culture at that time were immense
and only short-term cultures were accomplished. Yet,
for the first time, successful culturing of glioblas-
tomas, medulloblastomas, astrocytomas, meningio-
mas, acoustic tumors, and metastatic tumors was
reported from Cushing's laboratory. Thirty years later
tissue cultures were reintroduced in the investigation
of brain tumors, long-term lines of tissue cultures were
established, and at the present time in major medical
centers as Boston, New Haven, and San Francisco,
tissue-culture techniques are used in the investigation
of brain tumors. But it was in Harvey Cushing's ser-
vice that these investigative approaches were initiated.
These are but a few selected examples of the creative
accomplishments undertaken under the aegis of
Harvey Cushing and their impact upon neurological
sciences.

Cushing's 2000th Operation

The film of Cushing's 2000th operation to be shown
today was taken while he was operating on a 31-year-
old woman who was admitted with the chief complaint
of headaches, visual disturbances, and cessation of
menstruation. On x-ray examination an enlarged sella
turcica was found. In addition, the patient had
acromegalic features. Cushing performed a right
transfrontal exploration exposing a large, soft
adenoma of the pituitary gland, which was radically
extirpated by suction and subsequently verified by
Louise Eisenhardt as a chromophile adenoma. The
convalescence was not especially eventful, although
the patient complained of various discomforts, and
she was discharged on May 7, 1931; at this time she
perceived full visual fields.

Cushing was very much interested in his patients
and in the follow-up period of the patients operated
upon by him. In the Brain Tumor Registry at Yale,
Cushing's extensive correspondence with his patients
and their physicians is attached to each individual case
history. An example is the following letter written by
Dr. Cushing regarding the case celebrated today:

Jan. 12, 1932

Dr. E.D. Friedman,
1197 Park Avenue
New York, N.Y.

Dear Dr. Friedman:

Your patient, I.H., has been back here for the
3rd time complaining bitterly of her headaches
from which she was free for a period of 3 months
after her operation.

It is quite possible that this may be due to an
early recurrence of her chromophilic adenoma
and the fact that Dr. Sosman found the sella
turcica slightly enlarged over his former
measurements points in this direction. However,
her fields of vision are now unimpaired whereas