William Osler and "the special field of neurological surgery"

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Harvey Cushing's paper, "The special field of neurological surgery," published in the Bulletin of The Johns Hopkins Hospital in 1905, constitutes a recognized milestone in the establishment of neurological surgery as a separate surgical specialty in the United States. The main point the author wishes to make here is that the very special friendship of Sir William Osler, influencing, encouraging, stimulating Cushing at the particular time that it did (1901 to 1905), was probably the primary positive influence that made it possible for Cushing to achieve specialization in neurological surgery and to make his considerable contribution in this field.

KEY WORDS • William Osler • Harvey Cushing • neurological surgery • specialization • history of neurosurgery

Neurological surgery began as a special branch of surgery in the latter part of the 19th century as a result of a number of discoveries in medicine, especially the adoption of Lister's principles of aseptic surgery and the development of clinical neurology associated with the rise of the great schools of neurology. Cushing himself recognized that the foundation of neurological surgery rests on the work of Victor Horsley in England and Sir William MacEwen in Scotland.

In the United States, Harvey Cushing was the preeminent figure in the development of neurological surgery, along with Charles Frazier and Charles Elsberg. Moreover, Cushing went further than the earlier great British and continental neurosurgeons in that he was the first to limit his practice to neurological surgery. Of perhaps greater significance is his development of a school of neurological surgery which eventually would attract surgeons from abroad to work in his clinic, making him, according to Cairns, "the father of modern brain surgery."

When neurological surgery actually began in America is difficult to pinpoint. The specialty was probably established with Cushing's paper, "The special field of neurological surgery," published in March, 1905 (Fig 1). Indeed, this subject was significant enough that Cushing revisited the "special field" with addresses "... five years later" in 1910 and "... after another interval" in 1921. Some observers stated that Cushing established neurosurgery as a specialty in the United States in 1908 with the publication of "Surgery of the head" in Surgery, Its Principles and Practice, edited by Keen, who coincidentally proposed the subject to Cushing in 1905. Cushing later stated that the original 1905 paper was written shortly after his decision to limit his surgical work to the nervous system. In this paper, Cushing described the pitfalls of the then common practice of the neurologist calling in an "operator," a surgeon who had little knowledge and perhaps less interest in the problem at hand. Cushing felt that those who focused their studies in this particular field of neurology should do their own operating. In spite of strong opposition to operative specialization from many of his surgical friends, he believed that this was important.

The 1905 paper serves more as a reference point in time than as a medical landmark. Thus, in a brief period of only 4 years following his year abroad, Cushing had established the specialty of neurological surgery in the United States with its beginning in Baltimore. William Osler played a very significant role in influencing and aiding Cushing in this endeavor. Osler certainly advocated specialization.

Harvey Cushing served as William Halsted's resident from 1896 to 1900. Learning Halsted's meticulous surgical techniques uniquely prepared him to adapt these techniques and others to the new field of neurological surgery. He was able to take advantage of the
Professor's increasing absence from the clinic and the operating room to develop his own surgical skills to a very high degree. Halsted gave his resident a good deal of freedom, and Cushing made the most of it with a high degree of scientific curiosity and almost limitless energy. Cushing also had a giant ego to go along with these other qualities. Finishing his training under Halsted undoubtedly would have led to a number of promising opportunities for a career in general surgery; indeed, an offer was made to him to join the staff at Western Reserve in June, 1900. Halsted actually did nothing to encourage Cushing to embark on a surgical specialty, although he eventually did allow Cushing, albeit somewhat reluctantly, to devote his energies to surgery of the nervous system. Elliott Cutler tells us that Roy McClure, another of Halsted's residents, recalled what took place when Cushing asked Halsted's permission to specialize. The Professor's reply was, "Why, Dr. Cushing, we had only two cases of brain tumor last year!" Cushing persisted, however, and Halsted subsequently said, "All right, the field is yours."

In contrast, William Osler played an all-important role in shaping Cushing's early career as the foremost neurosurgeon of his time. This remarkable friendship has been clearly described in the splendid Presidential Address to the American Osler Society by Jeremiah Barondess in 1984. This friendship has traditionally been credited by Fulton and Penfield for shaping Cushing's interest in the human and cultural aspects of medicine, including medical history, book collecting, and medical institutions, rather than the strictly professional side of medicine. Ebers raised the question, "Did Osler push Cushing into neurosurgery?" The evidence suggests not, but that Cushing made his own decision to specialize in neurosurgery, with Osler supplying many of the key ingredients which paved the way for Cushing's success.

Unfortunately, the most likely source from which one would expect to learn of this connection (namely, the Osler biography) is silent on the subject. As Fulton noted, Cushing left himself out of the book completely. This unnecessary anonymity regretfully leaves a void in the records for the years 1900 to 1905, when Cushing was most closely associated with Sir William Osler. William Welch noted that this was almost unparalleled in a biographer. Dr. William Feindel (personal communication, 1987) noted that this circumstance was similar to the apostle John's veiled references to himself in the "Gospel according to St. John" in the New Testament.

One of the curious aspects of Cushing's career was that his development of neurosurgery at The Johns Hopkins Hospital was not associated with a dominant school of clinical neurology, as was the case in Great Britain, on the continent, and even in Philadelphia, where William Spiller and Charles K. Mills were co-workers and were responsible with Charles Frazier for much of the latter's early neurosurgical endeavors. The

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Fig. 2. Photograph of William Osler surrounded by (from left to right) J. M. Catell, Guy Hinsdale, J. P. Willitts, J. K. Mitchell, G. E. de Schweinitz, Miss C. Dalziel, Mrs. Green, Joseph Otto, Miss J. Dalziel, and two young patients. The picture was taken at the Orthopedic Hospital and Infirmary for Nervous Diseases. (Reproduced from Cushing H: The Life of Sir William Osler. Oxford: Clarendon Press, 1925.)

development of neurosurgery in New York likewise was dominated by a group of prominent neurologists, who invited Charles Elsberg to join them at the New York Neurological Institute in 1909. It was apparent that even as a resident Cushing felt that a surgeon should have the responsibility of acting largely on his own diagnosis, and that he should be impelled seriously to study his own cases before they came to the operating table. This environment was in sharp contrast to that in Philadelphia, where Charles K. Mills considered that "... one of the functions of the neurologist is to superintend and direct operative procedures upon the brain and spinal cord by the surgeon." It was precisely the unique milieu of clinical neurology at The Johns Hopkins Hospital, with William Osler as the dominant figure, that nurtured the aggressive Cushing in his quest for the new subspecialty. George Ebers has clearly demonstrated Osler's place in neurology; moreover, Russell DeJong has stated that the history of American neurology in the latter part of the 19th century would not be complete without William Osler. It was not Osler's position as head of the traditionally prominent clinical neurology service that provided the foundation for Cushing's neurosurgical growth, but rather his counsel and friendship during Cushing's last 2 years as a resident, his year abroad, and those intimate years from 1901 to 1905 when Cushing was a "latchkeyer." Osler is said to have been a spiritual father to Cushing, and to have had a keener understanding of Cushing's own restless nature than almost anyone. Indeed, in their stimulating influence over others to accomplish some good piece of work, Osler and Weir Mitchell had no rivals.

Before discussing neurology in the early days at The Johns Hopkins Hospital, I will make a brief digression for a look at Osler's Philadelphia days which will reveal connections that later played a role in Cushing's development. A favorite photograph from the Osler biography is the picture of Osler at the Orthopedic Hospital and Infirmary for Nervous Diseases, which illustrates in a sense "the complete Osler." He is shown here with attending staff, nurses, and patients — two children possibly with cerebral palsy or chorea, who may have become the subjects of two monographs he wrote during this period. Also shown are open atlases on the table, a skull, and what appear to be fixed specimens of brain (Fig. 2). Osler's appointment to the hospital was secured by Weir Mitchell. Osler was to become intimate friends with Mitchell and with others, including W. W. Keen — the most important 19th century Amer-
ican surgeon to operate with success on the brain. These lasting friendships made in Philadelphia, which will be referred to again later, had special significance for Harvey Cushing. 24

When The Johns Hopkins Hospital opened in 1889, Osler was appointed Physician and Chief of the Hospital. He was in charge of three departments in the outpatient dispensary, one of which was the "Department of Nervous Disease." Working with Osler in this Department was Dr. Henry Thomas, who was appointed Assistant in Nervous Diseases, and who soon began to give weekly clinical lectures. Thomas, the son of a trustee of Johns Hopkins University, was a graduate of the University of Maryland School of Medicine, where his interest in neurology was awakened by Professor Miles. Thomas spent a year in Europe studying in Vienna and working under Wilhelm Erb in Heidelberg; however, he probably learned more neurology from Osler. 1 Thomas admitted that Osler was looked upon as a guiding star of the younger clinicians, and stated that: "What good there is in me as a teacher and physician I owe to him."48 After The Johns Hopkins Medical School opened in the autumn of 1893, Osler gave Thomas charge of neurological training, and Thomas was appointed Clinical Professor of Nervous Diseases in 1896.

Reviewing case reports in the Bulletin of The Johns Hopkins Hospital, the reader gets the feeling that Osler had the final word on the Neurology Service. An example is a case report of a neurological disorder presented to the hospital medical society in February, 1894, which concludes with the statement: "In Dr. Osler's unavoidable absence, I am unwilling to make any definite statement as to the diagnosis in this case."45 Another example is a brain-tumor patient of Dr. Thomas.50 Osler saw the patient on April 10, 1896, "confirmed the diagnosis" of a brain tumor, and advised "pushing the iodide and mercury." The patient, failing to improve, was again seen by Osler with Thomas 3 weeks later, and Osler "urged the operation." Dr. Keen, who was asked to perform the surgery, successfully removed a large left frontal meningioma. Osler and Thomas were present during the surgery, and examined the tumor carefully, "while waiting for the hemorrhage to be arrested." This report illustrates Osler's active participation in neurological cases and, in addition, his appreciation for surgery for certain disorders of the brain.

Osler's recognition of the place of surgery in treating certain disorders of the nervous system becomes clear through his association with Sir William Gowers and Victor Horsley and their work in London. Theirs was probably the leading center of neurology at this time. In August, 1894, Osler spent a few days with Gowers in London.11 He had been a friend of Gowers since 1878. It is interesting that Osler's monograph, On Chorea and Choreiform Affections,34 published that same year (1894) is dedicated to Gowers. During this same visit with Gowers, Osler observed Victor Horsley re-

move a meningioma. Osler had first met Horsley one summer evening in 1878 while Horsley was a student at University College. Probably no other American neurologist had a closer insight into the pioneering work of Horsley than Osler, who followed Horsley's career closely as he became the greatest Hunterian surgeon of his day.42 It is easy to understand why Osler advocated surgical treatment of certain brain and spinal cord tumors, brain abscesses, and subdural hematomas, citing primarily the work of Horsley in the first edition of his book The Principles and Practice of Medicine.39

This was the setting when Cushing arrived in Baltimore in 1896, the same year that Keen operated on the patient mentioned above. Cushing's first formal piece of writing was "Haematomyelia from gunshot wounds of the spine. A report of two cases, with recovery following symptoms of hemilesion of the cord."40 One of the cases had been presented previously to The Johns Hopkins Hospital Medical Society on May 3, 1897. Discussing the case, Dr. Thomas stated: "I know of no case in the hospital records that has been worked up so carefully as this."47 Recalling this experience 25 years later in his Presidential Address to the American Neurological Association, Cushing stated: "The opportunity personally to study for the first time a neurological case, which though a nonoperative one had drifted into and was permitted to remain in a surgical ward, made a great impression on me, and, spurred on by H. M. Thomas and L. F. Barker, with the report of this case I started on my inky way."113 It is significant that, through 1905, Cushing coauthored only one neurological paper with Henry Thomas, and that was on the subject of lesions of the brachial plexus.49 This probably represents his desire to make his own neurological diagnosis. Cushing also had a tendency to omit credit to coworkers, a concern Osler would address later.

In all likelihood, Osler acted increasingly as Cushing's chief stimulus and mentor during the last 2 years of his residency. Osler counseled Cushing regarding an offer from the Department of Surgery at Western Reserve University in 1899 and, along with Welch, encouraged his "young friend" to go abroad for a year of study.29 One incident in particular stands out during this period. In April, 1900, Cushing was requested by W. W. Keen to read a paper on gasserian ganglion resection at a meeting of the College of Physicians of Philadelphia.12 Cushing reported on his surgical technique, illustrated with drawings from four cases of gasserian ganglion resection for trigeminal neuralgia. He had operated on his first case in 1899, barely a year before. As William German noted, "Here we find the young H.C. [Harvey Cushing], not yet five years out of medical school, speaking in the Temple to the Elders in neurology and surgery."35 In addition to Keen, participants included William Spiller, Frances Dercum, Robert Abbe, and Charles Dana. Cushing's paper was brilliant, though a year later Spiller and Frazier would demonstrate that retrogasserian section of the trigeminal root was a superior procedure.46 It is doubtful that Cushing had met
or had any direct association with Keen prior to that meeting. How was it then that Cushing was invited to give this important paper by the then dean of the American surgeons and America’s greatest pioneer brain surgeon? The invitation may well have been initiated by William Osler, whose very warm personal friendship with Keen would have brought Cushing’s work to Keen’s attention.28

Encouraged by Osler and Welch to go abroad for a year of study, Cushing sailed for England in June, 1900.51 It was his intention to give priority to study with men whose interests were neurological, especially Kocher, Horsley, and Sherrington. It was during his first month in England that Cushing first came into intimate contact with Osler. Osler was spending the summer in England “brain dusting.” According to Fulton, Osler must have gone out of his way to include Cushing in many social and senior scientific gatherings he would not otherwise have been included in.29,31 Osler’s interest in Cushing is illustrated in his response, in the spring of 1900, to an inquiry about Cushing by one of his Yale classmates. Osler replied: “Your friend Cushing has opened the book of surgery to a new place.”51

Initially, after arriving in London, Cushing spent only a brief time with Horsley. During this period, he watched Horsley perform several operations on brain and spinal cases. His year abroad was highlighted, however, by his work in Berne under Theodore Kocher. Cushing’s brilliant experiments demonstrating the effect of intracranial pressure on systemic blood pressure had been suggested by Kocher.5,29 This was to be one of the most important fundamental neurophysiological discoveries. Cushing had become interested in Kocher through his original study of his case of hematomyelia of the spinal cord. Kocher was greatly admired by Halsted, with whom he had much in common.22 Cushing then spent a month in Turin in northern Italy in the laboratory of the Italian physiologist, Angelo Mosso, repeating his Berne experiments.51

Cushing returned to England in early July. He had written to Horsley about working with him, but Horsley advised him to visit Sherrington in Liverpool. After spending 3 days with Osler, whose friendship with Sherrington dated from 1894, Cushing went up to Berne. The problem of “Hirndruck” and the relationship between intracranial pressure and blood pressure had been suggested by Professor Theodore Kocher.16

A year later in November, 1902, Cushing returned to Philadelphia at the request of Charles Mills to discuss his paper on brain tumors. Cushing stated: “Little could I have known about the subject. I had had perhaps a case or two at the Church Home and Infirmary, but could scarcely have had any successful cases at the time in question.”29 Following the talk, he was invited by Weir Mitchell, whom he met now for the first time, to come to his home. Cushing spent the evening and into the early morning hours with Mitchell, his son Jack, and W. W. Keen, talking about books and sampling some old Madeira wine. Osler’s Philadelphia connection can be seen again in this professional and social encounter.

Osler assisted Cushing perhaps indirectly in his early endeavors in neurosurgery, but he helped him directly and in a substantive manner by referral of patients. In the Mütter lecture, Cushing described, in addition to his experimental studies, clinical observations of three cases of increased intracranial pressure with medullary failure resulting in death. Two of the cases, including one of a cerebellar cyst, were referred by Dr. Osler.16

In March, 1902, Cushing presented a ninth case of gasserian ganglion extirpation to The Johns Hopkins Hospital Medical Society.8 In discussing the patient, Osler stated: “It is really a difficult thing to get physicians to appreciate the extraordinary benefit of this operation. The doctor under whose care the patient was, consulted me several times about it and it was with some difficulty that I persuaded him to have the operation performed.” In 1903 and 1904, two additional cases of trigeminal neuralgia were referred by Osler to Cushing for surgery. The latter case was operated on by Cushing in Montreal, apparently the first operation of its kind done there.29 The first brain-tumor case that Cushing operated on was one of a tumor in the pituitary region. Referred by Osler in 1902, the patient underwent three operations without the tumor being located, and eventually died.15

One of Cushing’s most important early contributions

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to neurosurgery was his method of subtemporal or occipital decompression for inaccessible brain tumor. This procedure, devised by Cushing, afforded rather dramatic relief for those patients with increased intracranial pressure and failing vision. This method allowed decompression with opening of the dura, and permitted closure such that the wound did not break down with resulting cerebral fungus. Cushing reported 15 cases in 1905. In two of the three examples described in this report, the referring physician was William Osler.

Cushing’s first operation for removal of a benign intradural spinal tumor was performed in November, 1903. Osler’s note of the case indicating his confidence in Cushing is worth quoting: “When the patient first consulted me I suspected cervical caries or pachymeningitis. It was not until after his admission to the hospital, and more careful study of the case with Dr. H. M. Thomas, that tumor was suspected. I urged early operation, feeling sure that the condition would not be made worse.” This tumor, probably a meningioma, was quite rare in those days, and was similar to Horsley’s famous case. This was Cushing’s first intradural spinal cord tumor, and he considered it as perhaps a “once in a lifetime case.” Cushing stated: “Due to the early and unequivocal diagnosis made after the patient’s admission to Dr. Osler’s service, and his prompt transference for operation without the customary period temporizing with antiluetic treatment, the case seems in many respects the most satisfactory of any heretofore recorded.” What better source of referral than from the most eminent and widely influential physician of his time.

Early in 1904, W. W. Keen offered Cushing the Chair in Surgery at Jefferson Medical College. Cushing eventually declined the offer after consultation with Osler. Perhaps more important, however, was the fact that Keen would ask him, in August, 1905, to write the “Surgery of the head” section for Surgery, Its Principles and Practice, which he edited and which was finally published in 1908 (Fig. 3). This represented Cushing’s first systematic treatise on brain surgery, and established him as the leader of the new specialty. By this time, Cushing’s growing reputation was bringing him both students and increasing numbers of patients.

As indicated earlier, Cushing established neurosurgery as a specialty with his paper, “The special field of neurological surgery.” The paper was originally presented to the Academy of Medicine in Cleveland in November, 1904, and was subsequently published in the Bulletin of The Johns Hopkins Hospital in March, 1905. A photograph of Cushing taken at about that time with Halsted and his “All-Star” team is presented in Fig. 4. The theme of the paper, after a review of the status of surgery for various disorders of the nervous system, was the necessity for specialization in surgery of the nervous system. Cushing emphasized that the surgeon should work closely with the neurologist and, moreover, be familiar with all aspects of neurology, and not simply act as a technician to be called in at the last moment by the neurologist. The importance of the 1905 paper is even more obvious in his paper on the same subject 5 years later. In the 1905 paper, Cushing’s discussion of surgery on brain tumors was largely confined to the decompression procedure for temporary relief of symptoms in cases of brain tumor, which were “few and far between.” By 1910, however, he had


FIG. 4. Photograph of the young Harvey Cushing 1 month preceding presentation of his paper “The special field of neurological surgery.” The legend reads: “Halsted’s ‘All-Star’ Team. Standing: Young, Follis, Finney, Cushing, Bloodgood, Mitchell. Seated: Halsted. 5 October, 1904.” (Original photograph is in the Yale Medical Library, New Haven, Connecticut.)
performed some 250 operative procedures on 180 patients with brain tumors. Cushing also noted that other young men were preparing to specialize in neurological surgery.

The sixth edition of Osler's *The Principles and Practice of Medicine* was published in 1905. In the preface, dated May, 1905, just when he was leaving Baltimore and The Johns Hopkins Hospital, Osler thanked Harvey Cushing of the Surgical Clinic along with H. M. Thomas of the Neurological Department for revision of the section on the nervous system. What an acknowledgment of Cushing and of the new specialty for him to be able to contribute his experience to the newest edition of the "most used and useful book in medicine."21

In summary, William Osler was, by his counsel, encouragement, association with influential figures in neurology, and (most importantly) his referral of neurological cases, of paramount importance in Harvey Cushing's development of the then new "special field of neurological surgery." The specialty was established by Cushing at the end of his closest and most intimate association with William Osler during the Baltimore period prior to Osler's departure in May of 1905 to become Regis Professor of Medicine at Oxford.

Finally, Cushing spoke of a particular quality of Osler that to him was especially significant: "... perhaps because of his unusual powers of visualizing disease gained in the post-mortem room, he was far more tolerant than most of his contemporaries in the so-called surgical invasion of the traditional province of internal medicine...; and it has been said of him that few physicians have ever shown better surgical judgement or had a more instinctive and certain knowledge of the proper moment for surgical intervention."21

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