

## Historical Vignette

# The Brigham Diary of Loyal Davis: a portrait of Harvey Cushing and a neurosurgical acolyte

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✓ At 27 years of age, Loyal Davis wrote the Brigham Diary while training as an Associate in Surgery with Dr. Harvey Cushing. The diary is a daily record of the Cushing neurosurgical service between 1923 and 1924. The literary tone of the document is one of youthful enthusiasm and candor. Its contemporary portrayal of Harvard University's third Moseley Professor displays a demanding surgeon and scholar whose primary concern was the care of his patients and who taught the meticulous techniques of neurosurgery by example. In contrast to the experiences offered by current neurosurgical residency programs, Loyal Davis examined 107 patients, observed 81 operations, assisted Dr. Cushing during 23 operations, assisted Dr. Gilbert Horrax in 13 operations, and never performed an operation independently during his year at the Peter Bent Brigham Hospital. Despite these technical constraints, the young assistant learned the Cushing method of surgery and skilled patient care and was encouraged to continue laboratory investigations. Davis also emulated Cushing's exacting method of preparation of medical manuscripts, which were characterized by scientific innovation and an engaging literary style.

The diary shows that Cushing often held inflexible surgical and scientific opinions and was contentious in their defense. These opinions were modified only when he was presented with unequivocal facts. The young surgeon sought Cushing's approval which carried a genuine but restrained benevolence.

Harvey Cushing's impression on Davis was lasting and profound. The diary conveys the philosophy that uncompromised discipline is a necessary virtue and hard work is full satisfaction in itself. In the following years, Loyal Davis systematically patterned his surgical and scholarly endeavors after those of Harvey Cushing, an exemplar whose unstinting resolve was the pursuit of excellence.

**KEY WORDS • neurosurgical education and training • history of neurosurgery • Peter Bent Brigham Hospital • Harvey Cushing • Loyal Davis**

IT was once written about Harvey Cushing that:

Whether in the operating room, on the tennis court, in the preparation of a paper or in the presentation of a subject before a medical meeting, Cushing was exacting of his young associates. Often it was difficult for the younger men to look on these disciplinary measures as anything but sheer mental or physical cruelty, but when, years later, they received a short note saying, "*More power to your elbow. H.C.*", understanding came.

Loyal Davis<sup>13</sup>

More has been written about Harvey Cushing than about any other twentieth century surgeon (SB Nuland, personal communication, 1993). Fulton's<sup>25</sup> distinguished biography prompted others to publish a variety of biographical sketches and anecdotal accounts,<sup>23,38,43,47–49,52</sup> as well as tributes<sup>7,27,29,39,50,51</sup> and reminiscences.<sup>11,12,28</sup> In addition, we have seen Bailey's fractious and ambivalent caricature of his surgical chief,<sup>1</sup> which not only disparaged

Cushing's research but also ridiculed his competitive personality, and a description of Cushing's dispute with Walter Dandy,<sup>24</sup> the basis of which was the former's insistence on priority and recognition in the surgical treatment of acoustical tumors.

Recent vignettes by two of Cushing's last house officers, Bronson S. Ray<sup>44</sup> and Richard U. Light,<sup>36</sup> have added further biographical material covering the end of Cushing's tenure at the Peter Bent Brigham Hospital. Most of these commentaries have recognized Cushing's exceptional surgical ability, his broad range of interests, and his professional patterns and habits. Taken together, these papers offer reflective and often provocative insights into the complex personality of a remarkable man.

In contrast to these retrospective and conventional portrayals, the Brigham Diary of Loyal Davis, written between 1923 and 1924, is a contemporary, daily account by a young trainee on Cushing's neurosurgical service. Written with youthful enthusiasm and candor, the diary conveys a clear picture of Cushing's uncompromising dis-



FIG. 1. Loyal Davis (1896–1982) in late 1924 after he left Harvey Cushing's neurosurgical service at the Brigham.

cipline in the operating room, the exacting precision of his surgical techniques, his methods of clinical teaching, and the importance that he attached to laboratory and clinical investigation. These are the perceptive, often critical judgments of a young surgeon as he learned the Cushing system and attempted to meet its demanding challenges.

#### Harvey Cushing, the Neurosurgeon (1869–1939)

By 1923 Harvey Cushing had attained preeminence in the emerging discipline of neurological surgery. His research on the physiology of increased intracranial pressure,<sup>4,8</sup> an extensive experience with penetrating head wounds during World War I,<sup>5,9,26</sup> and two generously illustrated and tightly reasoned monographs<sup>6,10</sup> continue to be frequently cited in the medical literature.<sup>21</sup> After his appointment as Harvard University's third Moseley Professor of Surgery, Cushing's clinic at the Peter Bent Brigham Hospital became the neurosurgical teaching and research center for the development of the next generation of neurological surgeons.

#### Loyal Davis, the Neurosurgical Acolyte (1896–1982)

From 1920 through 1923 Loyal Davis (Fig. 1) was a surgical associate of Cushing's friend and colleague, Allen B. Kanavel (1874–1938; Fig. 2), Professor of Surgery at Northwestern University Medical School. In addition to his classic studies on infections of the hand,<sup>31</sup> in 1909 Kanavel modified the early transsphenoidal approach to pituitary tumors by an infranasal approach.<sup>32,54</sup> Because of his contributions to the development of this emerging field of surgery, it is not surprising that Kanavel was a charter member of the Society of Neurological Surgeons.<sup>45</sup>



FIG. 2. Allen B. Kanavel (1874–1938), Professor of Surgery at Northwestern, a friend and colleague of Dr. Cushing. He encouraged Loyal Davis to apply for an appointment in surgery at the Brigham.

Davis had been trained and educated in the principles of general surgery by Kanavel and was also engaged in neuroanatomical research in the laboratory of Stephen Walter Ranson at Northwestern University Medical School. After publishing his anatomical description of the inferior longitudinal fasciculus,<sup>15</sup> Davis later received the degree of Doctor of Philosophy for a study of the deep sensibility of the face.<sup>17</sup> During this period of research and teaching Davis learned invaluable lessons of neurological medicine from Lewis J. Pollock. A life-long friendship formed between the two men and their scientific collaboration resulted in a series of physiological studies on the anemic decerebrate animal.<sup>40–42</sup> At this time, Kanavel encouraged the young general surgeon to apply for a position as a trainee with Harvey Cushing.

#### The Brigham Diary

The Brigham Diary of Loyal Davis (Figs. 3 and 4) is 291 pages in length and was written between October 1, 1923 and May 21, 1924. It is composed of 275 pages typed on the surgical stationery of the Peter Bent Brigham Hospital, 57 of which have two sheets of 5 × 7-in. perforated note paper attached to them. The typewriter used for the document was an Underwood Model 5 with standard elite type (MH Whitlock, personal communication, 1993). On the first page of the diary, there is an informal photograph of Cushing, probably taken between 1923 and 1924 by Miss Alice Thyng, his medical photographer. Four more introductory pages contain 11 photographs of the hospital, Harvard Medical School, Cushing's office, the operating rooms, surgical laboratory, and Children's Hospital, which were taken by the diarist.

The following 73 pages contain Davis' remarks on all aspects of his hospital duties, comments on diagnoses, and indelible experiences with Cushing in the operating room. Among the last 15 pages are two Brigham operative

# The Brigham Diary: portrait of Harvey Cushing

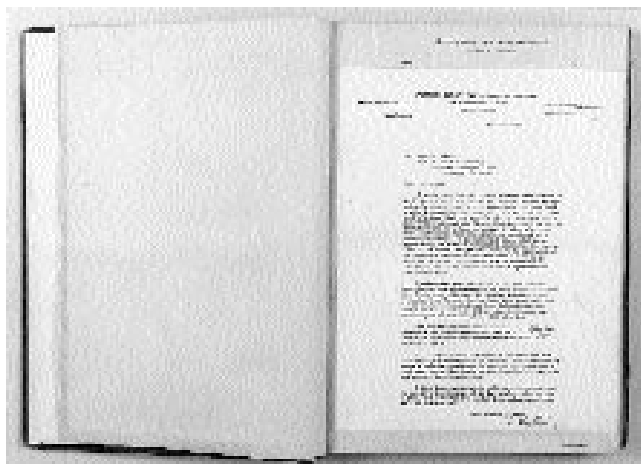


FIG. 3. The Brigham Diary of Loyal Davis displayed at the national headquarters of the American Association of Neurological Surgeons.

schedules, a hand-written request from Professor Max von Frey of February 28, 1924, for a reprint of the paper on deep sensibility of the face, and two sketches of craniotomy incisions. There are five photographs of Cushing's instruments, his hand-written outline for their coauthored paper on "Experiences with blood-refusion after operation," and six pages of instructions for central nervous system stains.

Prior to November 30, 1923, the diary contains succinct comments on 53 patients. After this date there are complete neurological histories and examinations of 107 patients. At the conclusion of each evaluation there is a notation that describes the operative findings and a correlation with the examination. There were always summarizing comments such as:

Impression: I believe this child has a definite intracerebellar tumor. There was a big difference of opinion about this boy. Putnam (Tracy) thought he had a pineal tumor. They did a ventriculogram and found only dilated ventricles. A suboccipital exploration showed an extracerebellar glioma.

The diary concludes with the program of the first meeting of the Halsted Club held in Baltimore on June 9 and 10, 1924.

### *The Cushing Neurosurgical Service and Cushing's House Officers at the Peter Bent Brigham Hospital During 1923 and 1924*

On Monday, October 1, 1923, the young surgical trainee from the Midwest met Cushing for a second time and was introduced to the latter's house officers, Kenneth McKenzie and Percival Bailey, and surgical associate, Gilbert Horrax. The record of the meeting states, "Dr. C's greeting quite cordial. Advised to take my time and become acquainted." Davis' introduction to the Brigham did not provide a specific set of instructions or duties.

During the 1st week the new trainee examined patients on the following basis:

C. suggests I make free use of the wards which I have hesitated to do because he didn't say as much when I talked to him.

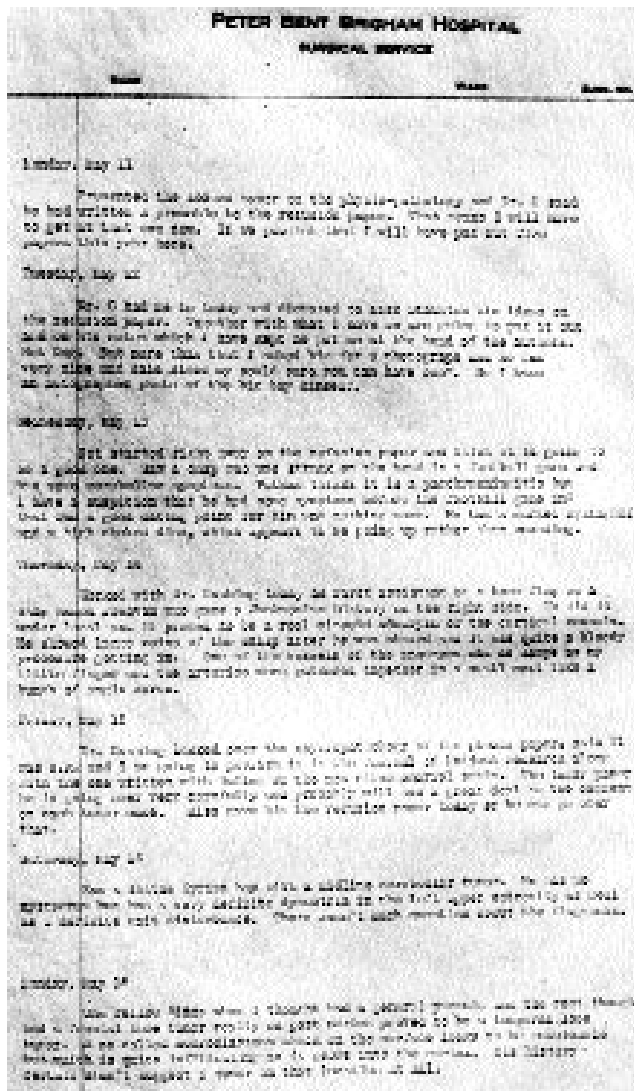


FIG. 4. A typical page from the Brigham Diary.

Later that week he wrote,

Sort of took matters into my own hands and went up on the C-2 ward and examined a patient with unilateral exophthalmos and then went down and dictated into a dictaphone. The latter is a wonderful saving of time and should prove profitable at home.

Within the 1st week of his arrival, Kenneth McKenzie asked Davis to review a paper on suprasellar cysts.<sup>37</sup> The diary recorded his opinion that he had made some helpful suggestions because of his previous experience as an author of surgical publications. At the time the house officers agreed that all suprasellar cysts were calcified and "would show on the X-ray plates." There was also a general neurological consensus that any patient with fibrous tumors over the body that suggested von Recklinghausen's disease, with minimal cerebellar signs, unequivocally had a cerebellar tumor.

The importance of correlation between neurological ex-

amination and operative findings, as well as the significance of the autopsy examination was impressed upon the new trainee during his first several weeks on the service. One diary entry notes:

C's interest in postmortem specimens and in reviewing mistakes is interesting. Recently pulled off the carotid artery at the optic foramen thinking it was a portion of pituitary which he was leaving.

Brain sectioning was performed by Dr. Cushing himself. These review sessions stressed the clinicopathological correlation, as well as surgical errors and the "might have beens" of his work. Another early entry underscores Dr. Cushing's concern with the classification of intracranial tumors:

All cases going through are diagnosed on the history sheet in red ink by Dr. C himself, thus ensuring an accurate diagnosis and proper classification [i.e., intracranial tumors].

In contrast to his general view the new trainee did not hesitate to record a more critical assessment:

Certainly this clinic doesn't function well pre-operatively. I mean no one but Dr. C knows when he is going to operate on a case and sometimes they are in many days before he does a thing.

Davis then suggested that preoperative discussions would be of value in preventing "a lot of mistakes in operating," citing a suboccipital craniectomy in which an acoustic neurinoma was not verified.

Percival Bailey was the most gracious of Dr. Cushing's associates, and gave friendly encouragement to his junior colleague from Chicago. In the spring of 1924 Bailey recommended that Davis read his paper on papillomas of the choroid plexus to the American Neurological Association in June: "which would help my membership application later on." The two men shared a double room in Philadelphia and attended the meeting of the Society of Neurological Surgeons as well. Bailey also arranged that his friend give a paper at the first meeting of the Halsted Club in Baltimore, and coauthored with Davis a paper on a staining method for mitochondria.<sup>2</sup> Despite Bailey's generous personal and professional support, the younger man wrote a tactless comment after a cerebellar exposure for a suprasellar cyst performed by Gilbert Horrax resulted in death:

This is the first time that P. Bailey has been rather obnoxious in his attitude. Isn't it easy to criticize from the grand stand.

Gilbert Horrax had been associated with Harvey Cushing for 4 years when Loyal Davis became a trainee at the Brigham. Horrax was a devoted and skillful surgical assistant, whose Sisyphean task was to direct the house officers and maintain an efficient neurosurgical service, all of which he accomplished until Cushing retired in 1932. In addition to performing the initial and final stages of an operation, Horrax operated independently and the Cushing trainees were his assistants. After 6 months of training on the surgical service, one finds this entry in

Davis' diary:

Horrax is certainly losing any confidence he ever had and I think his association with Dr. C. is very detrimental to him because he is afraid to call his life his own and his surgery suffers as a result. He is a very nice chap and I like him very much but he ought to have more confidence I think.

In fact, Davis confused this "lack of confidence" with humility, because Horrax had mastered Cushing's techniques so closely that Cushing once said that a visitor could not tell which one had operated (RU Light, personal communication, 1993).

*Clinical Research and Preparation of the "Cushing-Styled Manuscript"*

After his 1st week of adjustment to the Cushing service, it became clear to Davis that blood loss during intracranial operations was a major problem; despite this, transfusion of whole blood was used sparingly. As an alternative, refusion of blood and saline that was removed by suction from the operative field often supported the patient's vital signs. Within 48 hours from the time he reviewed the histories of operations Davis arranged for autotransfusion experiments in dogs at the Harvard Medical School surgical laboratories. On October 16, 1923 the diary reads:

Worked on a dog over at the school today and they have a nice place to work in. Transfused blood and fresh muscle tissue extract without any effect on the blood pressure when given slowly. When put in rapidly it produced a temporary rise and then fall [blood pressure]. I must keep in mind trying to get such a department started at Northwestern.

During October and November Davis autotransfused several more animals without producing untoward reactions, and with undisguised ambition he wrote: "Hope I can get some more clinical cases cause I can get a nice paper out of it I'm sure."

On November 8, 1923, Davis performed the first clinical autotransfusion using 600 ml of blood and fluid removed from the operative area by suction. The operation involved the removal of an occipital lobe meningioma arising from the region of the lateral sinus; the tumor extended through the tentorium and produced cerebellar signs. The patient had been operated on five times previously and in each instance surgery had to be discontinued because of blood loss. On this occasion more tumor was removed without operative shock and, as Davis described it, "She made a peach of a post-operative recovery, and Dr. C. seemed much pleased." After autotransfusions had been performed in 10 animals and 21 patients without a reaction, a well-constructed outline of a paper describing the technique was written by Dr. Cushing (Fig. 5), which I have "translated" below with some little difficulty.<sup>35</sup>

*Experience with Blood-Refusion after Operations*  
Davis & Cushing

The method of blood refusion or replacement to be described is the outcome of certain changes in the technique of operations which have taken place during the past few years at the Brigham Hospital clinic. The events leading up to these changes are as follows. In operations such as the transsphenoidal operation for pituitary tumors as well as for tonsillecto-

## The Brigham Diary: portrait of Harvey Cushing

my and other intrabuccal operations as carried out in the clinic a suction tube such as is commonly used by dentists to get rid of excessive secretions came to be routinely employed. This apparatus which was merely attached, is an enforced tube, to a running water suction pump generally came to be used as an adjunct to many operations particularly those about the head and neck for the removal of blood from the field instead of by sponges. It was found that cotton pledgets wet in saline solution—now so commonly used by neurosurgeons can be quickly dried after being put in place by means of such a suction tube and in the course of the development of the procedure these tubes came even to be a favorite method of “sponging” ie of recovery of fluid or blood which may obscure operative fields.

It was first suggested by Dr. Emile Holman we believe that this blood thus collected might be received in a sterile receptacle citrated I believe and replaced in the patient should the patient's condition during or at the end of the operation appear to indicate the need to transfuse. When ever possible it would save the surgeon the embarrassment of having donors ready who in emergency might be called upon for this purpose.

It is our intent to give our experience with this novel procedure.

### *Discuss Material*

The first few cases worked well. Sponges were wrung out. One bad result.

Experience in laboratory.

Research in clinic.

Number of cases tried. Unfavorable results.

Give a few examples.

The authors concluded in their publication: “Our experience, in short, has been sufficiently encouraging to justify our bringing this matter to the attention of others,”<sup>19</sup> which is a typical example of Cushing's medical prose.

In November 1923, Dr. Cushing proposed a project that was of more immediate interest to him. The diary reads:

Dr. C. suggested that I workup the cases of tumors of the choroid plexus and go into it in detail. He gave me all of his reprint literature and I took it home and started working on it.

After a review of detailed clinical records and the literature, the gross and microscopic sections were reexamined. More tissue was then embedded, stained, and sectioned by the trainee, whose attention to detail compensated for his lack of experience. By April 30, 1924, the diary states, “Am waiting for Dr. C. to talk over the choroid plexus paper with me so that I can rewrite it and get it all fixed up for publication.” On the following Saturday, May 3, 1924, the diary continues, “Went in and spent about three hours with Dr. Cushing going over the plexus and their tumors that I gave to him.” During this session, Cushing taught Davis his approach to, and style of, writing a medical paper, and commented that the draft was too much of a “*Sammelreferat*” (collective references) and should be shortened. The clinical and pathological details of six patients were presented at the annual meeting of the American Neurological Association on June 7, 1924, and were later published.<sup>20</sup>

The description of these tumors suggested other patho-

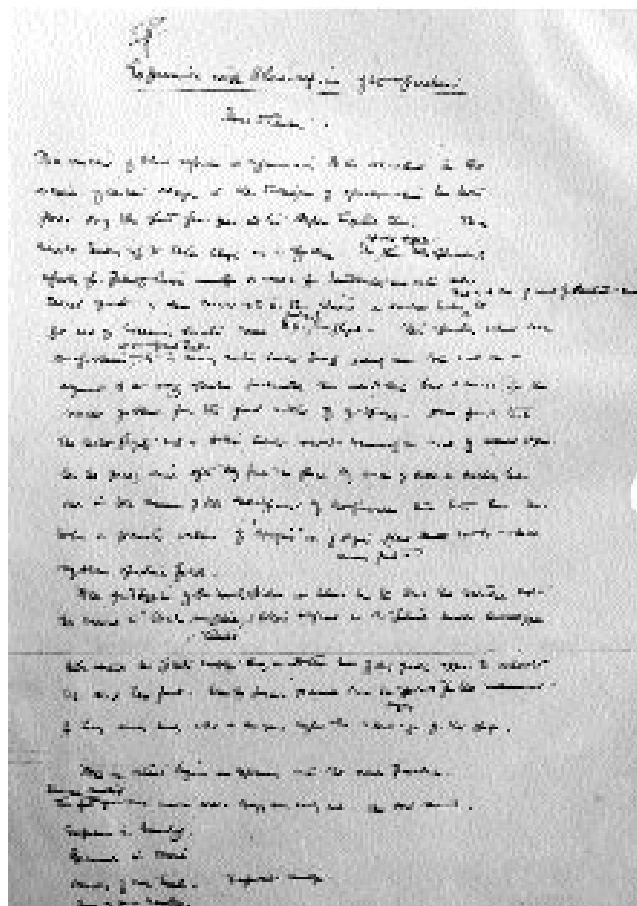


FIG. 5. Dr. Cushing's characteristically illegible hand-written notes for the paper on autotransfusion.

logical and technical problems that might be investigated. A microscopic description of mitochondria<sup>2</sup> and a study of the physiology of cerebrospinal fluid production in hydrocephalus<sup>18</sup> concluded that these cytoplasmic structures did not have a secretory function.

Prior to his appointment at the Brigham, Davis and his colleague, Lewis J. Pollock, developed an experimental method of decerebration<sup>42</sup> that was more sophisticated and less traumatic than the gross midbrain sections of Sherrington.<sup>40,46</sup> Walter Cannon was interested in this investigative work and asked Davis to demonstrate the technique of basilar artery ligation, which he subsequently did on several occasions in the physiology laboratories at Harvard. On October 25, 1923, the diary reads:

Did another decerebrate animal at the Physiology department today and Dr. Cannon himself came in to see it. He was very much pleased and was very enthusiastic about it. He stated that he was going to make it a regular laboratory demonstration preparation.

With this research experience and the knowledge that F.M.R. Walshe had recently published a paper on the decerebrate state in man,<sup>53</sup> it is not unexpected that the diary would read:

Got the pictures of the cat and sent them on to Dr. Pollock.

They are very good and show a beautiful decerebrate rigidity. I am on the lookout for a patient who shows this phenomenon and I think I have one in a child who has a suprasellar cyst.

In February, 1924, a 4-year-old boy was admitted to Cushing's service, unconscious and with decerebrate posturing. His neurosurgical examination was recorded in the three-page neurological note that is a part of the diary. A suprasellar cyst, which compressed the upper midbrain, was tapped on two occasions by Cushing, but the child died 18 days after hospital admission.

In the paper on decerebrate rigidity,<sup>16</sup> written with Cushing's explicit instructions, Davis was careful to emphasize that the experimental criteria should be the basis of similar descriptions in man, but that the anatomical lesion seen in the clinic would be of a far different character. The paper concluded with the literary phrasing of his exemplar, "In the nature of things, such cases are infrequently encountered," and this has proved to be the case, although Davis did not speculate that trauma would be the common cause of clinical decerebration.<sup>3</sup>

#### *Comments on Cushing's Surgery*

The 27-year-old trainee was occupied with detailed neurological evaluations, regularly observed Cushing's operations, and engaged in the preparation of two manuscripts during his first 5 weeks at the Brigham. Davis was impressed by the closure of wounds, which were carefully approximated in anatomical layers with interrupted fine silk sutures that caused no tissue reaction and by the silver foil that was placed over incisions. The starched dressings that were used to support the head after suboccipital operations were not changed for 10 days. In addition, he noted that ether vapor was administered through a nasal catheter, blood pressure and pulse were regularly recorded on charts, and patients remained on the operating table "until they were sufficiently recovered to be moved safely which I think is a mighty fine idea and we should adopt this."

It was clear that the younger man was learning by example when he commented on Cushing's surgical approach to a large occipital lobe meningioma during a second-stage operation:

He seems to attack and fall back, attack and fall back indefinitely. The upper surface of the meningioma was completely exposed. He was afraid its attachment to the lateral sinus would endanger the patient. It seemed as though he wasted a great deal of time replacing pieces of muscle to stop hemorrhage instead of doing what he had to do and then stopping the hemorrhage. He removed a piece of fresh muscle from the leg to use as a sponge and as a pledgelet. Very good idea I think. He also placed silk sutures on the surface of the tumor for traction. Field of operation is constantly bathed with saline solution.

On another occasion the observation was made:

C. did a transfrontal and very nicely exposed the optic chiasm and the tumor which he neatly took out. For carefulness he is certainly right there.

Although bone wax was introduced by Horsley 30 years previously,<sup>30</sup> Cushing's technique was ingenious:

They use wax here quite freely and put it in their burr holes

if there is bleeding and then burr right through it. That drives the wax into the bone and stops hemorrhage very nicely.

The sequence of incisions for ventriculography and suboccipital craniectomy impressed the trainee and he wrote:

They consider a ventricular puncture of great importance in assuring themselves of a posterior fossa lesion and do it the first thing before making the vertical portion of their cross-bow incision.

The diary describes Cushing's motor-driven drills, and there are also photographs of the instruments that were used for craniotomies and the magazine that made silver clips. The following note of December 28, 1923 remains a significant technical caveat 70 years later:

Have seen so far about four or five cases where they have left in little cotton pledgelets. Dr. C. is now careful about placing pledgelets with strings on instead of free ones.

A description of Cushing's surgical care and precision was entered in the diary after Davis was first assistant in a craniotomy for a retroorbital meningioma:

He is very careful in raising bone flaps to look under and see if the dura is adherent before he breaks it up. Another thing in sawing with the Gigli the first few cuts should be made straight up and right on the saw and then the bevelling can begin. He cuts down into the base of the bone flap with a Montenevasi [Montenovesi] forceps (Fig. 6).

Cushing's surgical management of gliomas is less frequently described in the diary than the management of meningiomas, but an account of an operation for a temporal lobe glioma not only reflects the experienced surgeon's skill but also his interest in teaching. The following diary entry is a summary of what Cushing did and said for the benefit of his first assistant:

The soft jelly-like glioma took in the entire temporal lobe. He sucked out a great deal of it out with the aspirator. That stunt works very well. On the surface these gliomas have three characteristics, 1) the convolutions are very flat 2) the color is yellowish grey and 3) there is an avascularity as compared with normal cortex. One should needle and then cut right down through the cortex using clips after making a track with a grooved director.

Prior to his appointment at the Brigham, Davis had written a paper on the anatomy of the trigeminal nerve<sup>33</sup> and Cushing had requested a reprint of another study on the deep sensibility of the face<sup>17</sup> with the question: "Have you any explanation to offer for the facial paralyses which so uncommonly occur in certain cases after a trigeminal neurectomy?" Approximately 1 month after his arrival, Cushing asked Davis to be his surgical assistant during a trigeminal neurectomy, "so I could see how he does it and to follow closely for the occurrence of a facial paralysis." The patient was operated on in the supine rather than the sitting position, and "bleeding confused his [Cushing's] field a good number of times." The extradural, subtemporal approach "did not disturb the dura over the petrous portion of the temporal bone where he would be likely to

## The Brigham Diary: portrait of Harvey Cushing

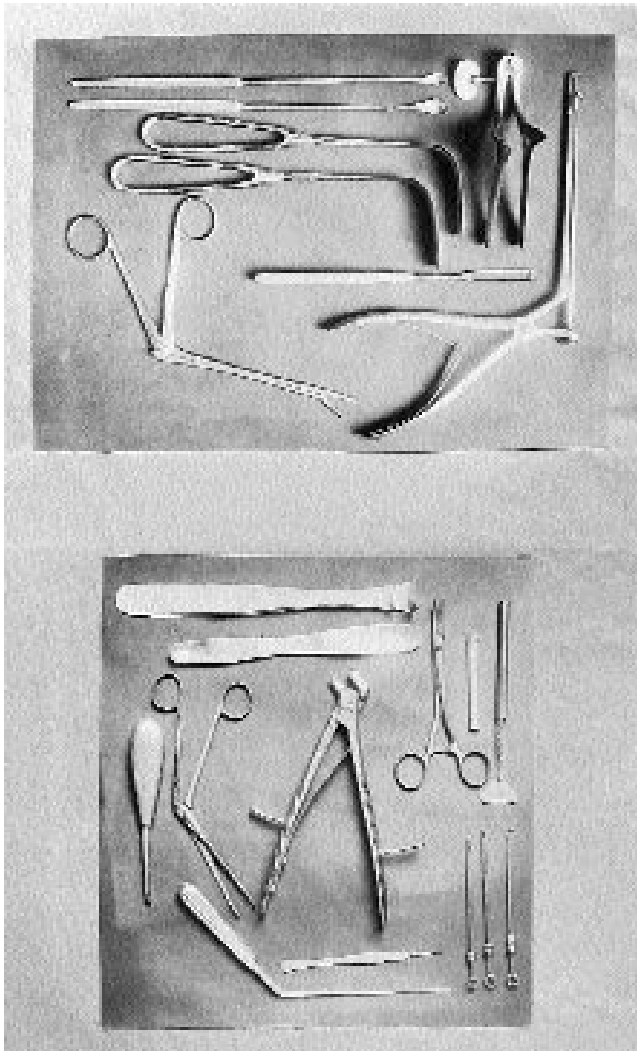


FIG. 6. Some of Dr. Cushing's craniotomy instruments. The Montonovesi rongeur is in lower set, center position.

put traction on the greater superficial petrosal nerve," and because the motor root was not visualized, it was not preserved. The trainee assisted Cushing on most of the trigeminal neurectomies during the year, and his final comment on these operations was:

Dr. C. attempted a trigeminal neurectomy and had to give up with an incomplete removal. They are certainly tasks here. I haven't seen one go off smoothly yet. I am inclined to get the opinion that Dr. C. is a bit inclined to stretch things a bit in his enthusiasm to have everything fit in as he thinks it should.

Cushing was aware of Kanavel's interest in the transsphenoidal operation, and Davis observed or assisted with all of these procedures while he trained at the Brigham. The November 1, 1923 diary entry provides a concise description of the intraoral, labiobuccal approach to a chromophobe adenoma:

He then introduces an instrument like a nasal speculum and breaks through the anterior wall of the sphenoid air cells. After this he breaks into the floor of the sella turcica, introduces a

punch and makes an opening into the dura mater. He has a hole almost the size of a thumb's nail. He can visualize each step of the operation.

Later on November 23, 1923, Davis commented:

Dr. C. operated on a lady with a pituitary tumor by the transsphenoidal route. This certainly gives a nice exposure and is I think his most successful and clever operation.

A review of the operation given on April 24, 1924 reads

Worked as Dr. C.'s first assistant on a transsphenoidal case and he was very kind and showed me every step in the procedure. It went very slick. He won't let anyone else do them.

The diary contains more technical specifics on trigeminal neurectomies and transsphenoidal operations than on any other surgical procedure. During his year at the Brigham, the young trainee assisted Cushing during 23 operations and Horrax in 13 operations and observed 81 additional neurosurgical procedures. All but three operations were intracranial procedures; the remainder were laminectomies for two spinal cord tumors and a cordotomy. Davis' entry of December 24, 1923 conveys the frustration that young surgeons experience:

Dr. C. let me sew up the dura but it certainly is hard to work around these birds, because of their constant criticism. However I got it sutured and while H.C. was standing by and got along well enough.

However, Cushing's remarks in the operating room were brief but constructive criticisms with implied encouragement, which invoked a desire for excellence in surgical technique and judgment. Selective diary entries illustrate this point.

Dr. C. said I must learn to make closures so that they would say there was a young surgeon in Chicago who operated upon you without leaving a scar. He has been very nice to me in the operating room and has shown me a lot of things.

Finally in March, 1924:

Dr. Cushing took me away from Horrax and went in with him on a temporal lobe tumor. Dott was second and I was first assistant. We got along very well and he was extremely nice to me.

### *Impressions of Dr. Cushing 1923-1924*

The most trying encounter with Cushing was recorded on December 6, 1923.

Went around with Dr. C. today while he looked over the cases for his clinic tomorrow night. Called me up particularly to criticize my chart on a spinal cord case and when he got through his areas were just about like mine. He certainly is a peculiar individual and very intolerant.

Years later the details of the unpleasant discussion were described in more detail. The "peculiar and intolerant individual" had made the diagnosis of a spinal cord tumor; Davis was firm in his conviction that the patient had mul-

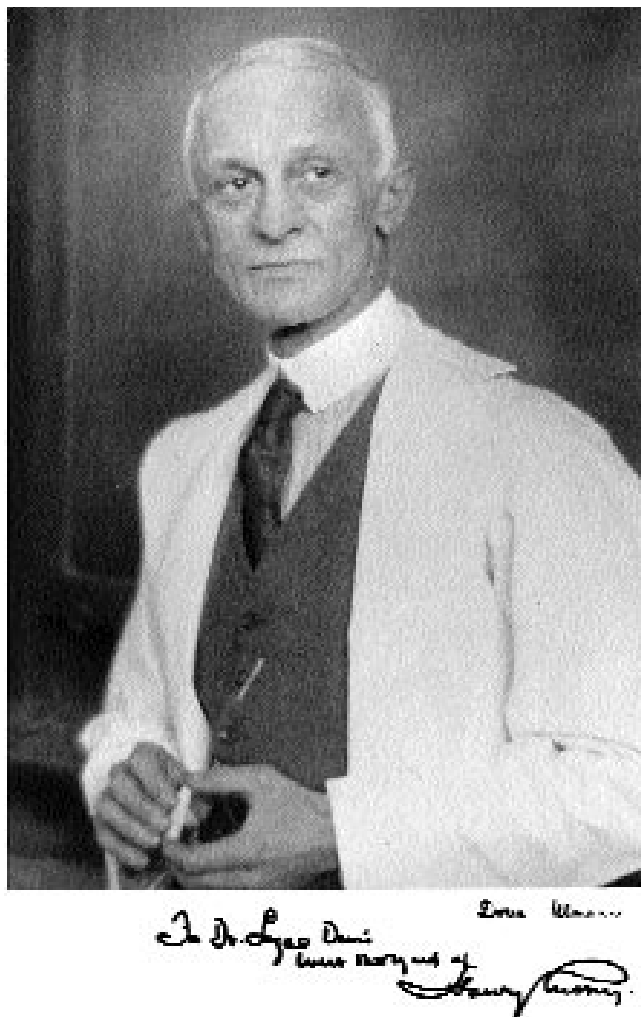


FIG. 7. The diary reads: "I asked him for a photograph and he was very nice and said, 'Bless my soul sure you can have one.' So I have an autographed photo of the big boy himself."

tiple sclerosis, adding with rebarbative audacity that he would be convinced of Cushing's diagnosis only when he removed the tumor.<sup>14</sup>

On Saturday, October 27, 1923, Davis entered, "Dr. C. gave me a ticket to the Harvard-Dartmouth game and asked me to take a Mr. Bramwell from England." One month later Cushing gave him his faculty ticket, raincoat and overshoes for the Yale game in which "Ducky" Pond and the Elis prevailed—"Oh what a mighty mud slinging contest. Yale 13-0." For Christmas, 1923, "Dr. C. presented me with a copy of James Parkinson's book on 'Medical Admonitions' published in 1801," and later in January, 1924, "we went out to his house last night (Sunday) for supper and had a very nice evening. He is a great deal more pleasant outside his operating room." There is a tone of satisfaction in the diary entry of February 14, 1924. "Have passed about one half of my allotted time here and have enjoyed it very much so far. I am sure I have picked up a great deal both in diagnosis and operative technique." Cushing's generosity and interest in his neurosurgical trainee were expressed by the diarist on May 3, 1924:

Went in and spent about three hours with Dr. Cushing going over the paper on the plexus and their tumors that I gave him. He was very nice about the paper and wants me to make the choroid plexus tumor report one with him. I told him that I was leaving on the 30th and he said that he didn't know anyone around whom he would rather have stay another year with him if it were possible.

The neurosurgical trainee's final discussion with Cushing was on May 12, 1924. His diary entry for that date reveals a disarmingly youthful and almost immature exuberance, as well as a gleeful sense of achievement, which belie his exacting surgical training and education, and the constrained atmosphere of the Brigham under the aegis of its Moseley Professor.

Dr. C. had me in today and dictated to Miss Staunton [Madeline E. Stanton] his ideas on the refusion (autotransfusion) paper. Together with what I have we are going to put it out and on his kept he put me at the head of the authors. Hot Dog. But more than that I asked him for a photograph and he was very nice and said, 'Bless my soul sure you can have one.' So I have an autographed photo of the big boy himself (Fig. 7).

#### *Lessons From the Diary*

The Brigham Diary portrays the daily routines and activities of the accomplished surgeon and scholar Harvey Cushing, who was then 54 years of age and at the zenith of his professional accomplishments. The diary leaves no doubt that Cushing's primary concern was care for the patient, the performance of fastidious surgery, and a constant evaluation of surgical results ("keeping the score"). Planning for clinics, teaching medical students, careful supervision of clinical research, and scrupulous preparation of scientific manuscripts were all of high priority, but secondary to his clinical responsibilities. The combination of patient care, teaching, and clinical investigation is a recurrent theme in the diary.

Challenging discussions between Cushing and his house officers regarding the neurological examination, the anatomical localization of lesions, and an insistence on reviewing the surgical pathology as well as the necessity for ventriculography, stimulated an eagerness to learn. The diary indicates that correlation of the surgical and pathological findings with the neurological examination generated an atmosphere of intellectual competition among the trainees, and Loyal Davis was not modest when he was correct.

This one caused a riot. They explored her cerebellum, found nothing. Frontal-parietal cyst. Bailey, Horrax, Dott for cerebellum. My note against this diagnosis.

There are perceptive accounts of Cushing's surgical techniques, particularly the operations for trigeminal neuralgia and the transsphenoidal approach to pituitary tumors. The diary pictures a conservative, punctilious, and demanding surgeon whose remarks in the operating room concerning anatomical closures and the importance of scalp incisions were designed to emphasize the goal of perfection in each surgical step that one might assume to be routine. It is clear from the diary entries that Cushing

DR. LOYAL DAVIS  
 201 C OAK STREET  
 CHICAGO

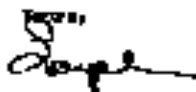
November 4, 1931

Dr. Harvey Cushing  
 701 Huntington Ave.  
 Boston, Mass.

Dear Dr. Cushing:

Will you be good enough to give me the title of the book which has made the greatest impression upon you? I am making a collection of books of this kind and will later send you a copy of the one you choose for your inscription. I do not want to qualify that request in any way because I wish it to represent your first and only choice. I am sure that you have such a book in mind. I imagine Sir William Osler's would have been Thomas Brown's *Malignt Medici*.

I trust you will be interested in my telling you something about the various books which I already have in this special collection. I will arrange this very much.



PETER BENT BRIGHAM HOSPITAL  
 700 WEST WASHINGTON ST.  
 CHICAGO, ILL.  
 November 21, 1931

Dr. Loyal Davis  
 201 C Oak Street  
 Chicago, Illinois

Dear Loyal:

I have had your letter of November 4 regarding me and thank you for the wonderful time. I wish I knew just how to help you in the greatest degree possible. I am sure that you will find the book which you desire for your collection. I think that you are very much interested in the various medical experiences.

Respectfully I answer the title had a great effect on me. I go back to the time of starting papers, in which there is a clearly arranged display of the whole and each volume separately. But I don't think I remember much about it and unfortunately can't give it, though I suppose it had an effect on me.



FIG. 8. Upper: Seven years after leaving the Brigham, Loyal Davis asked Dr. Cushing for the one book that had made the greatest impression on him (Harvey Cushing Papers, Manuscripts and Archives, Yale University Library). Lower: Dr. Cushing's reply was probably unexpected because Davis anticipated a title of a medical classic.

was not a surgical *jongleur*, but had long since established a standard fixed technique for each of the various operations that he performed.<sup>34</sup>

The diarist recounts Cushing's exacting attention to investigative and literary details in the preparation of scientific manuscripts. The outline of the paper on autotrans-

fusion<sup>19</sup> was prepared after a long Saturday afternoon session. In each paper Cushing wrote with Davis, there was first an exhaustive review of the literature, particularly the papers by German authors. The footnotes to references often included brief comments that Cushing considered of particular consequence in the development of a position or opinion that was either unsubstantiated or controversial. The manuscript on "Papillomas of the Choroid Plexus"<sup>20</sup> is such an example. Years later Loyal Davis made an engaging remark<sup>22</sup> on the distinctive literary style of his exemplar found in this paper: "The article contains one short sentence, which is applicable, and which is pure Cushingese: 'This pursuit we have found a most baffling one.'"

### The Later Years

After Loyal Davis left the Brigham, he maintained an active correspondence with Harvey Cushing<sup>55</sup> between 1924 and 1939. There were approximately 50 letters covering the younger surgeon's clinical progress and disappointments, neurosurgical societies and meetings, advice for experimental investigation and administrative problems, and the establishment of the Brain Tumor Registry at Yale University. One of the more interesting of these letters is a request from the younger surgeon for Cushing's opinion of the one book that made the greatest impression (Fig. 8 upper). Cushing's response was probably an unexpected one (Fig. 8 lower). For years afterward, and perhaps for the rest of his life, Loyal Davis would relate with pride, admiration, and gratitude, various accounts of his professional experience with Cushing at the Brigham. The younger man's care of patients, principles essential to resident training and education, pursuit of laboratory investigation, and abilities as an author reflected the lasting impact of his neurosurgical exemplar. Davis' selection of instruments, operating room discipline, and surgical techniques were all patterned after his surgical indoctrination at the Brigham. As the years passed, the friendship between these two men remained socially formal and for the most part was epistolary. It was evident that each saw in the other estimable qualities that he could admire and respect. Of all the lessons described in the Brigham Diary, Harvey Cushing most impressed on the young neurosurgical acolyte the doctrine that excellence was the absolute norm and that one should pursue this noble goal with relentless energy and persistence.

### Acknowledgments

Mr. Carl H. Hauber, the Executive Director, and Mrs. Chris A. Phillips, the Archivist of the American Association of Neurological Surgeons, and the author thank Dr. Nicholas Wetzel, house officer, associate, and friend of Dr. Loyal Davis for retrieving the Brigham Diary, which is displayed with other neurosurgical memorabilia at the Association's headquarters.

The author is particularly grateful to Dr. C. Rollins Hanlon for his thoughtful and scholarly review of the manuscript.

In addition, the author expresses his gratitude to Ms. Barbara Blaesing, Dr. Paul S. Cunningham, Mr. Ferenc Gyorgyey (Historical Librarian, Yale Medical Library), Mr. Carl H. Hauber, Dr. Richard U. Light, Dr. Sherwin B. Nuland, Dr. Daniel Ruge, Mrs. Grethe Shepherd (Reference Librarian, Yale Medical Library), Dr. Nicholas L. Tilney, and Dr. Nicholas Wetzel for the generous assistance in the preparation of this manuscript.

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Manuscript received February 5, 1994.

Accepted in final form July 6, 1994.

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