

Historical Vignettes

The Massachusetts General Hospital

Early history and neurosurgery to 1939

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✓ The early history of the Massachusetts General Hospital (MGH) is reviewed with emphasis on the development of neurological surgery. The hospital opened in 1823. Early trephinations were performed by Dr. John Collins Warren and others for treatment of trauma and epilepsy. In the 1880's, interest in brain surgery increased, and Dr. John Elliot performed several trephinations for brain tumors, three of which were witnessed by Dr. Harvey Cushing during his years at the MGH as medical student and intern. In 1911, all brain surgery was placed in the hands of Dr. S. J. Mixter. He later shared the assignment with his son, Dr. W. J. Mixter, who described herniation of the intervertebral disc with Dr. J. S. Barr and became the first Chief of the Neurosurgical Service at MGH in 1939.

KEY WORDS • Massachusetts General Hospital • Harvard Medical School • historical vignette • Harvey Cushing • John Elliot • William J. Mixter • history of neurosurgery

SOMETIME in the first decade of the 19th century, two young members of Boston's medical elite recognized that it would be a good thing if there were a hospital in town. Drs. James Jackson and John Collins Warren, close friends, contemporaries at Harvard College, and later cofounders of the Boston Society for Medical Improvement and the *New England Journal of Medicine and Surgery*, had shared experiences training in the great hospitals of London; they wanted students at the Harvard Medical School to enjoy a similar opportunity for clinical instruction without having to leave Boston. At that time the Harvard Medical School, already 29 years old, offered only the resources of the Boston Almshouse for clinical exposure. The primary function of the Almshouse was to provide housing for the healthy poor, and it had provision for just eight sick inmates. Of the nation's three public hospitals at the time, the nearest was in New York City.

Founding and the Early Years

Joined by 54 leading citizens of Boston and surrounding towns, Jackson and Warren framed a petition

in 1810 to the Great and General Court of Massachusetts for a charter to build a hospital. The court granted the charter in the following year.¹⁰

The motivation to found and build a public hospital in Boston was more complex than an unmixed recognition of the duty of the rich to provide for the poor. The signatories to the 1810 petition, who represented Boston's most socially prominent families, were assured of getting more for their money than simple charity. The proposed hospital was to be staffed primarily by relatives of those who signed the petition. Since physicians associated with a charitable hospital practice also tended to accrue patients of a higher social standing, the hospital thus functioned not simply as a training ground for fledgling physicians, but also as a means of reinforcing the medical and social elitism already characteristic of contemporary Boston society.⁴² The staff of the hospital was to be predominantly composed of members of this medical oligarchy for many decades, greatly enhancing the status of such families as the Jacksons and Warrens until late in the 19th century.⁴⁶

Although the hospital's charter was granted in 1811, the Massachusetts General Hospital (MGH) did not

Massachusetts General Hospital



FIG. 1. Illustration of the Bulfinch Building, first home of the Massachusetts General Hospital, which opened in 1823. The operating room of the hospital, now known as the Ether Dome, is visible in the center of the building's top floor. (From an original ink wash and watercolor lithograph by Robert J. Leanna II.)

open its doors for many years. The first delay was due to fundraising difficulties during the War of 1812 and its economic aftermath. By 1816, the Trustees had obtained pledges of support totaling about \$100,000. Charles Bulfinch, Boston's leading architect, was hired to design the hospital. After a tour of the public hospitals of New York City and Philadelphia, Bulfinch drew up the plans, specifying a building with a central mass flanked by wings. It was to house smaller wards and more private rooms than he saw elsewhere, so as to accommodate the demands for privacy he anticipated from New Englanders.¹⁹ The building's cornerstone was laid on July 4, 1818, with elaborate Masonic ceremony. Yet, when the hospital was finally completed and ready to receive patients in September, 1821, with six beds set aside for free care for the poor, only one person presented for admission in the 1st month. One year later the patient census was 12, leaving 83 empty beds.¹⁰

Although the people of Boston might not yet have appreciated it, the hospital already incorporated a number of unique features that were to ensure its survival. One was the handsome edifice in which it was housed (Fig. 1), built of granite blocks cut at the State Prison and still standing today. Within this building, an experienced in-house physician — not a student — was available to care for inpatients and accident victims 24 hours a day. There was an outpatient department organized by specialty. There were two bathtubs. And to the later delight of Harvey Cushing during his year as intern,¹⁷ detailed case records were kept starting with the first patient, forming one of the most complete groups of original case records available today for any 19th century hospital in the United States.

From the very beginning, emphasis was placed on both graduate and undergraduate medical education; for \$30 a student could obtain an admission card to

the wards, which was valid for 1 year. (Such admission was free to students at the Harvard Medical College.¹⁷) Indeed, the Trustees found it necessary to combat the initial public image of the new hospital as a collecting ground for poor patients who would undergo experimental medical treatments at the hands of "a few young doctors."²³

Gradually, the stigma attached to being a patient in a hospital (instead of having one's operation or medical treatment at home) partially subsided, and the MGH was soon crowded enough to sustain the occasional epidemics of erysipelas which punctuated the pre-Listerian era. The first epidemic, in 1827, required the evacuation and fumigation of the entire building for its eradication.¹⁰

Patients were admitted in one of three general ways. "Accident patients" were always admitted without question, as were patients who could pay their own hospital charges. (Several weeks' advance payment was required.) For the poor, admissions that might today be classified as "elective" were, to some degree, contingent on an assessment of the patient's moral worth. This was assured by a personal guarantee from one of the hospital's financial supporters, in the shape of an admission ticket given by the donor directly to the patient, or by personal application of the prospective patient to the hospital's resident physician. This screening system allowed the exclusion of incurable cases, those deemed to have a venereal etiology, or the chronically drunk.^{23,46} This exclusionary policy is reflected not only in the written guidelines for use by the resident physician; later statistical retrospective surveys confirm that the policies were actually carried out. Thus, a study of acute lobar pneumonia showed that less than 10% of patients admitted before 1860 were "intemperate" in their use of alcohol; the figure was 66% for the years 1880 to 1889.⁴⁴ The Trustees, anxious to avoid public perception of the hospital as a pauper institution, had limited its commitment to care for wards of the state from the outset. The target population was the growing number of transient laborers drawn to Boston (and away from their families) by the maritime commerce which fueled the city's economy throughout the 19th century.²³

Neither accident patients nor patients admitted by certification of need were expected to pay; with the exception of revenue from the few private patients and the proceeds from a state monopoly on life insurance provided by the hospital's charter, the MGH relied entirely on donations from the citizens of Massachusetts to finance its operations. These donations took many forms. In 1824, the Trustees were pleased to acknowledge the generous gift of a sow, "of an uncommonly fine breed." The donation of a small library in 1832 occasioned some embarrassment when a substantial portion of the volumes were found to be of a "naughty" character, and the Trustees directed that they be burnt.²³ Purchases during this period included handsome china with a picture of the hospital on each plate, and silver spoons which were added in 1829 to replace the original pewter flatware.¹⁰

An additional strategy the hospital used to gain favorable publicity (as well as a few extra dollars) was the

exhibition of an Egyptian mummy, which had been donated to the City of Boston by a Dutch merchant in 1823. Dr. Warren opened the mummy for examination, and then placed it in a glass case in the hospital's operating theater, where it presided over surgery for many years. Periodically it was sent on tour to other cities, the proceeds going to the hospital. In 1931, it became one of the first mummies to be x-rayed, revealing that it had undergone a species of transthemoidal surgery for brain removal prior to embalming. In the process it became almost certainly the first mummy to be issued a hospital unit number.²⁴

The Ether Demonstration, 1846

Some 10,000 patients had been admitted to the hospital by 1846, and over 100,000 by 1900. During these years the hospital was fortunate in attracting Boston's finest surgeons and physicians, and it became the site of several innovations of worldwide medical significance. Pre-eminent among these was the first successful public demonstration of surgical anesthesia, on October 16, 1846.^{20,45} The operation, a partial resection of a congenital vascular malformation of the neck, took place in the domed operating theater on the top floor of the hospital. The mummy was present. The surgeon was John C. Warren (Fig. 2), one of the hospital's founders and then nearing the close of his career. Despite Warren's comment at the end of the operation, "Gentlemen, this is no humbug," the new technique was not at the time deemed of sufficient importance to be noted in the patient's medical record.³² The operating theater (Fig. 3), now a national historical landmark, also failed to elicit any particular reverence from contemporaries. However, during its heyday the Ether Dome witnessed a total of about 8000 operations.⁵¹

After new operating rooms were built in 1868, the Ether Dome was converted first into sleeping quarters for women employees, then into a female ward, and finally became a nurses' dining room. In 1892 and 1930, it was restored to an approximation of its original appearance. Today it is used as a lecture hall, and Neurosurgical Grand Rounds are held there each week.

The ether demonstration had significant and immediate consequences. The first was a more than twofold rise (from 16% to almost 40%) in the percentage of patients admitted to the hospital's surgical wards who actually underwent an operation. As well, the total number of patients admitted to the surgical service increased from 221 to 293 in 1 year.³⁸ These changes took place despite the fact that anesthesia was initially used quite selectively, with four out of 10 operations proceeding in the old grim fashion, including hernia repairs, most facial surgery, and even amputations if the patient were drunk. The patients who benefited most from the new discovery were women, in whom the operative rate more than tripled, and victims of industrial and railroad accidents, in whom the number of operations quadrupled. London's *Punch* commented that the new painless surgery might be "properly described as 'Good News for Travelers by Railway.'" Dr. Oliver Wendell Holmes (who in 6 months would suc-

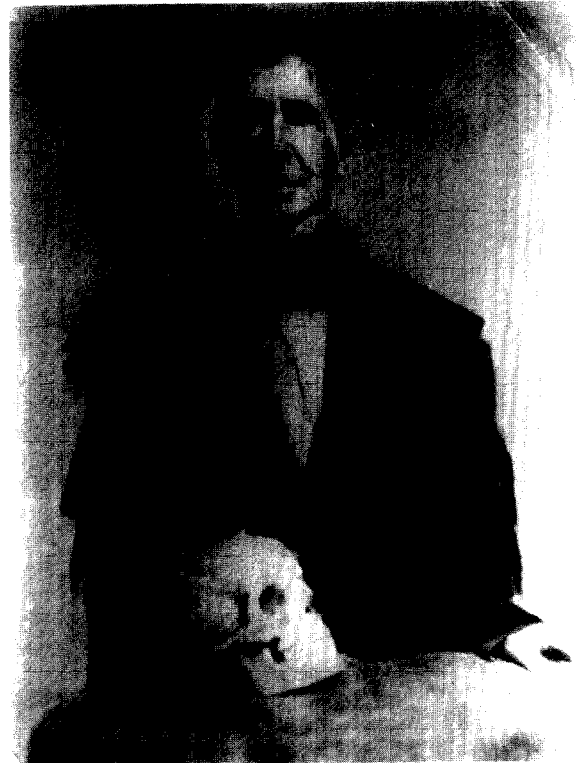


FIG. 2. Photograph of Dr. John Collins Warren (1778–1856), cofounder of the Massachusetts General Hospital and the *New England Journal of Medicine and Surgery*. He holds a skull from his extensive collection, which included over 550 skulls and casts of heads, as well as a complete skeleton of a mastodon. Warren performed the surgery in the first successful public demonstration of ether on October 16, 1846.

ceed Warren as Professor of Anatomy at the Harvard Medical School) coined the term "anesthesia" for the new technique, which was adopted first in London and Paris, then in New York, and finally in Philadelphia and the rest of the United States.³⁸

Period of Slow Advances

Medical care at the hospital changed over the years, as did surgery; but the conservative character of Boston medicine was reflected in the lack of therapeutic advances originating there. Cofounder James Jackson set the tone for the entire century at the MGH with his characteristic emphasis on therapeutic moderation.⁴⁷

In 1835, his successor Dr. Jacob Bigelow, at that time Boston's most distinguished physician, delivered a celebrated address on "self-limited diseases," arguing that most illnesses would work themselves out through the healing powers of nature, without recourse to the heroic depletive therapies then current.⁸ Considering the contemporary therapeutic armamentarium, with its heavy reliance on venesection and purging, this conservative philosophy was probably no bad thing for the patients. Both Jackson and Bigelow had enjoyed sojourns in Europe during their training (London and Paris, re-



FIG. 3. Daguerreotype, taken by Josiah H. Hawes, showing Dr. John Collins Warren operating in the Ether Dome, circa 1846. This operation is often cited as the first performed under ether. This grouping, however, was actually posed some time after that operation, since Hawes felt faint at the sight of blood and was forced to leave the amphitheatre. The glass case containing the Egyptian mummy is faintly visible to the left of the feet of the statue of Apollo in the upper right corner.

spectively), which no doubt reinforced their native New England skepticism regarding vigorous therapeutics, particularly as practiced in Philadelphia.^{5,11} The MGH medical staff, however, soon gained a reputation elsewhere in the country as therapeutic nihilists.⁴⁷ This reached its peak in 1860, when Oliver Wendell Holmes opined in his widely publicized Presidential Address to the Massachusetts Medical Society that “if the entire materia medica, as now used, could be sunk to the bottom of the sea, it would be all the better for mankind, and all the worse for the fishes.”²⁷

These same conservative traits resulted in delays in the introduction of new diagnostic technologies. Clinical thermometry, which became practical in Germany in the 1850's, was first mentioned in MGH patient records in 1864, about the same time that New York physicians began to record body temperatures.^{41,44} Temperature charts were first maintained in 1867, but were not used routinely until the 1880's.^{40,44,47} Routine measurement of blood pressure did not appear at the MGH until 1912,⁵² although Harvey Cushing had brought back the Riva-Rocci blood-pressure device from Italy in 1901, and reported extensively in 1903 on its use at The Johns Hopkins Hospital.¹⁶ The story of the Harvard University Department of Surgery's rejection in

1904 of its routine use to monitor intraoperative blood pressure is well known.^{14,22}

An exception to this general trend was the early use of x-ray films at the MGH, which started just a few months after Roentgen's 1896 report of their discovery. This expeditious innovation resulted from the enthusiasm of the hospital's pharmacist and photographer, Walter Dodd, a non-physician whose intensive work in the new field resulted in his death 20 years later from radiation-induced cancer.³⁰ George Shattuck later recalled the conditions in 1906: “When the lights were out and the power turned on, great blue sparks shot out from the metal tapes and they crackled and snapped like the aurora borealis.”⁵² Early attempts to obtain a chest film overloaded the fuses on the power mains, leaving the hospital briefly without electricity.³⁰

Physical Expansion

Meanwhile, the physical plant of the hospital was changing. The first new auxiliary building — the “Foul Ward” — was opened in 1854, over vociferous objection from nearby residents; it was used for infectious or delirious patients. Small new wards were added throughout the second half of the century, with the designated purpose of isolation — either of cases that

were thought to be contagious or to separate the well-to-do from the poor. (A few private rooms had been available at the hospital since at least 1827, which were usually used for wealthy visitors from out of town. Open-ward patients were drawn from the class of "working poor," primarily laborers.) In 1867, housing for three new operating rooms was completed, along with a recovery room and a "flat" for house officers, complete with piano. In 1882, an outpatient building was added. A separate structure on Allen Street for autopsies was also constructed, as was "Ward E," for clean surgical cases (described further below).

After the turn of the century, the trend in new buildings was less toward segregation by function and more toward segregation by income. In 1917, the Phillips House was erected, for those "well able to pay." It featured its own separate, exclusive telephone exchange, a balcony on each floor, and an electrocardiograph hook-up in every room, on the off-chance that this might "save a valuable life." The patients were free to choose their own personal physician or obstetrician; each doctor set his own fee, which was only loosely regulated by the hospital Trustees.⁵² Thus the Trustees sought to make practice at the MGH more attractive to promising young physicians. Next to be added was the Baker Memorial Building, opened in 1930 and intended to "provide the same quality of care to persons in the middle-income group that had already been made available in the General Hospital to the poor, and in the Phillips House to the well-to-do."²¹ Each of these new buildings functioned essentially as an independent hospital, with its own kitchen, x-ray department, and operating rooms. Eventually the financial constraints of the Depression forced some sharing of facilities. Despite this geographic segregation by income, at least for the period 1823 to 1880, actual medical treatment did not vary in any substantive manner between income groups. Some special facilities were used for patients of all income levels: within a few days of its opening in August, 1933, the new neurosurgical operating room in the Baker Building was used for procedures performed on patients from the general wards, the Baker Building, and the Phillips House.

Antisepsis and Early Brain Surgery

In the late 1870's, Lister's doctrines of antisepsis gradually took hold at the MGH, primarily through the influence of J. Mason Warren, the son of John Collins Warren.⁵¹ By this date, the hospital had assumed a distinctly surgical character, surgical admissions having outnumbered the medical side since the outbreak of the Civil War. The 1867 operating rooms, with their polished marble and brass fixtures, were for their time "the last word in surgical buildings."⁵² But their long dusty air ducts, which piped in air taken almost directly from the outlet of the kitchen exhaust fans, fell out of step with contemporary theories of operative asepsis. In 1889, the hospital added the Bradlee Ward ("Ward E"), a surgical pavilion to be used only for operations requiring special antiseptic precautions, such as abdominal and brain surgery — "excluding compound frac-

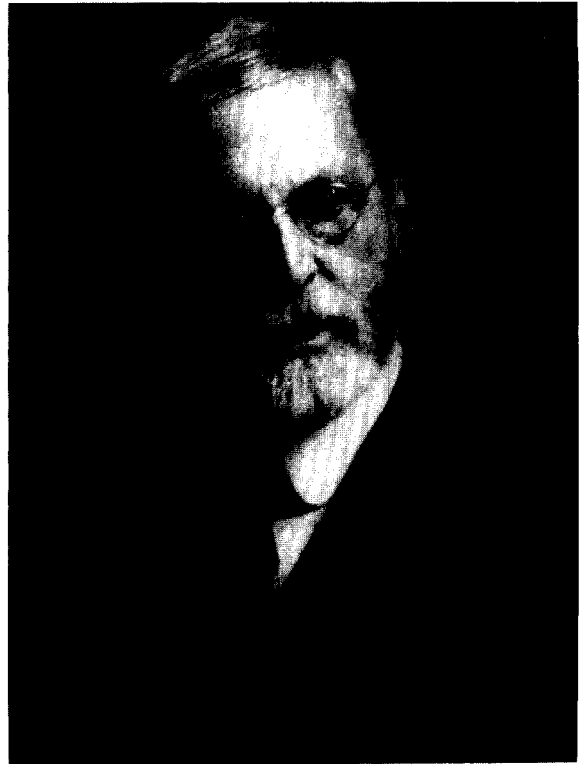


FIG. 4. Portrait of Dr. James Jackson Putnam (1846–1918), first Electrician and Neurologist to the Massachusetts General Hospital (MGH). Putnam was a personal friend of Sigmund Freud and a cofounder of the American Neurological Association, of which he was President in 1888. In 1889, he made the diagnosis of brain tumor for the first craniotomy based on cerebral localization performed at the MGH.

ture of the skull." It was the first such ward in the country. With the extra money from the Bradlee bequest, the hospital installed its first electric lights. It had been lit since its founding by copper lamps fueled with whale-oil.³⁷

By 1891, the new aseptic technique was mandated for all operations in the hospital, ending the brief reign of Listerism, with its picturesque cloud of atomized carbolic acid over each operative field and each dressing change. "It certainly adds nothing to the immediate comfort of the surgeon . . . it flatters neither the vanity nor the scientific sense to exorcise an invisible enemy with something very like a censor," Henry J. Bigelow had said, as he did his best to quash Lister's methods when they were first introduced.^{7,37,51} One wonders what Dr. John Homans said to start his operations when he could no longer intone, "Gentlemen, let us spray."¹⁷

The new aseptic ward was not in great demand for operations on the brain, which had remained distinctly unusual throughout the 19th century. During the hospital's first 2½ years, only one patient had undergone trephination for trauma, and throughout John Collins Warren's 30 years as Chief Surgeon he performed only seven trephinations there. This was despite Warren's strong interest in the brain: he published a monograph



FIG. 5. Photograph of Dr. Henry H. A. Beach (1844–1910), seated. (Probably taken after 1905 — note the rubber gloves.) In 1889, Beach performed the first craniotomy at the Massachusetts General Hospital based solely on cerebral localization. The tumor was not found until autopsy.

on the comparative anatomy of the nervous system,⁵⁰ and his collection of skulls and casts of heads was extensive.⁴⁹ Extracranial nerve section for trigeminal neuralgia was one of Warren's specialties, and he performed five during his years at the hospital. These cases formed the subject of the lead article in the first issue of the *Boston Journal of Medicine and Surgery*.⁴⁸ The first trephination at the hospital for an indication other than acute trauma was performed in 1832, for epilepsy. By 1838, other surgeons at the MGH were trephining for epilepsy as well, always in patients in whom the onset of seizures coincided with a palpable depressed skull fracture.²⁶ By 1870, 12 epilepsy trephinations had been performed, by six different surgeons.²⁵ But a whole year might sometimes pass without a trephination being performed for any reason.²⁵

The first glimmer of specialization in diseases of the nervous system at the MGH appeared in 1872, when J. J. Putnam (Fig. 4) gained an appointment as Outpatient Electrician and Neurologist.* The title of Electrician referred to treatments he gave with a "little battery" and a hand-cranked electrical generator, which, along

* Massachusetts General Hospital, in a letter dated June 28, 1872, appointed James Jackson Putnam an "Electrician." Boston Medical Library/Francis A. Countway Library of Medicine, Boston, Massachusetts.

with administration of bromides to reduce brain inflammation, constituted the main bulwarks of neurological therapeutics. Putnam was Harvard University's first lecturer in Neurology and a founding member of the American Neurological Association. Sigmund Freud, a personal friend of Putnam, often stayed at his Adirondack camp in Keene Valley, New York. In the absence of proper laboratory facilities at the hospital on Putnam's initial appointment, he converted a portion of his own house into a neuropathological laboratory. His office, to which patients were sent "to be electrified," was located immediately at the main entrance to the hospital. Overflowing with patients whose diseases were mysteries, and with whom no other physician wanted to deal, the office was soon dubbed the "Cloaca Maxima."⁵²

Throughout the 1870's and 1880's, operations on the brain were still essentially limited to trauma. They were performed by whichever Visiting Surgeon happened to be available — sometimes at the instigation of the neurologist, who might have been invited to see a comatose trauma victim who failed to rouse by morning. Despite advances in cerebral localization in Europe, operations at the MGH were still always predicated on a palpable fracture, and no procedures for brain tumor had yet been contemplated. In 1889, Dr. Henry H. A. Beach (Fig. 5) performed the MGH's first trephination

for tumor based purely on cerebral localization, the diagnosis having been made by Putnam.^{3,39} (This was just 3 months after the first such procedure in Boston was performed by Dr. E. H. Bradford at the Boston City Hospital.²⁹) Beach's patient, who suffered from an intrinsic brain mass posterior to the central sulcus, presented with episodes of speech arrest and right hand tremor. The trephination, over the motor strip, failed to disclose the tumor, despite digital examination of the depths of the brain. The patient died promptly after the procedure. Beach seems to have avoided craniotomies after this chastening experience. For the next several years, Dr. Putnam brought his patients to Dr. J. Collins Warren, grandson of the hospital's founder, who in a number of instances cut on the dotted lines drawn by Putnam. All brain-tumor patients appear to have been evaluated by a neurologist (usually Putnam) and an ophthalmologist (Dr. O. F. Wadsworth) prior to surgery. Except for the introduction of anesthesia, antiseptics, and the use of a skin flap rather than the old cruciate skin incision, the operative technique was essentially the same as that employed by Warren's grandfather 60 years previously for elevation of depressed skull fractures.³² Intraoperative electrical stimulation of the cortex, used in surgery on the human brain in England since 1885,⁶ was introduced at the MGH in about 1890; however, the records reflect disappointment with the apparatus, which frequently malfunctioned and was rarely, if ever, useful in outlining the motor area.³²

The Late 1890's and Harvey Cushing

The first man to express interest in brain surgery as a specialty at the MGH was Dr. John W. Elliot, who had met Victor Horsley during a trip to Europe in 1889. He returned eager to try Horsley's techniques in Boston.^{12,53} Unfortunately, he was not granted an appointment to operate at the hospital until 1894. During the interim he consoled himself by playing polo and perfecting his artificial gauze sponges for surgery, meant to replace the sea sponges then in use (with their inseparable burden of sand). He appears to have performed his first three explorations for tumor in 1895. These operations took place in the new Bradlee Ward for aseptic surgery, in its round operating theater, roofed with glass, paved with asphalt, and with rounded interior corners so that no dust could collect. The "Extern" on the service, who gave the chloroform for all three operations, was a Harvard University medical student named Harvey Cushing (Fig. 6). Forty-three years later, Cushing still remembered the cases well enough to report one of them in his monograph *Meningiomas*,¹⁸ with a photograph which he had kept tucked between the pages of a surgical textbook since 1895. Cushing's fascination with brain-tumor operations is evident from his ether charts for the cases (one of which carries the notation "Best case ever had," Fig. 7)¹⁵ and from his detailed autopsy notes on one of the two patients who died. These two patients were reported by another resident.⁴³ Cushing declined co-authorship, feeling that the cases had not been sufficiently well evaluated

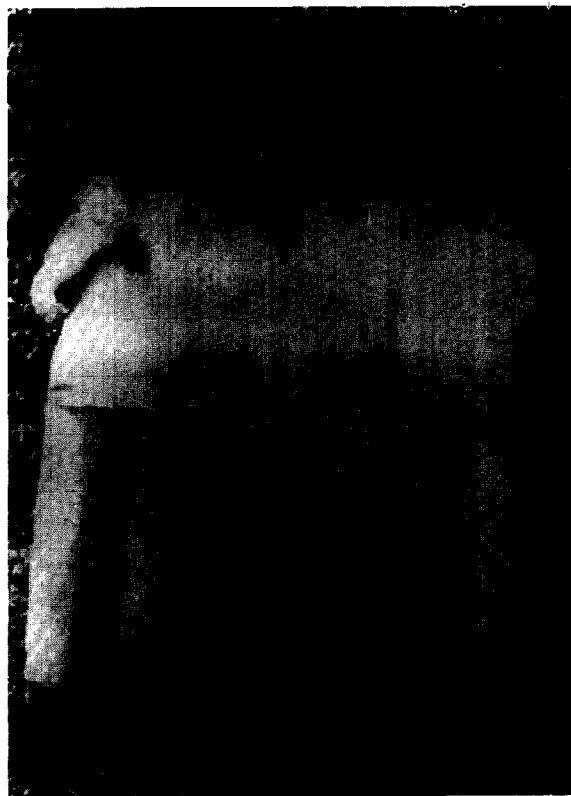


FIG. 6. Photograph of the South Surgical Service, 1895 to 1896, standing in front of the Bulfinch Building. Dr. Harvey W. Cushing (1869-1939), at that time a surgical intern, is on the far left.

preoperatively²² (another resident was responsible for the omissions³¹).

Emory Codman, Cushing's medical school friend, later speculated that these cases had directed Cushing toward a career in neurosurgery.⁴ Whether or not this is so, it seems certain that Cushing's advocacy of intraoperative blood pressure measurement, arguably his greatest single contribution to surgery, arose from his bitter humiliation and regret after a patient to whom he had given ether died in front of his medical school class. Cushing later described his vivid memory of the patient's "bedraggled whiskers" (the patient was actually a woman) and wrote that this experience had driven him to invent the ether chart (actually invented about a year earlier by Dr. F. B. Harrington, one of the hospital's visiting surgeons). These "stretchers" should not distract from Cushing's real role in the development of the anesthetic record, particularly during his years at The Johns Hopkins Hospital.⁴

Cushing's experience during that year of internship is interesting, both as the first exposure of America's most famous neurosurgeon to brain surgery, and also as the typical experience of a surgical intern in the 1890's at one of America's busiest hospitals. About 700 male patients and 500 female patients were admitted to Cushing's service (one of three general surgical serv-

Massachusetts General Hospital

TABLE 1

Number of craniotomies performed at the Massachusetts General Hospital during the years 1889 to 1916*

Reason for Craniotomy	Ward E 1889-1894	1893	1895	1896	1916
tumor	7	2	10	1	21
epilepsy	10	2	0	2	1
trauma	23	12	10	3	6
infection	1	2	1	2	2
other	3	2	5	3	3
total cases	44	20	26	11	33

* Source: Annual Reports of the Massachusetts General Hospital, 1893 to 1896 and 1916.

ices) during his 16 months of internship. Essentially, all patients underwent at least one operation, which averaged about four operations for the service as a whole on a typical day. No surgery was performed on Sundays without permission from the Chief Physician, and such exceptions had to be reported to the Trustees at their next meeting. The majority of operations on men were for trauma — setting fractures or amputations. Elective surgery on males was predominantly for hernias or hemorrhoids. Women usually entered electively for hysterectomies or breast resections. Appendectomies or amputations for gangrene were occasionally performed on either sex. Only 4.6% of all admissions would today be classified as neurosurgical cases, nearly all concussions or compound skull fractures. Cushing appears not to have actually performed a craniotomy during his year at the hospital, although he witnessed several, for tumor, trauma, and abscess.³¹ During this decade, the number of craniotomies per year for nontraumatic indications averaged eight, with a peak of 10 trephinations for tumor during 1895, Cushing's year of internship (Table 1). The standard of neurological sophistication of the surgical staff during Cushing's tenure may be gauged by the one case of "hysterical epilepsy" treated during the year; the woman received an oophorectomy at the hands of Dr. W. M. Conant. Postoperatively, Cushing prescribed the standard anticonvulsant drug of the day, potassium bromide, when the seizures were not alleviated by the gynecological procedure.³¹ Pelvic operations for epilepsy in young women continued at the hospital until at least 1906.³⁵

The results of the first elective craniotomies were rather discouraging. A 1905 report noted that the first 36 trephinations for tumor at the MGH had failed to cure a single patient; of the three patients among that number treated with "radical removal," two died immediately and the remaining patient had a rapid recurrence. Overall, nearly a third of the patients who underwent trephination for tumor were dead within 2 weeks. Results of craniotomy for epilepsy were more encouraging, nine of 21 cases showing postoperative amelioration of symptoms.¹³

The surgical technique was in its early stages. The skull was opened with one or more trephined holes; the dura was cautiously opened, and the brain was inspected and palpated. If nothing was found, a cortical incision was made and probed with the finger, extending if necessary under the margin of the craniotomy.

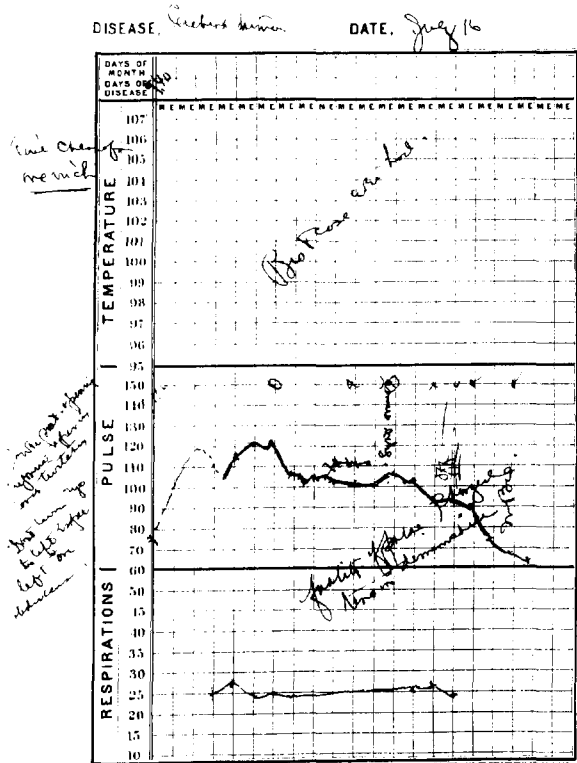


FIG. 7. Harvey Cushing's "ether chart" for the third of the three craniotomies for tumor he witnessed during his year at Massachusetts General Hospital (MGH) (July 16, 1895). The operation was performed by Dr. John W. Elliot. Contrary to standard MGH procedure, chloroform was used instead of ether, a practice said by Victor Horsley to reduce blood flow to the brain and hence reduce bleeding. The back of the chart reads "Elliot said never had less bleeding in opening skull." Across the top of the front Cushing has written "Best case ever had."

Electrical stimulation of the cortex was attempted in several cases with little success, due to failure of the machine or perhaps to the effects of the "antiseptic solutions" (carbolic acid or mercuric "corrosive") continuously poured over the cortex during the operation. The tumor, if found, was scooped out with a finger, and bleeding vessels were tied. Oozing from the brain was stopped with a 10% cocaine solution.^{28,29}

Medical treatment for brain tumor was strictly palliative. Bromides were the mainstay against seizures, and a bland diet was prescribed to combat vomiting. For truly refractory gastrointestinal distress, champagne frappé was used, as well as lime water and "peptonized" food. Nutrition might also be given *per rectum*. Headache was treated first with "milder remedies:" "evaporating lotions, cold, massage, or a mild galvanic current." In the end, morphine was provided.²⁸

Early 20th Century

John Elliot's interest in neurosurgery was short-lived. He turned to gynecology as a more favorable field, and

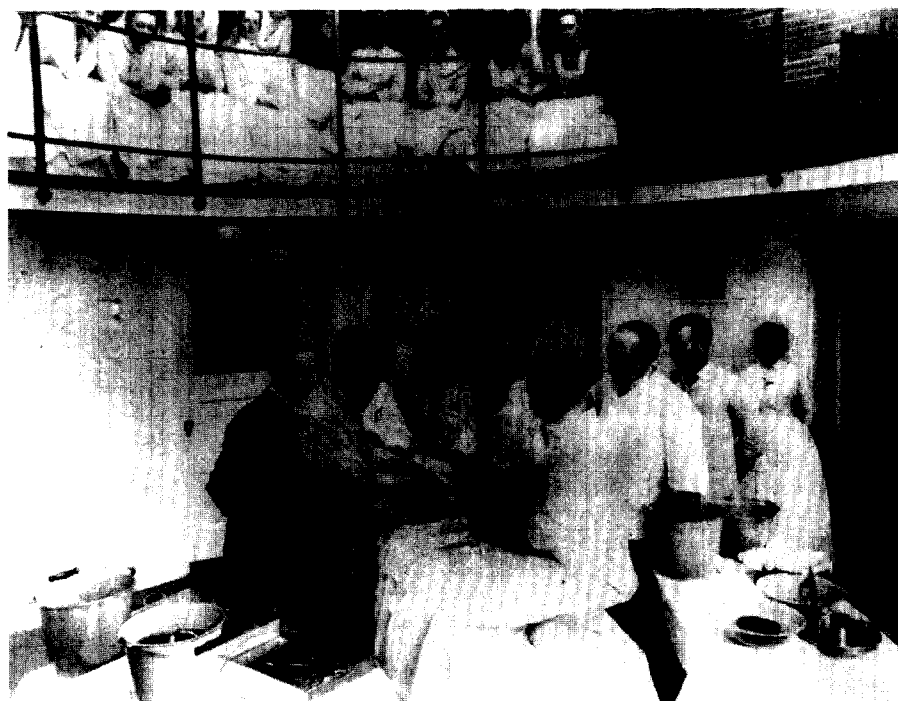


FIG. 8. Photograph of Dr. Samuel J. Mixer (1855–1926; bearded, center facing left) assisting at the second operation in the new Bradlee Ward for aseptic surgery (1889). Note the absence of rubber gloves. An assistant soaks his hand in a bucket of carbolic acid. In 1911, Mixer was made Chief of the West Surgical Service and was granted charge of all operations on the brain at the Massachusetts General Hospital.

again the performance of brain operations remained a task shared among the general surgical staff. Between the years 1895 and 1905, a total of 63 “brain cases” were divided between 18 operating surgeons.¹² Not surprisingly, little progress in diagnosis or operative technique was made.

By 1911, formal policies regulating interactions between surgeon and neurologist were established,⁵² and a “Special Assignment in the Surgery of the Central Nervous System” was given to Dr. Samuel J. Mixer (Fig. 8), who had shown interest in the operative treatment of trigeminal neuralgia. Mixer soon shared the “Assignment” with his son, William J. Mixer, who had spent 3 months assisting Horsley in London.³³ By 1917, 80 to 100 cases were being performed yearly.⁵² In the shadow of Cushing’s service across town at the newly built Peter Bent Brigham Hospital, the majority of the central nervous system operations performed at the MGH were for trauma, with a subsidiary concentration in tumors of the spinal cord. This interest bore unexpected fruit in 1934, when Mixer, together with orthopedic surgeon Joseph S. Barr, reported a series of herniated intervertebral discs with neurological deficit in the *New England Journal of Medicine*,³⁴ inaugurating a new era of spinal surgery.^{1,2} Francis Murphey assisted at the first lumbar discectomy as a medical student.³⁶

By the late 1930’s, the number of nontraumatic neurosurgical admissions had increased to about 400 per year. In 1933, special operating rooms for neuro-

surgery were provided in the new Baker Memorial Building. A residency program was established and, in 1936, the first neurosurgical resident, J. T. B. Carmody, completed his training. In 1939, the Neurosurgical Service was created, acknowledging the status of Neurological Surgery as an independent specialty, and formally ending the days when a brain operation might fall to whatever surgeon might wish to try his hand. Fittingly, Dr. W. J. Mixer was asked to serve as the first Chief of Service.⁵³

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