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Milestones leading to the development of spinal surgery in the late 19th century

D. J. Canale, MD*

The significant amount of spinal surgery in neurological practice today prompts a survey of the historical development of surgical treatment of disorders of the spine. Any discussion tracing the events leading to modern surgical practice must necessarily contain the contributions of men of medicine through the centuries; therefore, neurosurgery as practiced today is greatly indebted to the efforts of courageous and dedicated men in world history extending to the early Egyptians. Overcoming seemingly insurmountable barriers of prejudice bred of ignorance, societal customs, and religious tradition, these fathers of medicine have contributed the knowledge and experimental evidence which form the cornerstone of modern medical practice.

From the papyrus records of a surgeon of 2500 B.C. to Lister’s paper on asepsis and Morton’s use of anesthesia, the advance of surgery as an integral part of medical practice may be observed through the detailed records describing diagnostic procedures and treatment methods. Also viewed are surgical techniques employing remedies and instruments which bear little resemblance to those in use today.

Historical precedent is a well-known motivator, prompting understanding and inspiring progress. Building on these milestones of the past, modern men of medicine may further advance the practice of spinal surgery.

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SINCE spinal surgery comprises such a significant part of neurosurgical practice today, an account of the historical development of surgery of the spine seems particularly appropriate. This paper will recount and examine discoveries and events in medical history that have contributed to the advancement of knowledge of the nervous system and the science of surgery and, more particularly, surgery of the spine and spinal cord.

Successful surgical treatment of disorders of the spine and spinal cord was first accomplished in the latter part of the nineteenth century when William MacEwen of Glasgow performed the first successful laminectomy in 1883. Shortly thereafter, in 1887, Victor Horsley of London successfully removed an intraspinal tumor which had been diagnosed and localized preoperatively by Sir William Gowers.

Their efforts had been preceded by two momentous events in medical history. In 1846 Dr. W. T. Morton first demonstrated the practical use of ether anesthesia at Massachusetts General Hospital, a procedure which precipitated a remarkable increase in surgical procedures. Surgery of the nervous system, however, proved yet too hazardous since the problem of sepsis had not been overcome.

The publication in 1867 of Joseph Lister's famous paper, On a New Method of Treating Compound Fractures, Abscesses, etc. with Observations on the Conditions of Suppuration, introduced aseptic or antiseptic surgery, and helped initiate surgery of the nervous system. The importance of Lister's work cannot be overestimated. Horsley referred to surgery done prior to Lister as the "pre-scientific epoch of surgery." Surgery, as a definitive treatment for certain disorders of the spine, was then established by MacEwen and Horsley in the last quarter of the nineteenth century following the contribution of Morton and Lister. The first attempts at spinal surgery occurred much earlier in history, however, as the chronological order in Figure 1 shows.

Ancient Egyptian

The first references in recorded history to treatment of disorders of the spine are found in an ancient Egyptian writing, the Edwin Smith Surgical Papyrus dated about 1700 B.C. The document is a copy of an earlier writing dated about 2500 B.C., possibly written by Imhotep, the earliest known physician and architect, with commentaries added by a later surgeon. This ancient record is concerned largely with surgical problems in that, of the 48 cases described, 27 are of trauma to the head and 6 of injury to the spine. An idea of the treatment rendered by the ancient surgeon can be shown in two examples. In case 29 of the papyrus, the ancient surgeon describes a gaping wound in a cervical vertebra with no apparent neurological deficit. Treatment consisted of binding it with fresh meat on the first day and afterwards to "moor him at his mooring states" until the period of injury passed. This, perhaps, was a method of splinting the wound. Case 31 is an example of a more serious injury in which the ancient surgeon describes a dislocation of the cervical vertebra with paralysis of both arms and legs, incontinence of urine, priapism, and spontaneous ejaculation. The ancient surgeon declares the verdict to be unfavorable, and no treatment is suggested. In this case one can assume that the surgeon recognized the futility of treatment and, perhaps, declined to treat the patient because of fear of being accused of contributing to the fatal outcome. From the writings of other civilizations in existence during this period, such as the Babylonian and Assyrian in Mesopotamia, as well as the Hebrew, Hindu, and Chinese, there are not found any specific references to injuries or disorders of the spine.

Classical Greek period

The rise of Greek medicine is recorded in the writings of Hippocrates, the "father of
In addition to the dates shown, other milestones in spinal surgery were reached in the late 19th century by Macewen in 1883 and Horsley in 1887.
During the classical period of the fifth century B.C., medicine was advanced by Canale, who did much to advance the science of medicine by separating medicine from religion and by accurately describing diseases. He separated medicine from religion and by accurately describing diseases. Although he does not describe any actual surgery of the spine, he describes a gibbous deformity of the spine in which the spine is "contracted to a hump" from disease, most likely tuberculosis. He also describes scoliosis of the spine which he notes occurs in persons in good health. In these cases, he describes treatment which included extension and pressure on the deformity. He notes that fractures of the spinous processes may occur without other serious injury to the spine and that these will heal rapidly. In addition to his observations regarding the spine, he gives detailed descriptions for trephining the skull for head injuries. Regarding dislocations of the vertebrae, he describes two types. The first is that in which the vertebrae are displaced forward, compressing the spinal marrow and resulting in insensibility, paralysis, and retention of urine and feces. For these cases, he declares there is no satisfactory treatment and deplores the use of cupping and extension as methods of treatment for forward displacement which he declares to be usually fatal. The second type of dislocation is that of backward displacement of the vertebrae which he notes is rare but carries a better prognosis and is usually not associated with paralysis but may be confused with simple fracture of the spinous processes. He states that one rarely succeeds in straightening the dislocation, and in this particular case, condemns the use of succussion on a ladder.

Middle Ages

The work of Paul of Aegina, the last of the great Byzantine physicians, provides the next milestone in surgical history of the spine during the early part of the Middle Ages. Paul, practicing in Alexandria, is said to have been the first surgeon to operate on the spine. He recognized that the bodies of the vertebrae may be fractured, with resulting compression of the spinal marrow. Regarding treatment he says:

Wherefore having first given warning of the danger, we must, if possible, attempt to extract by incision the compressing bone, or, if not, we must soothe the part by the anti-inflammatory treatment.

This may be also one of the first examples of informed consent for surgery of the spine. It is doubtful that the surgery which he recommended could be compared with a true laminectomy as we know it today.

In general, medicine and surgery declined during the medieval period, with surgery, for the most part, being divorced from medicine and held in disrepute. With the rise of the universities in the latter part of the Middle Ages, beginning with Salerno in the eleventh century, there was a rebirth of interest in the study of anatomy; and human dissection was again permitted. Mondino's revival of anatomic dissection at the University of Bologna in 1315 was to have added significance two hundred years later in the anatomy of Vesalius. Guy de Chauliac, the greatest surgeon...
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of the Middle Ages, writing in the fourteenth century, recognized the symptoms of spinal cord injury but felt the prognosis was hopeless and recommended no surgery.

The Renaissance period

The advent of the Renaissance Period brought many advances in surgery, largely because Andreas Vesalius, whose monumental work *De Fabrica Humani Corporis* published in 1543 provided for the first time a correct understanding of the human body with a reasonably accurate anatomical description of the spine and spinal cord. Vesalius also repeated Galen’s experiments of sectioning the spinal cord.

The influence of Vesalius on Renaissance surgery is best noted in the works of Ambrose Paré, the famous sixteenth century French surgeon. Paré wrote an epitome of the *Fabrica* in the vernacular which became popular with surgeons of that time. His most well-known contributions are his use of the ligature, instead of the cautery, for bleeding vessels in amputation stumps and his advice against the use of boiling oil in the treatment of gunshot wounds. Paré gives rather explicit instructions regarding spinal injuries. He noted that the vertebrae may be fractured with the resulting compression of the spinal marrow. Regarding treatment, he says:

> Amongst these symptoms, are the stupidity or numbness and palsy, of the armes, legges, fundament and bladder, which diminish, or else take away from them the facultie of sense and motion; so that their urine and excrements come from them against their wils and knowledge, or else are wholly supprest. Which when they happen (saith Hippocrates) you may fore-tell that death is at hand, by reason that the spinal marrow is hurt. Having made such a prognostike, you may make an incision, to take forth the splinters of the broken vertebrae, which, driven in, presse the spinal marrow, and the nerves thereof.  

His description of the different kinds of dislocation of the vertebrae are essentially the same as those of Hippocrates. He gives clear instructions about the reduction of dislocations in the cervical area, as well as dislocations in the thoracic and lumbar regions, using a traction and counteraction technique, with the patient lying face down on a table. (See Figure 2.)

Considering the kinds of instruments available at the time and the probable outcome of most injuries to the spine, it is doubtful that a formal operation on the spine with removal of lamina was often performed. In his *Apology*, Paré records his treatment of the Constable Anne de Monmorenci, the leader of the Royalists in the Battle of St. Denis in 1567. Monsieur le Connestable had been suddenly rendered paraplegic from a gunshot in the middle of the spine. Paré went to Monsieur le Connestable’s house and dressed his wound but did not operate, reasoning that the spinal cord was crushed. He stated that the patient became confused and in a few days died. Paré, no doubt, recognized the futility of attempting to operate on this type of wound. There were, during the Renaissance, very few outstanding surgeons, so that operations on the spine were very rare.

Seventeenth century

Surgery, progressing little in the seventeenth century, was performed for the most part by barbers and was not held in high regard. Fabricius Hildanu, often called the father of German surgery, during this period described a unique method of reducing cervical dislocations by traction on a metal awl passing through the ligamentum muchae. This failing, he recommended early operation with the incision down to the spinous processes and dissection to expose the lamina on both sides with open reduction of the luxation with the aid of simultaneous extension and traction. Armour notes that his operative description closely resembles the modern operative approach to the laminae.
Eighteenth century

The eighteenth century brought several discoveries historically important to spinal surgery. Some of these, while not of immediate importance, were quite significant in later developments in neurology and neurophysiology. Robert Whytt, professor of the Institutes of Medicine at Edinburgh, repeated the experiments that had been performed on the spinal cord section by Stephen Hales, an English country parson. Whytt firmly established the nature of reflex action in the decapitated frog and experimentally demonstrated for the first time that only a small segment of spinal cord was sufficient to allow reflex action.

Domenico Cotugno, professor of surgery and anatomy at the University of Naples, made other significant discoveries during this century. In 1764, Cotugno published his "De Ischiade Nervosa Commentarius." This work contains astute clinical observations on sciatica in which he distinguishes two types, one in which the pain is limited to the hip, which he calls "arthritic" sciatica, and another which "runs" down the leg to the foot, which he calls "nervous" sciatica. His recommended treatment included bloodletting, purging and opium. In more protracted cases, he applied a cautery over the course of the nerve to produce a blister of the skin. A preferred area was in the region of the head of the fibula where the common peroneal nerve is quite superficial. In pursuing the site of nervous irritation in sciatica, he was led to the spinal cord, where he encountered cerebrospinal fluid. Cotugno gave the first accurate description of the fluid. The presence of cerebrospinal fluid in cases of hydrocephalus was known to the early Greeks. Until Cotugno's time it was thought that during life a vapor occupied the ventricles and subarachnoid space. Cotugno attributed the fact that the fluid had not been observed by earlier anatomists to the common practice of decapitating the cadaver prior to dissecting either the brain or spinal cord. This caused all the fluid around the brain and spinal cord to flow out and to be lost. In 20 cases of dissection without remov-
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ing the head, he collected between four and five ounces of spinal fluid in each one. To prove that this fluid was also present during life, he dissected living animals and found cerebrospinal fluid to be present.¹⁴

By the middle of the eighteenth century the status of surgery had improved in England as well as on the continent. One must doubt, however, that operative intervention was often successful, judging from the writings of Lorenz Heister, a leading German surgeon whom Horsley credits with first describing trephining of the spine. Heister states:

If in any case the spinal marrow should be divided, death will be generally an inevitable consequence; but to offer the patient no assistance because we despair would seem cruel and uncharitable; therefore, we must try our skill, though our attempt should be in vain; in order to which, the surgeon must bare the fractured vertebrae with the scalpel, and replace or else remove such fragments as injure the spinal marrow; the wound is to be afterwards gently cleansed as usual and dressed with Balsams, clapping over them a compress dipped in warm spirit of wine, or lime water, and spirit of wine camphorated, to be held on with the napkin and scapulary, until the wound shall terminate either in a perfect cure or death.¹⁵

Heister also clearly described his method of manual traction and manipulation for reduction of cervical spine fractures. In his book, A General System of Surgery, he illustrates a kind of sling traction for which he gives credit to Jean-Louis-Petit of Paris, the leading French surgeon of the first half of the eighteenth century. This method of placing the traction apparatus under the chin and occiput is essentially the same as we use today (See Figure 3).

Perhaps the most significant advance in surgery of the spine in the late eighteenth century was a new operation described by Percival Pott. Pott was surgeon to St. Bartholomew’s Hospital, London, when he published in 1779 his pamphlet, Remarks on That Kind of Palsy of the Lower Limbs Which Is Frequently Found To Accompany A Curvature of the Spine and Is Supposed to Be Caused by It; Together With its Method of Cure; etc.¹⁶ Considering the state of knowledge of surgery at this time, Pott’s discovery was of particular importance because he introduced a relatively easy method of treating and frequently curing paraplegia due to tuberculosis of the spine, which was not uncommon at this time. Percival Pott noted that this disease or distemper was called “palsy” and was supposed to be due to curvature of the spine. He reasoned that the commonly held theory of injury being the cause of the curvature was not correct even though he did not recognize the tuberculous nature of the disorder. He studied this condition carefully, performing postmortem examinations in which he noted that the intervertebral cartilage (discs) was destroyed, and that a quantity of sanies (pus) lodged between the “rotten bones” and the

Figure 3
Illustration taken from Page 192 of “A General System of Surgery, in three parts,” by Dr. Lawrence Heister, 1768. The figure on the left illustrates a sling placed over the head. On the right is another sling used to retain the patient’s body and pull down on the shoulders. This sling method was used to treat subluxation of the cervical vertebra.
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dura. In describing the treatment he stated: "The remedy for this most dreadful disease consists merely in procuring a large discharge of matter, by suppuration, from underneath the membrana adiposa on each side of the curvature and in maintaining such discharge until the patient shall have perfectly recovered the use of his legs." This recovery, he noted, would occur even though the curvature of the spine remained.

His technique consisted of incision and drainage of the paraspinal mass. He preferred placing a large kidney bean in the bottom of the incision and sprinkling in powdered cantharides (Spanish Fly) to act as an irritant in keeping the wound from closing over. His experience with the use of setons (linen drains) was not satisfactory because patients did not take proper care of the drain. Three years later in 1782, Pott elaborated further on this condition with another publication in which he states his belief that the cause of the paralysis was erosion of the vertebrae and that consolidation and union of the vertebrae which had been carious was essential for cure. At this time suppuration was still considered an essential part of healing, and Pott did not associate the drainage of the purulent abscess and its consequent relief of pressure on the dura and spinal cord with recovery of paralysis. This does not, however, detract in any way from his accomplishment.18

Nineteenth Century

Two important physiological discoveries relating to the functions of the spinal nerve roots were made in the early nineteenth century and had a profound effect in later years on the diagnosis and treatment of disorders of the spine. The first of these important contributions to neurophysiology was made by Sir Charles Bell in 1811 in a privately printed pamphlet, *Idea of a New Anatomy of the Brain,* in which he demonstrated that stimulation of the anterior spinal nerve roots caused the muscles to contract, disproving the theory that all spinal nerves were sensory.19 Francois Magendie of France demonstrated the sensory function of the posterior spinal nerve roots in 1822 after hearing of Bell's work. Magendie cut the posterior roots of the lumbar and sacral nerves on one side and demonstrated that the ipsilateral hind limb became totally insensitive to pain but was still able to move. The Bell-Magendie law, showing the function of the spinal nerve roots, has been compared in importance to Harvey's demonstration of the circulation of the blood.

The nineteenth century opened with the controversy over operating on the spine for fractures. Injuries to the spine with fracture and compression of the spinal cord caused by falls, blows or gunshot wounds were the only conditions for which spinal surgery was considered at this time. Benjamin Bell of Edinburgh, writing in 1801, recommended surgery where there was reason to believe that the cord was compressed by depressed bone fragments, citing a case of recovery from paralysis after the removal of a musket ball lodged in a vertebra.20

Charles Bell of London was, undoubtedly, a very talented surgeon as well as an anatomist and experimental neurologist. This is perhaps best demonstrated in his recommendations regarding the treatment of spinal injuries. His clear advice on the handling of a patient with an acute spinal cord injury would hold true even today. He states: "In whatever way the vertebrae are broken, the danger of moving the body must be apparent, since in every change of posture, or turn of the body, broken bones may be thrust against the spinal marrow." Further, he advises the surgeon to carry a catheter with him when called to see his patient with a spinal injury. His description of the patient with a distended bladder and ileus in this period of "the first shock," as he calls it, is essentially the same as we view a spinal-cord-injured patient today with "spinal shock."

Bell explains that, "looking into the anatomy as our only guide," there is good reason
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to surgically decompress the spinal cord; however, the "real circumstances" are such that removing the bone doesn't correct the injury to the spinal marrow. Moreover, "the little probability that the operation would do good with the chance of doing much mischief deters us from laying open the canal." (See Figure 4.) One can't help but conclude that the "state of the art" of spinal surgery at this time was not very high. Bell's conservative philosophy regarding the management of these patients, expressed in his operative surgery of 1810, however, was not shared by all.

In 1814 the younger Henry Cline, surgeon to St. Thomas Hospital of London, performed a formal operation for removal of a depressed vertebral arch. The patient, who was paraplegic, died following surgery. In a clinical lecture afterwards, Cline nevertheless justified the operation on the basis of the same circumstances that one would decompress the brain in a case of depressed skull fracture. Cline's operation and particularly his lectures attracted wide attention, and the case was even the subject of a report in the lead article of the January, 1815, edition of the New England Journal of Medicine and Surgery. Considerable controversy over Cline's position went on for years. Astley Cooper, a pupil of John Hunter and a popular surgeon at Guy's Hospital in London, supported Cline. Cooper's position on Cline's operation was: "I am certain that such an attempt was laudable...and if it saves only one life in a hundred, it is more than I have yet seen accomplished by surgery." Cooper noted these spinal-cord-injured patients were without hope though there were differences in survival. Those cases of fracture above the third cervical vertebrae were immediately fatal. Patients with fractures of the lumbar vertebrae usu-

Figure 4
Taken from "A System of Operative Surgery Founded on the Basis of Anatomy," by Charles Bell, this illustration shows Bell's knowledge of pathological anatomy in fractures and dislocation of the spine, and the consequent injury to the spinal cord. Page 225, 1814 London edition.
ally die within six weeks of injury; those with similar injuries of the dorsal vertebral survive no more than a fortnight or three weeks; and death ensues in three to seven days following fractures of the cervical vertebrae. With his conservative views Charles Bell vehemently opposed both Cline and Cooper on this matter. Commenting on this controversy, Donald Armour stated that because of Bell's great influence as a leading neurologist of the day, he helped retard the development of spinal surgery. I would disagree with Armour on this matter as I think that Bell, recognizing the problems of sepsis and the limitations of the "free use of the chisel," realized the futility of surgery of the spine at this period. Following Cline's report, there were occasional reports of operations on the spine, almost always unsuccessful, as late as the mid-nineteenth century.

A very important figure in medicine in the mid-nineteenth century was Charles Edward Brown-Séquard whose experiments on the spinal cord made a significant contribution to the clinical diagnosis of lesions of the spinal cord. He was widely travelled, and it is significant that he was appointed to the National Hospital for the Paralyzed and Epileptic, Queen Square, London, when it opened in 1860. He was the first to point out the clinical significance of experimental hemisection of the spinal cord. This really laid the foundation for anatomy and function of the spinal cord. His original papers on this subject were published in 1850 and 1855. The essence of his experiments is described in his statement: "So that wherever the lesion, in a lateral half of the cerebrospinal axis may be—below, above or at the level of the crossing pyramids—if it produces anesthesia, it is on the opposite side; while paralysis in these cases is either on the same or on the opposite or both sides.'"

In his text on paraplegia published in 1861, the treatment of paraplegia due to tumors of the spinal cord is described. He recommends the application of a large belladonna plaster to the back, ergot of rye internally, galvanism to the legs, iodine of potassium for syphilitic tumors, and, if a tubercle is suspected, cod liver oil. The patient is also advised to have a most nourishing diet and a little wine. In no place is surgery mentioned for treatment of a spinal cord tumor at what was literally the "mecca of neurology" a scant 26 years before Victor Horsley was successfully to remove a spinal cord tumor at the same institution. By 1870, however, Brown-Séquard did express the view that trephining the spine might be useful, at least in cases of fracture of the spine with injury.

The Civil War (1861-1865) in this country provides another record for the study of surgery of the spine in the mid-nineteenth century. Results of 642 cases of gunshot injuries to the vertebrae are reported in the Medical and Surgical History of the War of the Rebellion. Of these 642 cases, 349 were fatal, a mortality rate of 55.5%. There were 62 cases operated on, and of these 27 died. The majority of the operations (34 cases) consisted of removal of the musket ball. Bone spicules were removed in 24 cases, and in four cases ligation of bleeding vessels was carried out. The author notes that the successful operations resemble the one described by the famous French surgeon, Louis, one hundred years earlier, in which the operation consisted of an incision with removal of a musket ball and loose bone fragments felt by the examining finger. It was the conclusion of the surgeon general, when this volume was published in 1870, that "formal trephining of the spine has hitherto given such unfortunate results that without much more positive favorable evidence it cannot be accepted as an established operation."

The final impetus for surgery of the spine came in the last quarter of the nineteenth century from a not unexpected source, the medical neurologist. The feeling about surgery of the spine at this time, however, had not changed much, as evidenced by Herbert Page writing in 1881 in Heath's Dictionary of
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Surgery. He stated: "The operation of trephining the spine... is an operation not within the range of practical surgery." The medical neurologist at the time undoubtedly was seeing most, if not all neurologic cases, and recognized the possibilities for surgical treatment of tumors in particular, now that the surgeons were operating under aseptic and scientific techniques, following the influence of Joseph Lister.

William Hammon, author of the first American text book of neurology and, with Weir Mitchell, a founder of American neurology, raised the question in 1881 of who would be the first to attempt an operation on the spine for an intraspinal tumor. Hammon, like others in his day, recommended anti-syphilitic treatment with iodine of potassium and mercury when a tumor of the spinal cord was suspected. If this measure was ineffective, he recognized that perhaps nothing else could be offered except "extirpation by trephining the vertebral column." By 1886, the leading neurologist of Edinburgh, speaking on the treatment of extramedullary tumors in 1886, noted that the operation was not yet a recognized plan of treatment. He added, however, that with the advent of antiseptic surgery, he would advise an operation if the growth could be localized and if vigorous anti-syphilitic treatment had failed to relieve the symptoms. Sir William Gowers of London commented that surgery "may ultimately be able to cope in some degree with meningeal tumors." The real modern pioneer in spinal surgery must be recognized as William Macewen, surgeon to the Glasgow Royal Infirmary. With the encouragement of the neurologist, Alexander Robertson, Macewen had already begun operating on the spine, performing his first successful laminectomy in 1883. He operated on a nine-year-old boy who had an angular curvature of the spine with complete spastic paraplegia and incontinence with a clinical level at D-6 of two years duration. Macewen removed the 5th, 6th, and 7th dorsal laminae and dissected a "fibrous neoplasm" off the dura. The patient began to improve almost immediately and eventually made a complete recovery. Macewen did not report the microscopic examination of the "neoplasm," and it was presumed by later writers to have been due to tuberculosis. He operated on a similar case in 1884 and by 1888 reported his experiences with six cases in which he had performed laminectomies. Two of these cases ended fatally, but both had active tuberculosis.

The distinction of successfully removing the first spinal cord tumor was to go to Victor Horsley. He was a superbly qualified young surgeon when, at the age of 29, he was appointed surgeon to the National Hospital for the Paralyzed and Epileptic, Queen Square, London, in 1886. A year later in June, 1887, the historic operation took place. A 42-year-old Army captain was admitted to the hospital on Sir William Gowers' service. He complained of intermittent back pain, increasing in frequency and severity for three years, with weakness in the lower extremities beginning four months prior to admission and progressing to spastic paraplegia and incontinence. He had a sensory level at D-5 to D-6. Sir William Gowers made the diagnosis of a benign intraspinal tumor. Diagnoses prior to admission included intercostal neuralgia, syphilis, aneurysm, and hysteria. Horsley was asked to see the patient on the 9th of June and examined him about 1:00 p.m. At 3:30 p.m. the same day, Horsley took the patient to surgery. Ether was employed as the anesthetic. The patient was placed in the semi-prone position and "prepped" with carbolic acid solution. The spray was used throughout the operation in the typical Listerian manner. Muscle bleeding was controlled with Wells forceps and sponge packing. The 4th, 5th, and 6th dorsal spine were removed. A ¾-inch trephine opening was made in the 5th thoracic lamina, and the laminectomy was completed by removing
the laminae of the 4th, 5th, and 6th dorsal vertebrae with bone forceps. After exposing the D-5 root at the upper end of the wound and not locating a tumor, Horsley, feeling the pressure, was unwilling to “leave the matter undecided.” His assistant, Charles Ballance, urged him to look higher, and, following removal of an additional lamina, a bluish-red tumor was seen on the left side near the attachment of the dentate ligament and attached to the highest root of T-4. The tumor was dissected away from the cord without difficulty, bleeding being controlled by gentle pressure with sponges. The tumor bed was irrigated with a 5% carbolic acid solution. The dura was not closed, and the wound was drained and closed in layers. Under microscopic examination the tumor was described as a “fibromyxoma.” Horsley states that “enormous quantities” of cerebrospinal fluid drained initially but this gradually subsided over six weeks. After this experience, Horsley recommended removing the drain within two days following surgery, rather than six, but did not mention closing the dura. The patient was discharged about two months postoperatively. He had little pain and was ambulatory. At the end of the year he was essentially asymptomatic.

Horsley reviewed 58 cases of spinal cord tumor, one of which was his own. Only in one other case was surgery performed—a lipoma in a 10-month-old child who survived only six months. All other cases ended fatally after treatment which included cautery, moxas, blister, iodine, mercury, potassium, baths, etc.

Gowers and Horsley’s case report received worldwide attention and demonstrated conclusively that certain lesions of the spine and spinal cord are amenable to surgical treatment. In the succeeding years surgeons on the continent of Europe and in the United States began to operate on the spine with success—in virtually every instance acknowledging Horsley for opening a new chapter in the history of surgery of the spine.
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