

# Localisation and William Macewen's Early Brain Surgery Part I: The Controversy<sup>\*</sup>

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## ABSTRACT

Neurosurgery for the removal of brain tumours based on localising signs is usually dated from the 1884 operation by Bennett and Godlee. However, within weeks of that operation claims were made on behalf of William Macewen, the Glasgow surgeon, to have been the real pioneer of such surgery. According to Macewen's protagonists, he had conducted seven similar operations earlier than Bennett and Godlee and, in a notable 1888 address, Macewen described these seven pre-1884 cases and a number of others operated on after 1884.

This paper, which is in two parts, contains an evaluation of the claims made for the priority of Macewen's pre-1884 operations. Part I deals mainly with Macewen's work in fields other than brain surgery that are relevant to it and sets out the facts of the controversy. It begins with a brief biography of Macewen, describes his pioneering work in antiseptic and aseptic surgery, his work on osteotomy and bone regeneration, and his use in brain surgery of the knowledge so gained. Part I concludes with an examination of the battle waged in the newspapers between Macewen's and Bennett's and Godlee's supporters, and of previously unpublished correspondence between Macewen himself, David Ferrier and Hughes Bennett. The primary records of the patients on whom Macewen operated, together with other materials relevant to the controversy, are examined in Part II.

**Keywords:** William Macewen, Hughes Bennett, history of brain surgery, cerebral abscess, asepsis/antiseptics, bone grafts, osteotomy, otology

William Macewen, the Scots surgeon, was a quite remarkable and precociously original man. In 1876, at just 28 years of age, only 8 years after completing the first stage of his medical training, he planned to remove an abscess from Broca's lobe in a patient with a transient aphasia. In 1881

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he published that case and three others he had operated on at the Glasgow Royal Infirmary (Macewen, 1881c). By March of 1884 he was able to demonstrate to his colleagues the results of seven similar operations on the brain and eight on the spinal cord (Macewen, 1884b). The *British Medical Journal's* short report of the 1884 demonstration stressed that “cerebral localisation of function guided the operator to particular lesions” (*British Medical Journal*, 1884a).

Macewen's publications pose a problem for the history of the neurosciences. They are an implicit claim for his being the first to use localising signs in planning operations for lesions of the brain and spinal cord, whereas the credit for the first operation for the removal of an intracranial tumour based on knowledge of localisation is usually given to Bennett and Godlee (1882–1885, 1884, 1885a, 1885b), with Gowers and Horsley (1888) usually credited with the first similarly guided surgery on the cord. How valid, then, is Macewen's claim? My primary purpose in this paper is to report what an examination of archival material and published, but little noticed, material reveals about Macewen's seven pre-1884 brain surgery cases.

The paper is in two parts. Part I begins with a brief biography of Macewen and describes his pioneering work in aseptic surgery and his contributions to reforming the education of nurses. His work on osteotomy and bone regeneration is then assessed, and his use in brain surgery of the knowledge of bone so gained set out. It concludes with an examination of the debate about the pre-1884 cases that took place mainly in the contemporary London and Glasgow press between December 1884 and May 1885.

## WILLIAM MACEWEN

William Macewen, the youngest of the twelve children of John Macewen – of the Macewens of Loch Fyneside – and Janet Stevenson of Ardmaleish, was born on 22nd June 1848 on the Isle of Bute, some 30 miles west of Glasgow in the northern part of the Firth of Clyde. John Macewen, a seafaring man with a financial interest in a small sailing ship, traded among the islands of the Firth, Ireland, and Scandinavian

and Baltic countries. During his early days, William Macewen developed a love of nature, the land and horse-riding, as well as forming a profound attachment to the sea and learning how to swim and sail a boat. He also became familiar with the tools and the methods of working the wood used in boat building. He completed his primary education at Rothesay (on Bute) where he was noted more for the blue and black bruises he inflicted on his opponents in single stick fighting than for his academic attainments.<sup>1</sup>

When William was about 10 years of age, his family moved to Glasgow and he attended the Collegiate School, Garnethill. According to the reminiscences of James W. Allan, then a classmate 2 years older than Macewen and later his brother-in-law, he was not a studious pupil, being careless about lessons and more likely to be found fighting with the single stick in the gymnasium than in the classroom. Nevertheless, Macewen gained entry to the University of Glasgow in 1865 and began the study of medicine, where Allan tells us about one of Macewen's very marked characteristics: his desire to investigate things for himself, a trait we first see in the long periods he spent examining the anatomical specimens in the Hunterian Museum at the Glasgow Royal Infirmary (Glasgow Royal Infirmary Museum, 1962).

In that Macewen gained no honours of note, Bowman (1942, p. 5) described his academic results as “undistinguished.” Bowman's description can be filled out by reconstructing part

<sup>1</sup>Single stick fighting was a traditional Scottish sport once commonly seen at fairgrounds. Antagonists used a stick lacking point or edge as a sword with the aim of cutting one's opponent's head “till the blood run an inch” (Information obtained by Carol Parry from John Burnett, Keeper of Social History, National Museum of Scotland). Although it is unlikely that that was the goal on the playground and in the gymnasium, the arms of those of Macewen's acquaintances lured to play against him were frequently black and blue as a consequence. This student pursuit is supposed to have given Macewen a good foundation for the fencing he practised later while waiting for cases to appear when he was the Casualty Surgeon for the Glasgow Central Police District, and at which he became “a formidable antagonist” (Patrick, 1924, p. 219).

of Macewen's academic record from the University Calendars (the University's archive of transcripts does not reach beyond 1873). The Calendars show Macewen managing first class certificates in only two subjects, second class or merit certificates in about half the remaining, and passes in the rest. In five subjects his place in the merit order can be calculated: second in twenty-seven of the combined first and second class results in Midwifery, eighth in thirty-one of the classed results in Practice of Medicine, eighth of twenty-two in Materia Medica, tenth of twenty-eight in Physiology, and forty-first of forty-two in Forensic Medicine. He completed his M.B. and C.M. during the 1868-1869 session, the degrees being conferred at the ceremony on the 30th April, 1869, and his M.D. in April, 1873.<sup>2</sup>

Soon after completing his residency, Macewen accompanied a wealthy patient on a tour of Europe that included visits to Italy and France (Macewen HA, 1974, pp. 30-31). By 1881 he had also visited some European medical schools and continued to make such visits throughout his career, eventually encompassing schools in France, Belgium, Germany, Austria, Russia and Italy. He had studied French, German, Greek and Latin for the General Education Examination that had to be passed during his medical training, and his later publications and notebooks show he was reading French, Italian and German well enough to translate whole articles and to condense others.<sup>3</sup>

Macewen was appointed Physician Superintendent at the Parish Hospital in Parliamentary

Road in 1871, where he began to concentrate on surgery, but by 1874 he was at the Glasgow Royal Infirmary, working exclusively as a surgeon, and 2 years later was promoted to full surgeon in charge of wards. In 1871 he became Casualty Surgeon to the Glasgow Central Police District and set up a private practice.

At only 28 years of age Macewen had achieved what was appropriate, in those days, for a 50 year-old. But, in a sense, that was only a beginning. Thus he was elected to Fellowship of the Faculty (later the Royal College) of Physicians and Surgeons of Glasgow in 1874, and by 1876 the Glasgow Faculty (later, School) of Medicine had appointed him Lecturer in Medical Jurisprudence. The Glasgow Royal Infirmary School of Medicine appointed him Lecturer in Clinical Surgery in 1881 and later Professor in 1889. With Joseph Lister [1827-1912], David Ferrier [1843-1928] and Hughlings Jackson [1835-1911] among those who supported him, his application in 1892 for the Regius Professorship of Surgery at the University of Glasgow was successful. But it meant severing his connection with the Glasgow Royal Infirmary and having to build one of equal significance with the rival Western Infirmary (which he did with great difficulty). Elected Fellow of the Royal Society (London) in 1895 for his work on bone, his Fellowship of the Royal College of Surgeons (England) followed shortly

<sup>2</sup>Descriptions of Macewen's College and University interests from the 1924 handwritten and typescript 'Notes by Dr. J.W. Allan on the School and College days of Sir William Macewen' (University of Glasgow Archives, DC79/36 and DC79/41 respectively). Reconstruction of Macewen's academic results and his place in the merit order from published results in the *Glasgow University Calendars* for the period 1866-67 to 1869-1870. Degree conferrals from *Glasgow University Calendars* for 1870-1871, p. 151 and 1873-74, p. 161. The topic of Macewen's M.D. is not known.

<sup>3</sup>For some of Macewen's translations and condensations see the *Glasgow Medical Journal*, 1873, 5, 353-360 and 1874, 6, 370-396, as well as the many French and German references and translated quotations in his *Osteotomy* (Macewen, 1880a).



Fig. 1. William Macewen at about 30 years of age (Courtesy of the Royal College and Physicians and Surgeons of Glasgow).

after, in 1900. Created a Knight Bachelor (K.B.) in 1902 for his services to surgery he was elevated to Companion of the Bath (C.B.) in 1923. During the First World War he held the rank of Surgeon Rear-Admiral as Surgeon-General to the Royal Navy in Scotland and conducted rehabilitation work at the Erskine Hospital. In 1922 he was elected unanimously to the Presidency of the British Medical Association, and in 1923 was President of the International Society of Surgery. Macewen was also the recipient of many honours and honorary degrees from universities and other bodies in the United Kingdom and abroad. He died in 1924 aged 75 years (Patrick, 1924).

Although a conservative in politics and in many other aspects of life, the descriptions of Macewen's teaching methods by Duguid and others show that he insisted that his students develop independent habits of observation, examination and deduction. He especially disliked his students and assistants quoting opinions and conclusions from books that they had not verified by their own observations. In his clinical instruction he typically first restricted students to looking at the patient and describing what they saw. Only when Macewen was satisfied with those visually based descriptions were students allowed to palpate, whereupon they had to give another description. Finally, possible diagnoses were formulated. These were written down before being produced, one at a time, without the student's name to identify them, and read to the class by Macewen before the whole class discussed it. Although a disciplinarian and hard taskmaster, as Duguid (1957) and Young (1926) bring out, Macewen was nevertheless open to contradiction and persuasion on matters of medical and surgical practice by adequate opposing arguments or the demonstration of the satisfactory effect of a new procedure.

It is true that some of his colleagues, assistants and students found him difficult, but they seem to have been the minority. A good illustration of the esteem in which at least some of his students held him came during his time at the Western Infirmary. Macewen was party to a prolonged dispute with the University and the hospital directors over the wish of the latter to reduce the number of teaching beds available to him. One phase of the battle kept him away from teaching for three days. When he returned he was greeted "with a great

demonstration by his students, and in the course of a few remarks expressed his keen appreciation of their sympathy and support" (Undated newspaper clipping – probably a Glasgow newspaper. University of Glasgow Archives, DC79/160).

In his obituary notice, Patrick (1924) characterised Macewen as essentially an individualist, a view I found current in Glasgow in 2002 with several retellings of one of his self-descriptions, "I am not a co-operator," and the opinion that "He was a rude bugger." Yet, when he was working with small committees, he was the soul of tact and very easy to work with. As President of the British Medical Association in 1923 he was, Patrick said, "adroit and courteous at handling difficult people and delicate situations."

Nor was he remote and uncaring. His correspondence with Rebecca Strong, the Glasgow Royal Infirmary's formidable matron, reveals a concern for the problems that almost forced her to resign, as well as an understanding of the difficulties of her nurses (Gibson, n.d.). He showed the same qualities when he was Chairman of the House Committee by asking the residents to be "gentle in your demands on the nurses" at a time when many of the Infirmary's nurses were on vacation (University of Glasgow Archives, DC79/15). The same quality is found in his rehabilitation work during the First World War at the Princess Louise Scottish Hospital for Sailors and Soldiers at Erskine ("The Erskine Hospital"), where the stories of his battles on behalf of his patients are the materials from which legends are fashioned. Many years after the event, Katherine Leitch, once an Erskine Hospital cook, recalled that before the Christmas Dinner concert on 25th December 1917, the presents were "distributed by Sir William Macewen, a slim and elegant Santa Claus" (Undated newspaper clipping – probably a Glasgow newspaper. University of Glasgow Archives, DC79/160).

Possessed of a notably quick and acidic wit, Macewen once remarked to a visiting surgeon from New York who was becoming increasingly anxious about his unhurried preparation for an operation, because – the visitor explained – it was customary for US surgeons to bathe before operating: "In Scotland we bathe whether we operate or not." On another occasion, he was forced to apologise to a hospital manager whom he had described as

being no better than “a cabbage, content to vegetate and run to seed.” He did so icily: “I apologise,” adding – after one of his long and characteristic pauses – “to the cabbage.” Nor was he afraid to joke about the Scots. Once, in addressing a dinner of the fifth year men of Glasgow University, he responded to a criticism made by the Royal Commission on Physical Training in Scotland, that Scottish universities were not doing enough to ensure the physical fitness of their students, with “he was of the opinion that football, and even golf, excellent as they were, were not the be-all and the end-all of existence” (Undated newspaper clipping – probably a Glasgow newspaper. University of Glasgow Archives, DC79/160).

#### MACEWEN AND ANTISEPSIS AND ASEPSIS

Much of Macewen’s success in various branches of surgery, including the extraordinary results of his treatment of pyogenic brain infections and his osteotomies, were due to the antiseptic and/or aseptic regimens that he followed. They bear examination, especially as they reflect the move from antiseptics to asepsis for which he became famous in Glasgow.

Antiseptic procedures were actually developed by Lister in Glasgow after he took up his appointment at the Royal Infirmary there in 1861. His purpose was to prevent unseen airborne agents that were suspected of causing putrefaction (bacteria had not then been seen under the microscope) from entering accidentally caused wounds, such as fractures, or those caused deliberately by surgical incision or amputation. Hence Lister applied undiluted carbolic acid to the wound to prevent the agents from entering and applied a dressing of cloth soaked in it; and covered the dressing with tinfoil to prevent it drying out and contaminants being reintroduced. Lister eventually replaced foil with a cloth soaked in a mixture of carbolic solution and shellac and coated with gutta-percha. On returning to Edinburgh in October 1869, Lister developed the second main technical aspect of his method, the one for which he is most famous: spraying the operating theatre with a fine mist of dilute carbolic acid to kill the airborne contaminants.

Exactly what led Lister to experiment in the way he did is not clear, but he was aware of and repeated Louis Pasteur’s [1822–1895] work on the airborne contamination of sterilised liquids in the belief that contamination of the same kind caused putrefaction in wounds. He began developing and testing antiseptic principles for controlling infections in compound limb fractures and tubercular abscesses of the spine in 1865, at the Infirmary. In March of that year Lister treated his first case (unsuccessfully), but had more success with ten of eleven cases of compound fractures between August 1865 and April 1867 so that by the December he could publish the first of two now famous papers on his methods and their results (Lister, 1867a, 1867b).

Macewen was 21 years younger than Lister and only a first year student of medicine in 1865 when Lister began his trials. Hence, and despite some claims to the contrary, Macewen was never close enough in time to Lister or advanced enough in his studies to be one of his Dressers or House Surgeons (Wellcome Historical Medical Museum, 1927, pp. 65–67). He was, however, an early convert to Lister’s methods (Jones, 1995, 1996) and was himself working as a surgeon at the Glasgow Royal Infirmary when the then Infirmary Chairman, Mr. W. M’Ewen (no relation), compiled very strong evidence that antiseptics decreased mortality by about 50%. According to the *British Medical Journal* (1879a, 1879b), M’Ewen’s analysis of Infirmary treatments between 1875 and 1878 showed the average annual mortality in all cases treated antiseptically was 2.93% whereas it was 5.84% in those treated non-antiseptically.<sup>4</sup>

<sup>4</sup>M’Ewen reported this comparison in September 1879 to the 6th International Medical Congress in Amsterdam (M’Ewen, 1880, p. 411). There is much less detail in the summary of what he said there than is given in the *British Medical Journal* accounts, and the mortality percentages are different although the ratio – 4.6:2.4 percent – is about the same. A comprehensive search by Mr. Alistair Tough of the Glasgow Health Board Archive has not been able to locate a copy of what the *British Medical Journal* calls “the documents relating to Mr. McEwen’s statements,” and which must constitute an important set of comparative data evaluating early antiseptic treatment.

One of William Macewen's first publications after his surgical appointment at the Glasgow Royal Infirmary reported a bilateral ovariectomy, a then quite dangerous operation, conducted successfully and antiseptically at the Glasgow Town Hospital (Macewen, 1874). In much of his early surgery he used carbolic acid in the same way as Lister in dressing post-operative wounds, and eventually also sprayed dilute carbolic acid throughout the theatre whilst operating. Like Lister, Macewen also paid attention to the problem of ligating blood vessels and suturing wounds. In systematic experiments Macewen treated sterile catgut of various thicknesses for varying periods of time in varying concentrations of chromic acid, so that it was capable of being absorbed by the body at different rates. Lister conducted similar experiments on preparing catgut – apparently independently of Macewen – and, astonishingly, Part I of Macewen's paper reporting his appeared in the same journal only a week ahead of Lister's, with Part I of Lister's paper actually ending on the same page on which Part II of Macewen's began. Although Macewen's catgut was superior to Lister's in a number of respects it took 6–8 weeks to prepare and never became as popular (Lister, 1881; Macewen, 1881a, 1881b; Gibson, 1990; Hall, 2001). On the other hand, when Macewen summarised his long experience with catgut ligatures in his 1904 Address on surgery to the British Medical Association, he included his original recipe (Macewen, 1904a). The *British Medical Association* (1904, ii: 247-248) judged what he said about ligation to be “almost if not quite the last word on a matter which has been much debated.”<sup>5</sup>

Draining wounds was almost as important in nineteenth century surgery as ligating and suturing them. Macewen found the main drainage methods – rubber tubes and the capillary action

of carbolised catgut or horsehair – deficient in a number of respects: the materials often became the focus of infection and they could not be, or could not be guaranteed to be, absorbed by the tissues. Absorbable tubes made of animal bones had been developed, but were expensive and absorbed before the pus had formed that they were supposed to drain. Because the hollow bones of birds were narrower in diameter and did not require drilling, Macewen considered using them, eventually settling on the tibia and femora of domestic fowls, and by February 1880 had made tubes from the bones returned to the hospital kitchen from the patients' meals. These were scraped, steeped in hydrochloric acid, trimmed, the internal contents removed, re-steeped in the acid, and then placed in a solution of carbolic acid in glycerine. Chicken bones so treated took an average of “something over eight days” to be absorbed, and if treated with a chromic rather than a carbolised solution could last for 2-3 weeks. As Macewen put it “The patients made their repast on the chickens, while their tissues consumed the bones” (Macewen, 1881a). Infection control advanced so quickly that only some 26 years later, Macewen was able to say that he did not use drainage tubes of any kind, adding that if he had to, he would still use chicken bones (Macewen, 1904a).

Opposition to Lister's antiseptic regimen outside Scotland was considerable, being especially pronounced in England. Although some objections were well founded in various practical problems with Lister's procedures and some did reflect mere medical conservatism, Fox (1988) pointed out that the main opposition came from advocates of public health reform and not from “thoughtless Luddism by a group of conservative bigots within the medical profession.” The reformers emphasised asepsis, that is, the removal of the basis for septic infection by measures such as cleanliness of person, clothing, instruments and surroundings, and eventually of sterilisation through boiling and heating. Although aseptic surgery is usually pictured as evolving gradually from the antiseptic, the fundamental discontinuity between the assumptions of the two regimens makes, as Fox points out, that kind of development impossible. Asepsis played down the role of

<sup>5</sup>Although Macewen (1881a) said that the preparation of the catgut took 7-8 months, another of his publications from the same time speaks of weeks, and he also gave instructions for shortening the period to between 4 days and 2 weeks, depending on the strength required of the ligature (Macewen, 1881b. See also Macewen, 1904a). Nevertheless Lister's method took only 48 hr (Lister, 1881).

the air as bearer of septic agents and involved much more than carbolic spray, carbolised ligatures and carbolised dressings. From the point of view of its proponents, the emphasis in Lister's methods was limited to the control of septic agents in the very local situations of the patient's body, the operating theatre and the hospital ward. Consequently, Fox argues, it detracted from any fundamental reform of the hospital system and from measures for improving public health by improving public hygiene.

Macewen is pictured as pioneering many of the elements of the aseptic regimen, in Glasgow at least, and did come to embrace asepsis over antisepsis, but we do not know if or how he was affected by this more general debate. Later in life he attributed aseptic treatments to developments in germ theory, and especially what was learned from Ilya Ilyich Mechnikov or Metchnikoff [1845–1916], about the body's own defences. Antiseptics were not only harmful to bodily tissue but were unnecessary: "healthy living tissue is free from germs and pure air is innocuous" (Macewen, 1912c). From that viewpoint, aseptic surgery was "a natural evolution" from antiseptic surgery – "the one paving the way from the other."

Perhaps Macewen's mind was partly prepared for aseptic surgery by what an elderly nurse once showed him when one day, physically overcome by the foetid odour from the infected wounds of patients recently operated on, he was sitting in despair, almost ready to give up medicine. The nurse asked, "What's makin ye sae tired and sad this day laddie?" When Macewen explained, she took him to see a patient who was, against the odds, recovering from an amputation. She told Macewen that, unlike the patients over whom he had despaired, the surgeon who had conducted this operation insisted on washing his hands thoroughly before operating and using clean silk to suture the wounds. Macewen absorbed the lesson. Even though a student, he says he persuaded some of the surgeons whose work he was observing to wash, and to allow him to use clean silk for suturing (Macewen, undated typescript. University of Glasgow Archives, DC 79/38). Although this incident with the nurse is most often placed in the context of orienting Macewen

toward antiseptic procedures, it makes more sense in influencing him toward asepsis.

Actually, nothing contrasts Macewen's aseptic practice with Lister's antiseptic procedures more than the condition of the wards housing their patients, the theatres in which the two operated, and clothing they wore when they did so. Leeson, one of Lister's dressers, described Lister's Edinburgh wards as he had seen them in the mid-1870s as follows:

The buildings were old, their sanitary arrangements primitive, and the ward neither lofty nor well lighted; there were no through currents of air, the windows . . . hardly . . . ever opened. What outside air found its way to the wards filtered in through dark and smelly passages; the floors were sprinkled with sand, and though, I suppose, they were occasionally washed, I never saw such process in evidence. (Leeson, 1927, p. 136)

Leeson contrasted them with the clean airy wards built on the then new 'pavilion' principles at St. Thomas' Hospital in London, where he had trained.

Some years after introducing his methods in Edinburgh, Lister (1875) himself described how he had 71 patients for only 55 beds, with the surplus sleeping on mattresses on the floor, and as many as two or three children in one bed. There had "hardly been a day on which there have been as few patients as beds." Moving his patients during the annual cleaning of the wards often caused injury, as well as inconvenience, so he prohibited it. It was "three years since any cleaning took place on these wards of mine" and, as a consequence, he did not, as was sometimes said, "work under superior hygienic conditions." To think that greater cleanliness was involved in his regime was "an entire mistake" (Lister, 1875).

As to the theatres, Leeson recalled that Lister began his lectures there by sitting "on the old worn horsehair-covered chair which had served as the chair of clinical surgery for years and must have been a museum of microbes." Operations were performed on

a plain kitchen table, devoid of all accessories, [standing] upon an old wooden floor frayed with wear and stained with blood, upon which

were sprinkled a few handfuls of sawdust; at the side of the window there was a large leaden sink, but there were no basins or other provision for the washing of hands, nor do I remember such washing taking place before commencing an operation. (Leeson, 1927, p. 85)

The theatre itself was “grimed with the filth of decades. I suppose it was occasionally cleaned, but such process was never in evidence. Many of the students came straight from the dissecting room. The operating table looked as though it was never washed” (Leeson, 1927, p. 107). Thomson (1927), one of Lister’s House Surgeons, recorded that “the operating table served for all cases – sterile or suppurating.”

According to Thomson (1927), the antiseptic procedure involved purifying the site of the operation for 12–24 hr with a carbolic dressing, soaking instruments in a carbolic solution for an hour, isolating the neighbourhood of the operation with warm towels rinsed in carbolic lotion, and treating any accidental contamination with carbolic rinsing. Leeson’s (1927, p. 86) account is similar, except for saying that until patients arrived at the theatre they “underwent no special treatment, neither washing nor scrubbing of the part, and were clad in their ordinary garments.”

As for the surgeons, they also wore ordinary clothes. Many photographs attest to Lister wearing an ordinary suit when operating (e.g. Guthrie, 1949, Plate XVI facing, p. 73), and Thomson also recalled that Lister

never wore a white gown, nor a mask, nor gloves. He frequently never removed his coat, but simply rolled his sleeves back, and turned his coat collar up, so that his white starched collar would not be made sodden by the cloud of carbolic spray in which we operated. Sometimes he removed his black frock coat and an ordinary towel was pinned across his chest. (Thomson, 1927. See also Leeson, 1927, pp. 85, 107)

Thomson himself operated over many years in “an old blue frock coat which I had worn for years previously in the dissecting room. It was stiff and glazed with dried blood.”

Despite the surroundings, Lister’s procedure practically guaranteed sterility, especially when it was combined with what Thomson (1927) said Lister called “the unconscious caretaker” – the clouds of watery carbolic steam sprayed throughout theatre and over the field of operation. Antiseptic dressings could be kept on for a week, as they often were, and usually conveyed “both to the eye and to the nose an idea of anything rather than cleanliness.” Nevertheless they were, as Lister put it, “Æsthetically . . . dirty, though surgically clean” (Lister, 1875).

Macewen, on the other hand, was using antiseptic and aseptic methods side by side between the mid-1870s and the early 1890s. Thus he followed Lister in pre-operative preparation and dressing wounds (e.g. Macewen, 1885, 1886d, 1893a). But he also used ordinary soap and water to clean the site of operations, turpentine to remove grease and oil from the skin and hair, and methylated spirits to remove the turpentine *before* applying a solution of carbolic acid almost immediately before commencing the operation (e.g. Macewen, 1886e). He seems to have used the spray only occasionally (e.g. Macewen, 1880c, 1886a, 1886c).

In contrast with Lister, but from a time that does not seem to be determinable, Macewen insisted on absolute cleanliness of wards, wounds and operating theatre. He also required that those operating wash their hands and arms thoroughly with soap and water and rinse them in sterile saline beforehand. These procedures are foreshadowed in the clean, aseptic environment he described for the 1874 ovariectomy (Macewen, 1874), procedures which will be summarised later. By about 1880 he was boiling the undecorated, plain surfaced stainless steel surgical instruments, with which he replaced the folding, bone-handled implements of his day, and using dry sterile gauze for dressings. Macewen and his assistants wore white, freshly washed and sterilisable clothing during operations. This dress led to his becoming known at the Glasgow Royal Infirmary, initially and somewhat derisively but eventually popularly, as “the man in the white coat” (Bowman, 1942, pp. 61–63; Macewen HA, 1974).

Clearly, Macewen’s asepsis could not have developed in any simple way from Lister’s

antisepsis. An accurate chronology of how it did cannot now be reconstructed because there are too few documents and records about Macewen's work, as distinct from recollections and opinions. One of the few things about which we can be certain is that Macewen installed a Schimmelbusch steam sterilizer in August 1890 and had another specially made in Glasgow a month later. The first replaced a Fish-Kettle that his nurses had bought for him 10–15 years earlier for boiling his instruments (Bowman, 1942, pp. 63–66). Macewen's steps from antisepsis and toward asepsis may therefore date from the late 1870s or early 1880s.

It was also evident to Rickman Godlee, Lister's nephew, that it was Hector Cameron [1843–1928] who was Lister's true disciple in Glasgow, and that by saying that, from the first, Macewen "worked more on the German than the original Listerian lines," that Macewen had adapted rather than adopted Lister's antiseptic methods (Godlee, 1924, pp. 328–329). The context of Godlee's remark was one that pictured the German 'line' as placing more emphasis on general cleanliness and sterilisation than Lister.

Whenever and in what ways Macewen's procedures diverged from Lister's, the one thing that is certain is that by the beginning of the twentieth century Macewen had become a leading proponent of asepsis. In a 1904 discussion of modern surgical practice he explicitly accepted the distinction between asepsis preventing the infection by bacteria and antisepsis as treating existent septic conditions, and just as explicitly placed himself in the asepsis camp. He relied on washing with soap and water for near sterile hands, on adding glycerine to a carbolic solution for his hands and testing them bacteriologically, wearing gloves to protect his own hands, using dry sterile swabs, and not putting antiseptic lotions into wounds (British Medical Association, 1904; Macewen, 1904b, p. 804).<sup>6</sup>

<sup>6</sup>Even though Tröhler (1993) does not mention Macewen, he provides a brief and otherwise apparently authoritative discussion of when and by whom the separate elements of aseptic practice were proposed and when they came into common use.

## MACEWEN, NURSES, AND THE TRAINING OF NURSES

Properly trained nurses were almost as important to Macewen as antisepsis and asepsis, and his support was important, possibly central, to the development of nursing as a profession, at least in Scotland. He and Mrs. Rebecca Strong formed an alliance in the 1880s to develop a training syllabus that was the first to provide training for nurses of a kind that we would recognise today as appropriate. Strong and Macewen believed that, after a good preliminary liberal education, nurses should acquire a "fair knowledge of anatomy, physiology, bacteriology, hygiene, cuisine and an outline of the principles of therapeutics, medicine and surgery" (Macewen, 1891, pp. 4–5), and that they should be examined on these subjects before being allowed to begin their clinical instruction or take charge of a ward. In arguing for their proposals, Macewen asked: "Cannot nursing be raised to a distinct profession, with its entrance examination, its minimum requirements, theoretical and practical, its teachers, its examiners, and its diploma?"

Behind Macewen's insistence on what we might term a 'medical training' was his view that nurses had to be trained to function as "part of [the surgeon's] brain beside the patient" (Macewen, 1891, p. 7). A nurse needed to become highly sensitive to the changes in the patient's condition and to use all her senses in making a record of it as faithful and accurate "as a photographic plate." Nurses so trained

Constitute an intelligence department, which gathers information from all sources concerning the enemy, – disease. In order to be of service in this corps, she must not only have been taught accurate habits of observation, but she must have an intelligent appreciation of the physiological manifestations of life, and a knowledge of the ailment she is called upon to watch. The more faithfully and graphically she can record what she has seen, and the greater her knowledge of individual disease, the surer she will make a proficient member of the intelligence department. (op. cit., pp. 7–8)

Macewen's illustration of this point was the importance of a chronologically accurate record of the development of an epileptic convulsion for locating the site of the lesion in a patient who was, in fact, the third of his pre-1884 cases (op. cit., p. 9).

The Strong-Macewen proposals gave nurses much greater medical knowledge (and status) than many doctors wanted for them. When she joined with Macewen in making them, Strong had only recently returned to work at the Glasgow Royal Infirmary. What she was asking from Macewen was a very different training from that introduced by Florence Nightingale [1820–1910], in whose methods she had herself originally trained. Not only was it not, as Nightingale complained, ward based, but its medical emphasis was at the expense of what Nightingale termed “moral training.” Later, when writing to a friend about a similar scheme, Nightingale asked what was to be taught by way of anatomy, physiology, etc., before nurses entered wards for practical training, because it was “a system I have always dreaded” (Baly, 1986, pp. 209-210. See also Abel-Smith, 1960, Ch1, 2, and 4; Maggs, 1983, 1993, pp. 1310-1311).<sup>7</sup>

Macewen regarded his and Strong's system of nurse training so centrally that it was said that one of his reasons for repeatedly declining the invitation to the Foundation Chair in Surgery at Johns Hopkins a year or two later, was because he was not guaranteed control over the supervision and

training of the nursing staff. William Halsted [1852–1922] was appointed in his place (Bowman, 1942, pp. 310-311). Knowing what intelligence was required, Macewen wanted to train his own officers for gathering it.

## MACEWEN THE GENERAL SURGEON

As Casualty Surgeon for the Glasgow Central Police District, Macewen was often required to conduct post-mortem examinations of murder victims, to give expert evidence in criminal proceedings or coronial inquests, and to attend to various emergencies which – to judge from his collections of press clippings – ranged from fractures of the head and limbs of victims of falls and fights, to people found unconscious on the street because of epilepsy or too much alcohol (Macewen's *Medical Scrapbooks*, Royal College of Physicians and Surgeons of Glasgow Archives, 9/10B, 9/10B). Much of Macewen's early surgical work was of a similarly general kind including the repair of a variety of wounds of the abdomen, thorax and head. Some of the knowledge so gained may have led to his better-known surgery of the skull and its contents, and of the limbs, but much of his other surgery is also related, although less obviously and directly. Each of his surgical procedures shows the same skill, logic and experimental *nous* of his brain surgery work and many also illustrate Macewen's status as surgeon.

### The Indirect Connections

Macewen's operations or procedures having an indirect connection with his brain surgery, include those for removing ovarian cysts, reducing aneurysms, repairing inguinal hernias, tracheal intubating and lung removing. Most had an experimental basis, all were pioneering, and many became standard treatment methods.

### Antiseptic Ovariectomy

Before performing his ovariectomy on Elizabeth N. in 1874, Macewen wrote to Lister for advice on the desirability of using catgut for ligating the pedicle (the attachment to the tissues from which the cyst sprang). Lister was quite definite: he was not prepared to advise so using catgut “except

<sup>7</sup>The novelty of the Strong-Macewen proposals can be sensed by comparing them with the typically narrow practical training offered elsewhere, for example, with that still in use as recently as ten years earlier at the Western Infirmary in Glasgow (*Glasgow Medical Journal*, 1879). Theodor Billroth, the eminent German surgeon, outlined a syllabus at about the same time as Strong and Macewen that had a similarly practical bias, but his medical ‘generosity’ extended only to allotting 27 pages of his 326-page book for nurses to an Appendix on ‘The structure and functions of the human body’ (Billroth, 1890). That things soon changed markedly, is attested by texts such as Wise's (1896), O'Brien's (1900) and Miles' (1899), especially by the more than 30 books and pamphlets for nurses advertised on four pages inside the back cover of the latter.

under my carefully considered arrangements,” that apparently included the more traditional pedicle clamping. In similar conservative vein he said that Macewen might consider cauterising it. Lister was away so his reply was delayed and Macewen acted without his advice.

Before the operation Elizabeth was bathed, provided with fresh clothing, a new mattress and bed linen, and placed in a specially cleaned and heated room. Macewen took care “to have the person and clothing of all those who were to be in attendance perfectly fresh and clean.” Almost the complete Listerian armoury of weapons was also used: the spray, carbolised solutions to bathe instruments, sponges and the hands of the operator and assistants, hot carbolised sponges to clean the body tissues, and antiseptic dressing on completion of the operation.

On operation, Macewen found an enormous right-sided cyst. It filled “the whole abdominal cavity”, measured 38.5 inches (97.8 cm) around its most prominent part, although Elizabeth was only 58 inches (147.3 cm) tall. After its removal, the left and smaller ovary was also removed because it was found to be “well-advanced in cystic degeneration.” As he had planned, Macewen secured the pedicle with “complete assurance in the trustworthiness of the antiseptic catgut... notwithstanding the opinion of many authors to the contrary,” finding it “in every way suited and no untoward circumstance arose from its use” (Macewen, 1874). The operation was a complete success, Elizabeth recovering with minimal complications and being allowed out of bed after 4 weeks.

### **Aneurysms**

Between 1875 and 1880 Macewen considered, used, or experimented with a number of procedures for treating aneurysms: pressure, ligation, the introduction of foreign bodies, and galvanopuncture. All coagulated the red blood cells but none were reliable or applicable to some of the more dangerous aneurysms. From his experiments and clinical observations, Macewen concluded that a better treatment would be to form a white thrombosis by inducing white blood cells to cohere to the inner walls of the sac. He did this by piercing the aneurysm with a very fine needle and

scarifying the inner wall of the vessel on the opposite side, sometimes manually and sometimes by allowing the pulsations of the blood flow to do so. The phagocytes (leucocytes) collected at the site of irritation and formed a stable thrombosis that eventually allowed circulation through it.

By 1890 Macewen’s new method was highly enough thought of for him to be invited to open the Midland Medical Society’s annual meeting that year in Birmingham with an address on it. As he put it, the honour was enhanced by the knowledge that Jenner and Lister, among other notable figures “each highly distinguished in their own right,” had previously opened the proceedings (Macewen, 1890. See also Macewen, 1877, 1878a, 1878d). His method was very successful but was never widely employed because the prevalence of aneurysms declined at about the time it was perfected.

### **Inguinal Hernia**

Beginning in March 1879 Macewen developed a radical cure of inguinal hernia. In his first operations he simply brought the pillars of the ring together with chromic acid ligatures, occluded the ring, and sutured the wound with chromic acid gut (Macewen, 1880b). Very soon he began closing the internal ring with a pad made of folds of the hernial sac that could be placed “on the peritoneal surface opposite the internal ring.” There it formed a bulwark, with its convexity presenting backwards to the abdomen and its base resting on the abdominal wall surrounding the circumference of the ring. The procedure was based on a profound understanding of the abdominal muscles and intestinal mechanics (Macewen, 1886b. See also Macewen, 1883b). It was to become one of two eponymous *Macewen’s operations* still known today.

### **Tracheal Intubation**

At the November 1879 meeting of the Glasgow Pathological and Clinical Society, Macewen described inserting a “gum elastic catheter” into the trachea of a man whose throat had been badly burned by a piece of hot potato that had stuck to the back of his throat when he attempted to swallow it (Macewen, 1879b). The tube had

allowed the man to breathe during the 36 hr it took for the swelling to subside and Macewen had obviated the need to open the trachea. He also mentioned that he had previously avoided a laryngotomy by using a tracheal tube for administering chloroform during an operation to remove an epithelioma from the pharynx and back of the tongue. Noting that the anaesthetised patient had been able to drink and “could say ‘yes’ and ‘no’ quite distinctly, Macewen put a tube into his own glottis, finding that he could breathe through it “though it was by no means a delectable sensation” (Macewen, 1879b).

Macewen’s advocacy of the procedure was received cautiously, possibly even unfavourably. At the 2nd May 1879 meeting of the Glasgow Medico-Chirurgical Society, he reported two further cases and showed the tubes, and the audience agreed that his was a new proposal, some of them by then having used it in their own treatments. His critical re-evaluation of French work did not convince the whole of his audience that the method was not as dangerous as had been suggested and that it should be persevered with (Macewen, 1879e, 1880d). However, the tolerance and usefulness of the tube led him later to develop a special flexible silver tube to be used for treating croup and diphtheria in children that he demonstrated at the International Medical Congress in London in 1881 (Macewen, 1881g). A short time later he recommended intubation in the treatment of a variety of conditions in children as well as in adults (Macewen, 1886f).

### **Lung Removal**

As early as 1875 Macewen had collated some of his observations on wounds of the lung and developed a suspicion that the cause of lung collapse (pneumothorax) was not due simply to the pleural sac being penetrated (Macewen, 1875). He observed and experimented over the years before concluding, counter-intuitively, that the pleuræ were held together by molecular cohesion, rather than by atmospheric pressure, and that lung collapse was not inevitable. Once he had reached his conclusion, Macewen contemplated operations for the removal of substantial portions of the lungs and in 1895 became the first person to remove a whole lung successfully. The tubercular

patient survived until he was 76, being shown together with three others at the 1913 London International Medical Congress (Macewen, 1899; Macewen HA, 1974, pp. 43-44).

Macewen demonstrated “molecular cohesion” in the 1890s by placing two pieces of dampened, optically worked glass together in a bell-jar with the upper piece hanging by a hook and a weight hung vertically from the lower surface. When the air was extracted from the jar by a vacuum pump, the lower glass did not fall off. In their standard work on the subject, Garré and Quincke completely accepted the role that Macewen gave molecular cohesion and also stressed that his clinical observations were “as striking and convincing as they could possibly be” (Garré and Quincke, 1912, pp. 26-27. See also pp. 66, 164-165 for an account and photographs of the patient). What made the operation notable was not only that it was the first and that it demonstrated Macewen’s technical surgical skill, but that it was based on an enormous amount of experimental work as well as clinical observation.

### **The More Direct Connections**

Most of Macewen’s bone surgery (osteotomies, reconstructive grafting, patella repairs), his experimental investigation of the relative importance of osteoblasts and periosteum in bone growth, his method for differentiating alcoholic coma, his skull repairs, and his otological surgery have clear connections to his brain surgery. Most were also pioneering and are still highly regarded today.

### **Bone Surgery: Osteotomy**

From 1875 Macewen began conducting osteotomies for correcting the various crippling osseous deformities resulting from rickets, a disease that then affected some 50–80% of all working class children in the poorer areas of Europe’s larger cities, including Glasgow. Macewen’s picture of the conditions in Glasgow that gave rise to rickets is worth quoting if only because they were the same conditions with which he and other surgeons had to contend each day in treating other afflictions. Besides

trauma and other epidemic diseases that prepared the ground

bad hygienic conditions, the want of pure air, light, and sunshine, bad or scant food supply, all tend to produce rickets... Children raised in some parts of a city like Glasgow, confined to close houses or compelled to play in crowded streets, breathing for the greater part of the year, air more or less filled with carbon and contaminated by the effluvia from sewers and emanations from chemical works; shut out from the light partly by the height of the houses, partly from the fact that even the sun's rays which do manage to struggle through the canopy of smoke which envelopes them, are so diluted that they are comparatively of little value; such children are scarcely to be anything but feeble and liable to succumb to severe epidemics or to have severe sequelæ, leaving permanent effects. (Macewen, 1880a, p. 14)

Interactions of the disease with other factors meant that when the children with severe rickets reached adulthood they were frequently unable to work and were condemned to an early death. Macewen's operation offered some hope.

Macewen's was to become a new kind of operation, using a new kind of instrument, one of his own devising and probably based on his knowledge of woodworking, which he called an osteotome (Macewen, 1879c, 1879d, 1879f, 1879g, 1879h). It became the standard method of operating. Until Macewen, the procedure required a wedge shaped piece of bone be cut or chiselled from the deformed limb before the new ends of the bone were opposed and allowed to reunite while splinted. His osteotomes were chisel-shaped but novel in that the blades were bevelled on *both* sides so that no bone dust or bone fragments were produced. Osteotomes of various thickness were used successively to make a single cuneiform opening, up to about two thirds of the width of the bone, in which the osseous tissue was "merely condensed" to the side of the bone opposite where the instruments were introduced. When the remaining bone was broken, the approximation of the two surfaces straightened the limb with minimal hiatus. The wound was

then dressed antiseptically and the limb held in a light splint.

By December 1878 Macewen had operated "on over forty limbs and had performed over fifty osteotomies, without a single fatal case" (Macewen, 1878e. See also 1878b), and 2 years later he had completed 835 operations on 557 limbs belonging to 330 patients with signs of sepsis only in eight, and a total of three deaths, all from causes unrelated to the operation, and published the standard work on osteotomy (Macewen, 1880a, p. 165). In it he consolidated the details he had given previously on how to operate and how to make the osteotomes, which became known among bone surgeons as *Macewens* (Leriche, 1935, p. 5). This method of operating is the second of the two eponymous *Macewen's operations*: subcutaneous supra-condylar osteotomy of the femur for genu valgum (knock-knee) and genu varum (bow-leg).<sup>8</sup>

### Bone Surgery: Reconstructive Grafting

Quite early in his career Macewen began to repair bone-fractures, most often of the skull, by transplanting bone. In 1881 he cited a case from 1874 in which he successfully transplanted a piece of bone together with its periosteum from the skull of a dog, to repair an irregularly shaped gap about 1 by 0.5 inches in the vault of the cranium of a fractured human skull. Within 3 weeks about two-thirds of the graft had adhered firmly and the remaining gap appeared to close soon after (Macewen, 1881d, note to p. 234).

Macewen's most extraordinary reconstruction was of the necrosed shaft of the right humerus of William Connell, the much-neglected 3 year-old

<sup>8</sup>Macewen (1880a) contains very good schematic illustrations of the openings made by the osteotomes and how the bones were straightened after them (See especially Ch. 16, pp. 131–143 and Figs. 26–28). There he also gives full details of the type of steel, its tempering, the other aspects of manufacture, and the properties osteotomes had to have – including a sharpness that allowed the surgeon to pare his fingernails with them (Macewen, 1880a, Ch. 8). It is said that Macewen decided on the name 'osteotome' because he thought that patients would be less likely to be frightened of an instrument so-named than one called a chisel.

son of very poor and itinerant parents. Because the shaft failed to respond to antiseptic dressing Macewen removed it in August 1878, drained the soft tissues, and also treated them antiseptically, but although the suppuration ceased, there was no regrowth of bone. Fifteen months later, on the 7th November 1879, Macewen incised the upper arm, created a sulcus, placing in it pieces of two divided tibial wedges of bone produced during his osteotomies that had been kept under antiseptic spray. The wound was stitched, a horsehair drain inserted, and dressed antiseptically. The whole procedure, including obtaining and preparing the wedges, took about 2-3 min. Over about the next year, Macewen made two more transplants, one to extend the upper fragment, the other to build up the shaft from the lower end, and finally performed two minor operations to bring the two newly grown pieces of shaft together (Fig. 2a). By the time William was seven he had a fully functional right arm, the humerus of which was only half an inch shorter than the left. Thirty years later, as skiagraphs (photographs from X-rays) and Macewen's own photographs show, although somewhat misshapen and now three inches shorter than its fellow, the arm was still healthy (Figs. 2b and 2c) and useful enough for William to become a pattern maker and to serve in France in the British army during the first World War (Macewen, 1876–1886, Vol. 4, pp. 131–139, and Vol. 5, pp. 36–37; 1881d, especially Fig. 1; 1912a, pp. 175–191 and Figs. 55–61; 1912b; Bowman, 1942, pp. 137–144).<sup>9</sup>

By early 1881, when it was evident that the reconstruction of William's arm would be successful, Macewen was encouraged to report it to the Royal Society. He was not a member, knew no members, and did not know that in addressing his

paper merely to 'The Secretary,' it would go directly to Thomas Huxley [1825–1895]. According to Macewen, Huxley decided to communicate it to the Society without first referring it to the Council, as he should have, and also invited Macewen to be present at the May reading (Macewen, 1904c). While that may have been so, all that can be documented is that Huxley received the paper on May 3, 1881, read it on May 19 after seeking the opinion of George Busk, a F.R.S. and notable surgeon with a special interest in osteology, and that Busk's judgement was extremely favourable (Royal Society Referees Report RR 8.331 of 10 May 1881 and Journal Book, 19 May, 1881). Later press reports also acclaimed the importance and originality of Macewen's work. Almost immediately Macewen published a French summary, the main thrust of which was to confirm the contested conclusions of Louis Xavier Édouard Léopold Ollier [1830–1900], the French surgeon and pioneer of bone transplantation. Macewen stressed that success depended on dividing the pieces of bone before transplanting them, rather than trying to graft them *en bloc*, a proposition that Ollier accepted (Macewen, 1881e; Ollier, 1881). More or less complete translations also appeared (e.g. Macewen, 1882).

### **Bone Surgery: Patella Fractures**

Macewen acted upon his belief in other ways. By 1883 he had found that transverse fractures of the patella could be repaired if the tissue usually found between the two pieces of bone was removed before the pieces were sutured or wired together (Macewen, 1883a). On one occasion when he demonstrated a patient in whom he had been able to reunite the patella 9 months after the fracture had occurred, his colleagues judged his success to be based on a new understanding of the pathology of non-union (Macewen, 1884a). Macewen took the work further, making an analysis of the mechanics of knee action and patella fracture that elucidated the relation between the pattern of muscular action that typically caused the fractures and the fate of the aponeurotic (tendon) tissue related to it. He showed that fracture usually caused aponeurotic and other tissue to be trapped between the fractured parts, either in a fold or as torn shreds. His analysis and

<sup>9</sup>Paula Summerly completed a Ph.D. in December 2003 on Macewen's photographs and the use to which he put them. Entitled *Visual Pathology: A Case Study in the History of Late Nineteenth Century Clinical Photography in Glasgow, Scotland*, the thesis is held in the Special Collections of the Library of the University of Glasgow until 2006. Although Macewen did not pioneer the clinical use of photography, he often used it for following his cases, sometimes for many years, and he did most of his own processing.

FIGS. 55, 56, 57.—SCHEMATA OF HUMERUS, SHOWING:

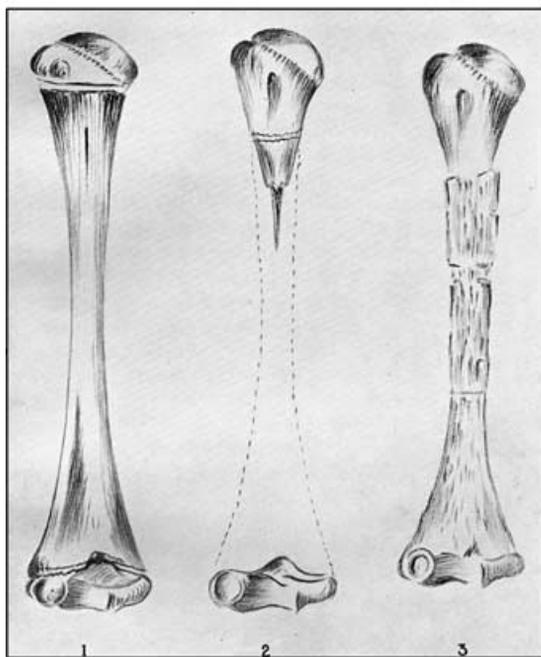


FIG. 55.  
The diaphysis which was  
necrosed and removed.

FIG. 56.  
The result 13 months  
subsequently, showing  
absence of shaft.

FIG. 57.  
Result of the completion  
of the grafts.

(a)

FIG. 59.—RADIOGRAM. INTRAHUMAN TRANSPLANTATION OF BONE. DIAPHYSIS OF RIGHT HUMERUS RESTORED BY BONE GRAFTS TAKEN FROM 6 TIBIAL.



Result 30 years after.

(b)

FIG. 58.—INTRAHUMAN TRANSPLANTATION OF BONE. THE GREATER PART OF THE GRAFT OF RIGHT HUMERUS BEING RESTORED BY BONE GRAFTS TAKEN FROM 6 TIBIAL.



Result 30 years after.

(c)

Fig. 2. Reconstruction of William Connell's humerus (Figs. 2a, 2b and 2c from Macewen 1912a, Figs. 55, 56, 57, 59, and 60).

treatment of 13 cases showed that the failure of the parts to reunite was not due primarily to poor patellar blood supply, or residual muscle action

pulling the upper part of the fractured patella away from the lower, or to the parts being separated by blood and serum distending the knee

joint. Macewen recommended incising over the joint, removing the tissue caught between the parts, and elevating the remaining aponeurosis before approximating and suturing the bony fragments with silver wire that could be withdrawn after about 6 weeks (Macewen, 1887a). The worth of Macewen's procedure was soon recognised.

### **Bone Surgery: Osteoblasts vs. Periosteum**

Four years after his dog-to-human skull transplantation, Macewen made an intriguing observation: a two and a half inch 'splinter' of bone detached from Archibald Wotherspoon's fractured tibia had remained healthy even though it was virtually separated from its periosteum (Macewen, 1876–1886, Vol. 1, pp. 53–56, 1878c). It was from these observations and experiences that Macewen began to question the orthodox view that bone grew from the periosteum, wondering instead if the real source might be the bone cells or osteoblasts. The splinter of Archibald Wotherspoon's tibia remained alive despite having almost no periosteum, and he had also not seen any bony regrowth from the healthy periosteum remaining on William Connell's humerus or condyles after he had removed the necrosed shaft.

Shortly after making the Wotherspoon and other clinical observations that had caused him to doubt that the periosteum was the source of bone growth (Macewen, 1887b), Macewen began a series of experiments that lasted over some 25 years into its role relative to the osteoblasts (Macewen, 1906, 1907a, 1907b, 1909, 1912a, 1912b). One set of experiments began from those of Henri Louis Duhamel du Moncaeu who had concluded nearly 150 years earlier that bone grew from the periosteal sheath in the same way as did a stem from the sheath of bark around it. Although that doctrine had been modified over time Macewen (1887b), said that in his day "a belief of somewhat similar import is still deeply rooted." He explored it by stripping circles of periosteum varying in breadth from one-half to two inches from the shafts of dogs' leg bones and placing one or two silver rings wholly or partly around the denuded section of bone (Macewen, 1906, 1912a, pp. 62–75). In each case it was found after a period varying from 7 to 12 weeks that the ring or rings were completely

buried in new bone covered with a connective tissue different from normal periosteum and from any muscle or other tissue sometimes left in contact with the denuded bone. Where two rings had been placed on the bone with a gap between them, the new bone covered both the rings and the gap, and the same was true of the partial gap left by the single ring. Neither periosteum nor other tissue could be the source of the new bone.

In a second set of experiments, Macewen transplanted segments of bone about one inch long from one dog to another. In each experiment both the host's bone and the donor's pieces were stripped of periosteum and the donor segments divided into small pieces before implanting. He observed that that bone grew firmly and was again covered with its own non-periosteal connective tissue. He obtained essentially the same result in transplanting whole, non-divided bone shafts; the only difference being that the bone bulged less at the junction. Finally, Macewen observed that periosteum left intact after large segments of bone were removed from under it did not cause the growth of new bone, but was absorbed (Macewen, 1906, 1907a, 1907b, 1912a, pp. 33–47).

Macewen seems to have continued these experiments after 1906. In them he showed, among other things, that bone fragments could grow and unite when placed in sponges or among the muscles in the line of a bone shaft, and that bony growth occurred in glass tubes and decalcified turkey bones separating segments of bone (Macewen, 1912a). These ingenious and logically compelling experiments led him to conclude, as he had suspected, that the periosteum was, relatively speaking, simply a limiting membrane surrounding the osteoblasts. It was a role he again confirmed in a later and unique study of the growth and shedding of the antlers of the deer (Macewen, 1920).

Even before Macewen had fully established his conclusion, orthodox opinion began changing. As White (1881) remarked, it was Macewen's "well-conducted observations and experiments" that demonstrated the relative unimportance of the periosteum which, to that time, had generally been believed to be "almost or quite essential" to bone growth and bone graft. Ninety years later Trueta (1966), described Macewen's *The Growth of Bone* as a "masterpiece of the medical litera-

ture . . . endowed with the rare quality of eternal youth,” and related its conclusions to more modern theories. It was revascularisation through anastomosis between the blood vessels of donor and host that gave the osteoblasts the power to support transplants, a process made easier when smaller pieces of bone were transplanted. Although Macewen had been right about periosteum and bone division, he had not seen revascularisation in its full light. He was, however, “so close to [it] that he even suspected the osteoblasts were carried by the blood stream.” Much modern work, Trueta concluded, “follows the path he so splendidly opened.” Later, Trueta stressed that it was Macewen’s work that had first challenged the theory of Duhamel and which Ollier, among others, had supported (Trueta, 1968, pp. 2, 176, 316).

### Alcoholic Coma

As Casualty Surgeon, one of Macewen’s problems was differentiating coma produced solely by alcohol from that produced by conditions such as concussion, skull fracture, apoplexy, and opium use (Macewen, 1879a). Some medical lore of the day had it that body temperature in apoplexy was above normal but in alcoholic coma it was below by about 2.5° to 3° Fahrenheit. Macewen’s experience suggested that except for a dramatic fall in the late stages of alcoholic insensibility, there was considerable variation in temperature. He measured rectal temperature in over 50 instances where the post-intoxication status left no doubt that alcohol had been the cause and presented, “for tabular convenience” the results for exactly 50. These showed a range from 93.4° to 98.2°F with 82% ranging from 95° to 97.9°F. Even allowing that rectal temperatures were between half to one degree higher than axillary, Macewen had shown the temperatures to be much more variable than had been thought. He then compared those temperatures with those in coma due to skull fracture, opium poisoning, and apoplexy, and also found them to be variable but at times, very low. Temperature was too variable to provide a useful thermic test of alcoholic coma.

Contrary to another piece of medical lore, Macewen had also seen that the pupils were contracted in alcoholic coma. Was this, he asked, because of error in observation or of variability

in the facts? Eventually he found one case with dilated pupils. After making minute but futile inquiries about the patient’s history and what he had been drinking, Macewen went to call a colleague in order to show him the first case he “met with . . . having dilated pupils” but when they returned he found that the pupils were contracted. It then occurred to Macewen that the patient had been moved to a different location. As he sought to test for the effect of the change, the patient was accidentally shaken and Macewen then noticed that the pupils dilated before they “slowly began to contract,” reaching their previous contracted state after 20 min. A study of a further 50 patients in an alcoholic coma confirmed the observation in 47: if the patient was externally stimulated by having their hair or beard pulled, for example, the pupils would dilate and gradually contract, even though the patient did not regain consciousness to any degree. The three patients in whom the effect was not marked or absent were the exceptions that tested the rule: two had diseases that affected the fixity of the pupil and the other had fallen over a short time earlier. Because pupillary dilation was not observed in any other kind of coma, Macewen had found a specific test for alcoholic coma (Macewen, 1879a). The eponymous sign survives as *Macewen’s pupil*.

### Bone Surgery: Skull Repair

In 1884, Macewen repaired the depressed compound comminuted fracture of the skull suffered by Master William McClean (Fig. 3). William, a weak ill-fed Glasgow boy of 9 years had had his skull shattered by debris from a falling chimney. The fracture was of an irregularly shaped, roughly elliptical area two and a half inches wide at its widest point, extending over about five inches from about an inch above the left eyebrow to about an inch behind the auriculobregmatic line. After elevating the frontal portion of the fracture, and removing spiculae of bone and pieces of scalp that had been driven into the brain, Macewen trephined slightly lower, over the left lateral sinus. He then removed the periosteum from ten of the eleven detached pieces of bone, the last being partly denuded, and stored them on a sponge saturated with carbolic solution. He incised the dura mater under the fracture, released a

FIG. 44.—OSSEOUS REGENERATION IN FLAT BONES—SKULL.



Schema of re-implanted portions of skull.

FIG. 45.—OSSEOUS REGENERATION IN FLAT BONES.

Mosaic work of bones of skull by re-implantation.  
Boy aged 9 years—result when completed.Fig. 3. The repair of Master William McClean's skull  
(From Macewen 1912a, Figs. 44 and 45).

quantity of dark looking blood, and removed clots from the brain. The lime and brick-dust debris were cleaned from the pieces of bone which were then washed in a carbolised solution, the larger piece partly divided into three, and all thirteen only partly-separated pieces replaced over the otherwise much lacerated dura. Drainage hairs were inserted and the wound stitched with chromatised gut sutures and dressed antiseptically. During the 3 weeks following the operation some three or four fragments of bone were shed (the exact number is uncertain) but the remainder lived. The wound healed and a week later the skull was firm, and William was discharged. Ten years after the operation, at the age of 19, his skull was firm all over, the

bones over the site of the injury having grown in proportion to the rest of the skull (Macewen, 1876–1886, *Private Journal* Vol. 4, pp. 136–139, and 1912a, pp. 138–145 and Figs. 44 and 45).

What Macewen did in the case of William McClean was what he did on a smaller scale in much of his brain surgery, including several of the pre-1884 cases. He favoured treating the disc removed by the trephine antiseptically, scraping the periosteum from it, usually dividing it, and then replacing it or the divided pieces. He also often used decalcified chicken bones for drainage.

### Brain Surgery and Otology

Macewen made a notable contribution to otology, one having the closest of connections with his brain surgery. It is not clear exactly when or how his interest in ear disease was aroused, but it seems to have been in about 1880 through cases of cerebral abscess resulting from chronic ear infection. His first report of that kind of abscess was in 1881 and the second in 1887. Each patient had had an abscess in the temporal-sphenoidal lobe resulting from otitis media. The first, who died because the operation was conducted when she was already very weak, was Case 4 in the series of seven pre-1884 operations he reported in his 1888 address to the British Medical Association (Macewen, 1888a, Case 4. See also Macewen, 1893a, Case 30, pp. 177–181). The second, completely successful, initiated an important collaboration with Thomas Barr [1846–1916], a notable Glasgow otologist (1887, 1888a, 1888b; Macewen, 1887c. See also Macewen, 1893a, Case 28, pp. 171–177), a collaboration that became especially important over the next ten or so years (e.g. Barr, 1889; Macewen, 1893a, Case 36, pp. 197–203 and Case 39, pp. 209–210).<sup>10</sup>

<sup>10</sup>There seems to be no secondary literature on Macewen's collaboration with Barr or his influence on otology and otolaryngology more generally. Although one can be certain of its importance, I am rather less certain of its chronology and of the factors that brought it about. Its remoter consequences include two little noticed cases that Macewen reported of visual agnosia, one with auditory agnosia (Macmillan, 2004).

Barr's (1880) earliest reference to cerebral abscess resulting from otitis media is to three cases that ended fatally. In no case had there been any active intervention and his report was essentially about the post-mortem examinations. In 1882 he reported another case that had also ended fatally but in the discussion of it various techniques for opening the mastoid were mentioned, although none was widely practised (Barr, 1882). Two years later, in the first edition of his *Manual of Diseases of the Ear for the use of Students and Practitioners of Medicine* (1884, pp. 141–147), Barr mentioned only Schwartze and Politzer as draining the mastoid process by penetrating it.

By the second edition of his *Manual*, Barr was able set out a history of successful operations. Schondorff and Truckenbrod had led in 1885 and 1886, and Barker and Caird followed in 1886 and 1887. The first two had been guided by the fistulous openings with oedema on the surface of the head but the last two operated without such external guides. Macewen had not used external guides in operating on Barr's case in January 1887 (Macewen, 1887c), and Barr mentioned him three times in his list of the first nine successful operations for cerebral abscess that were not so guided (Barr, 1896, pp. 303–305).

What was novel about Macewen's operation was his combination of methods. He used what he knew about the localisation of brain function to plan the operations, landmarks on the skull as a guide to the entrance to the mastoid antrum, and a particular type of dental drill burr to gain access to it. The landmarks defined the supra-meatal triangle: a triangle formed by the posterior root of the zygoma above, the upper and posterior segment of the osseous external meatus below, and an imaginary perpendicular line uniting these two, extending from the most posterior portion of the external osseous meatus to the zygomatic root. Still known eponymously as *Macewen's triangle*, it was a more accurate guide to the antrum than other methods and, together with the burr's being made of a particularly hard steel by White's Dental Manufactory in Philadelphia, reduced the possibility of damage to other structures (Macewen, 1893a, pp. 296–305 and Figs. 57, p. 298 and 60, between pp. 304 and 305; Barr, 1896, pp. 93–95 and Fig. 67).

By 1895 Barr had himself operated successfully on four cases of middle ear infection, using Macewen's methods and dental burrs borrowed from Macewen (*Lancet*, 1895. See also Barr, 1896; Macewen, 1889, 1895). In the second edition of his *Manual*, Barr dropped practically every reference to the other methods he had outlined in the first, and concentrated on Macewen's methods, including using decalcified chicken bones for drainage and replacement of bone fragments (compare Barr, 1896, pp. 93–95, 303–308 and 1884, pp. 141–147, 420–421). In the last editions of his *Manual*, Barr did make favourable mention of other operative techniques but altered neither his judgement of the significance of Macewen's contribution nor of his place in otological history (Barr, 1901; Barr & Barr, 1909).

#### THE STATUS OF MACEWEN'S WORK

In each of the areas of work previously mentioned, the status of Macewen's work was exceptionally high, a point that is well illustrated in the fields of osteotomy and otology. In 1884 the 36 year-old Macewen was chosen to introduce the topic of osteotomy at the International Medical Congress in Copenhagen. Professors Alexander Ogston (Aberdeen), John Chiene (Edinburgh) [1843–1923], and Max Schede (Hamburg) [1844–1902], each an authority who had developed his own surgical procedure well before Macewen's, were to comment. On 14th of August when it was announced that Macewen was to speak, he felt somewhat unnerved, or as he put it in a letter to Roberta Strong, "a little put out" by the "very hearty reception" with which the announcement was greeted (Gibson, n.d.). Nevertheless he steeled himself to describe his technique, reporting that of the 1800 osteotomies he had performed on 1267 limbs belonging to 704 patients to the end of the previous month there had been but six deaths, all from causes unrelated to the operation. All his operations had been conducted "under spray with strict Listerian precautions" (Macewen, 1886a. See also Macewen, 1884c).

What then happened indexes the status of his work. As the *British Medical Journal* report put it,

the discussion was “remarkable for the almost complete renunciation of their methods by the other surgeons in favour of Dr. Macewen’s” (*British Medical Journal*, 1884b, p. 362). Ogston announced that he was forced “to the conclusion that, for simplicity and good results, Macewen’s operation was better than that which he had himself advocated. . . . For some years past he had told his students that Macewen’s operation was the best and wished to make to . . . the Congress a similar announcement.” Chiene said that he would give the Macewen procedure “a fair trial on his return to Edinburgh [and] thought that in all likelihood he would be able to report as favourably as Professor Ogston had done.” Schede then announced a national surrender: although still practising his own operation “in some cases,” he accepted “along with all German surgeons” the superiority of Macewen’s method (*British Medical Journal*, 1884b, pp. 365–366). Given that only 3 years earlier Macewen’s operation was regarded with much caution, the outcome was even more remarkable (Macewen, 1881f).

Otologists also paid tributes to Macewen at their meetings. For example, in its report of the 1889 meeting of the British Medical Association at Leeds, the *Archives of Otolaryngology* (1890, 19, 85–89) called Macewen’s address “brilliant,” and in commenting on Macewen’s 1895 address to the Section on Otolaryngology of the British Medical Association, authoritative otologists such as Professor Henri Luc [1855–1925] of Paris referred to Macewen’s *Pyogenic Infections of the Brain* – in which many operations were described – as “excellent;” Dr. Peter McBride [1854–1946] of Edinburgh “begged to join in the general chorus of approbation which had greeted Professor Macewen’s valuable contribution;” and Professor Urban Pritchard [1845–1925] averred that he now accepted and had adapted Macewen’s “kindly scolding” of otologists at the Leeds meeting “for not more emphatically insisting that all patients with otorrhoea be thoroughly treated” (*British Medical Journal*, 1895). According to Henderson and Guthrie (1949, pp. 113, 120–121), his otological surgery showed “more than a touch of genius,” and he is now recognised as one of the founders of the specialty of otolaryngology (e.g. Walton et al., 1986, pp. 968–969).

The greatest recognition of Macewen’s contribution to otology followed Barr’s communication of his methods to the *Quatrième Congrès International d’otologie* of 1888 in Brussels. Barr reported that Macewen had by then operated on seven abscess cases without using “any carious aperture or superficial swelling on the head” to guide him to its seat, and gave some details of Macewen’s first and second cases (Barr, 1889; Macewen, 1887c. See also Macewen 1893a, Case 25 [G.S.] pp. 151–162 and Case 28 [W.H.] pp. 171–174). The somewhat restrained *British Medical Journal* (1888, ii, 678–679) put it that at the conclusion of Barr’s paper the meeting had “congratulated the English school of surgery,” but according to the *Herald* (Glasgow) of the 14th Sept, 1888, the thanks were much more heartfelt and much more specific. Dr. Charles Delstanche [1840–1900], the President of the congress, moved a motion, seconded by Prof. Ambroise Arnold Guillaume Guye [1839–1905] of Amsterdam, requesting Barr to convey to Macewen “their warmest thanks for his great services to surgery.” According to the *Herald* the motion was carried unanimously. The audience included most of the world’s leading otologists.<sup>11</sup>

A final illustration of Macewen’s status is provided by the judgements of his *Pyogenic Infective Diseases of the Brain and Spinal Cord* (1893a) and its companion *Atlas of Head Sections* (1893b). The former brought together all the cases of abscess, from the first of 1876, and whether treated successfully or not; the *Atlas* was a set of 53 photogravures from Macewen’s own photographs of coronal, sagittal and horizontal freshly

<sup>11</sup> Adam Politzer, who gave a paper at the Congrès, was in the audience and must have voted for the appreciation. Even so, in the third edition of his textbook published five years later, he merely mentioned the operations of Barr and Macewen as having “done great service,” but gave no detail (Politzer, 1894, footnote to p. 279, p. 475). Nor, although he drew on many other papers presented at Brussels or published subsequently, did he include the dental burr among the equipment pictured, or discuss let alone have it displace the chisel and mallet. Neither did he list theirs among the operations he recommended for cerebral abscess (Politzer, 1894, pp. 468–478, 506–528, 716–717, 722, 723–725).

frozen head sections of subjects varying in age from two and a half to 60 years. Each section of the *Atlas* came with a key identifying each of the structures. Macewen pointed out that the advantage of the frozen preparations was that the organs and tissues could be seen *in situ* and in relation to the various bony landmarks. For any spot selected for operation, the atlas gave, said Macewen, “the relations of the various parts of the brain to the outside of the skull exposed in three different series of sections – coronal, sagittal and horizontal.” Consequently

The surgeon who is about to perform an operation on the brain has in these cephalic sections a means of refreshing the memory regarding the position of the various structures which he is about to encounter. (Macewen, 1893b, p. vii)

The *Atlas* was hailed immediately. Thus the *British Medical Journal* (10th February 1894) reviewer characterised its plates as “admirable examples of successful photographs,” assessed its contribution to cranio-cerebral topography as “very great,” and predicted that it would “doubtless take its place among the standard works of reference in its department.” Horwitz attests that “a multiplanar guide of equal usefulness” did not appear until 55 years later, in 1948, when Raymond Truex and Carl Keller published their *Detailed Anatomy of the Head and Neck* (Horwitz, 1995).<sup>12</sup>

*Pyogenic Infective Diseases of the Brain and Spinal Cord* was hailed no less enthusiastically. The *British Medical Journal* reviewer called it “a remarkable book,” Macewen’s name affording a guarantee “which the book amply fulfils,” that the discussion of the details of the diseases “is of the highest order.” The *Lancet* (1894, January 6th) reviewer dealt with it and the *Atlas* together. The two works were “two of the best and most

important additions to medical literature made in the year 1893,” and had “rarely been surpassed.” The reviewer described the *Atlas* as “a handsome quarto volume,” its representations of the sections as the “most beautiful specimens of photogravures,” and said that all surgeons were indebted to Macewen and his publishers.

In dealing with *Pyogenic Infective Diseases*, the *Lancet* reviewer emphasised the care with which Macewen had observed and recorded his cases and opined that his remarkable record of surgical triumphs would “act as a strong incentive to others to follow the lines of treatment laid down.” Almost immediately on its publication, William Osler [1849–1919] said in his influential text

A most important, one might almost say essential, factor in the treatment of intracranial suppuration, is an intelligent knowledge on the part of the surgeon, of the work and works of William Macewen. (Osler, 1898, p. 1028)

Osler repeated this opinion in many later editions, and some 40 years after Macewen’s book Turner and Reynolds began their synopsis of their own work on pyogenic disease by describing his as “the classical work.” They said that

The wealth of anatomical and clinical detail . . . made both during life and at autopsy and the reasoned deductions drawn from his observations, stamp the book as marking a new epoch not only in our knowledge of the pathways of intracranial infection but in the advancement of brain surgery. (Turner and Reynolds, 1931, p. 5)

Almost a century after *Pyogenic Infective Diseases* was published, Ingham et al. (1991, p. 3) said that Macewen had “dealt with most aspects of management [and that] much of his advice still holds good.” They noted the diagnostic significance of Macewen’s pointing to the absence of fever in the majority of cases of brain abscess and stressed that his low mortality figures were still “unrivalled” – 18 of his 19 patients recovered (op. cit., pp. 3–5, 64). Slightly more recently, Canale (1996) noted that only after the 1970s did any results for the surgical treatment of cerebral abscesses have a lower mortality than Macewen’s.

<sup>12</sup>There was some contemporary criticism that the freezing had distorted the relation between the cerebellum and the foramen magnum. Macewen replied by pointing out that because the “freezing was effected from without inwards” the brain would not have expanded and that, in any case, there were no signs that other structures had been affected (Macewen, 1922, Note to p. 163).

## CONTROVERSY: MACEWEN AND HUGHES BENNETT

Turning now to the issue of priority, the 1888 context in which Macewen set out his claim was one in which he summarised the 15 operations he had conducted on the brain and spinal cord before 1884, and others conducted subsequently (Macewen, 1888a, 1888b). Macewen's seven pre-1884 brain surgery cases began with John McKinley whose transient post-convulsion aphasia led him to postulate a lesion in Broca's lobe. The second patient, John Daley, was operated on in March 1879 for left sided convulsions followed by paresis, and Macewen predicted an intracranial effusion of blood in the lower part of the fissure of Rolando. The next surgery, also performed in 1879, was on Barbara Watson, whose symptoms pointed to the tumour of the dura mater that Macewen found pressing on her left frontal lobe. In the fourth patient, Christina Thomson, a lesion of the temporo-sphenoidal lobe was suspected because of motor involvement, and a massive abscess was found there but sadly she died of "exhaustion" shortly after the operation. The last three patients – William McGill, Mrs. McKirdy and Francis Newlands – all presented with motor symptoms; the localisation was confirmed in each, the lesion treated, and all recovered as had Daley and Watson.<sup>13</sup>

In its summary of the main features of Macewen's address, the *British Medical Journal* stressed his pioneering use of localisation in planning his operations and concluded "All honour to the surgeon who has so ably and successfully led

the way in this grand undertaking" (*British Medical Journal*, 1888, p. 324). Yet we know that on 25th November, 1884 in London, Hughes Bennett and Rickman Godlee had removed an encapsulated tumour (a glioma) from the brain of a Mr. Henderson, a native of Dumfries in southern Scotland, which claimed to be the first operation based on that knowledge.

Less than 3 weeks after the Bennett and Godlee operation, on 16th December 1884, an anonymous letter from Sir John Crichton Browne, signed with his title of 'F.R.S.', appeared in the *Times* (London) that was to generate a controversy over whether their operation was the first such, or whether those of Macewen had preceded it. F.R.S.'s letter was part of a discussion over vivisection and he was mainly concerned to point out to critics of vivisection that the success of the operation on the then still living Mr. Henderson was directly due to the experiments on animals conducted by, among others, David Ferrier. F.R.S. also described the Bennett and Godlee operation as the first of its kind. Buried amongst the topics canvassed in the debate which followed, and which continued for several months over a range of moral, logical, medical and physiological topics, was the question of whether this was so.<sup>14</sup>

The main challenge to F.R.S.'s claim that Bennett's and Godlee's operation was the first, came from Dr. James Whitson of Glasgow. From a personal letter of Macewen to Ferrier, actually written some weeks later, we learn that F.R.S.'s letter had been referred to by several speakers in Glasgow at a dinner held by the student medical society of the Glasgow Royal Infirmary,

and as considerable excitement was occasioned thereby it was considered necessary

<sup>13</sup>Here and later in this paper, I identified some of the 1888 cases by matching the initials and dates that Macewen published with the names, dates of admission/operation, symptoms, operation details, and the outcomes recorded in his *Private Journals* (Cases 1, McKinley; 2, Daley; 3, Watson; and 6, McKirdy). Case 4 (Thomson) was identified by matching the year and the description and location of the abscess, and Case 5 (McGill) by the year and month of the operation and the symptom. The details of Case 7 (Newlands) are known only from its late publication in 1885 but Newlands' full name and the dates he was admitted and operated on come from entries in the index to Macewen's *Private Journal* and the Glasgow Royal Infirmary Ward record.

<sup>14</sup>Trotter (1934, Note to p. 1210) says that Sir John Crichton Browne told him that he (Browne) was 'F.R.S.' An online search of Palmer's Index to the *Times* (London) from December 1884 to February 1885 under the headings 'brain surgery' and/or 'vivisection' will retrieve all the correspondence printed in that newspaper referred to here. Note, however, that the pseudonymous correspondents are not listed under 'F.R.S.' etc., but under such general headings as 'Note on brain surgery' or 'Surgery and vivisection, Notes on.' The Index is available on CD-Rom in many libraries.

that it be answered. This the President Dr. Whitson undertook to do. I said to him that I should prefer that he would not do so. I had no right to speak, but on being permitted to do so, said that F.R.S. merely wished to advance the cause of vivisection, as an experimental science, from which practical results had been obtained & therefore I thoroughly agreed with him and would support his views (Draft(?) letter from Macewen to Ferrier, 31st January (?), 1885. Royal College of Physicians and Surgeons of Glasgow Archives, 10/1A/44).<sup>15</sup>

F.R.S.'s letter appeared in the *Herald* (Glasgow) on 17th December, reprinted from the *Times* (London), and Whitson's answer there on 22nd and in edited form in the *Times* (London), on 26th. Whitson began by congratulating Bennett and Godlee and moved directly to F.R.S.'s "error in imagining that the case described by him is either unique, or the first in which the brain has been opened for the removal of tumours or other morbid material." He then briefly described the operations performed by Macewen between 1876 and 1879, adding that others had been conducted since, including one at which he had assisted. He concluded by saying that he had tried to be factual and not detract from the merits of Bennett and Godlee, but hoped he had succeeded in showing "that at least one provincial school is entitled to more credit than it has received at the hands of your correspondent 'F.R.S.'"

A letter from 'M.D.' appearing in the same issue of the *Herald* (Glasgow) made similar points but more strongly. M.D. opened by praising Bennett for his diagnostic accuracy and surgical skill, then defended the vivisection work by Ferrier and others that made the operation possible, before saying "No doubt such operations are new to London; but they may almost be said to be old to us here in Glasgow." After summarising several of Macewen's operations, including two

that we know were performed late in 1883, M.D. pointed out that what F.R.S. termed "a new era in cerebral surgery" had been inaugurated by Macewen "years before." Nor was F.R.S. correct in thinking that antiseptic precautions, which had enabled the success of the Bennett and Godlee operation, had not been used before: Ferrier's experiments as well as Macewen's surgery illustrated the same point. M.D. concluded with an acknowledgement to Ferrier to whom "not only science but also suffering humanity [owed] a deep and lasting debt of obligation."

Perhaps it was not surprising that at least two Glasgow papers endorsed Whitson's and M.D.'s counterclaim for Macewen's priority (*Herald* Glasgow 24th December and *Evening Times* Glasgow 26th). Nor, perhaps, that the only correspondent to take issue with the counter was F.R.S. His first reply, on 27th December in the *Times* (London), and reprinted in the *Herald* (Glasgow) on 29th December, claimed that he was not ignorant of Macewen's work although "Dr. Macewen has not published any reports of his cases and the brief notices of them which have appeared . . . certainly create the impression that they were of a very different character" from that of Bennett and Godlee, differences he went on to outline: the patient was not in a coma, the place of operation was determined by motor symptoms alone, the cortex was incised, and a tumour cut out of the brain substance. Whitson answered point-by-point: Macewen's patients were not all in coma, some operations were guided solely by motor symptoms, the brain was cut into and nocuous matter removed, the majority of operations were completely successful, and they were performed antiseptically (*Herald* Glasgow 30th December, reprinted in the *Times*, London, 3rd January 1885).

F.R.S. replied that Whitson's defence of the Glasgow claim displayed "an almost feminine jealousy," and challenged him to publish details of Macewen's cases in a medical journal, where they could be competently judged. He qualified his seeming surrender on Whitson's first three points by saying that what made the Bennett and Godlee case unique was "the combination of these three sets of conditions in one patient." He was sure Whitson was aware trephining had

<sup>15</sup>The items of Macewen's correspondence that I have cited are either copies which Macewen retained of what he seems to have sent, or are unsent drafts. Those I judge to be drafts are like this letter to Ferrier (10/1A/44) in that they are undated, have no signature, and sometimes have passages crossed out.

been carried out successfully and without anaesthetics “many times before 1879, and in many hospitals that are not in the vicinity of the Saltmarket” [the site of the Glasgow Royal Infirmary] (*Times* London 5th January 1885, reprinted in the *Herald* Glasgow 6th January). Whitson rejected the argument, saying that Macewen had met all three conditions, adding that the nature of matter removed from the brain was not at issue. He concluded by taking exception to the flippant and wholly irrelevant remarks characterising the beginning and end of F.R.S.’s letter – the Saltmarket then being a notorious Glasgow slum (*Herald* Glasgow 8th January, reprinted in the *Times* London 13th January).

The newspaper debate over priority seems to have been brought to an end with a letter on the 15th January 1885 from Bennett in the *Times* (London). Bennett made no claim to priority, saying merely that because details of his and Godlee’s case had not been published, the discussion had led to “a series of premature surmises and erroneous conclusions.” He gave a brief account of how he and Godlee had localised Henderson’s tumour, noted the accuracy with which it had been done, and the degree of relief afforded the patient in the 4 weeks that he had survived.

Almost the last archival detail we have is in correspondence between Bennett and Macewen a month later. Bennett must have written for details of his cases, because Macewen replied,

I hope to be able to send you details of the cases to which you refer; you will then judge for yourself concerning them. They have all been shown before my clinical classes; most have been presented to the various societies here, and two demonstrations were given, one to the Southn. Med. Society, the other to the Brit Med. Ass Branch. The last of these in July of last year. Details of these have not yet been published by me.

I never knew the London press “to suppress” information sent them. (Copy of letter from Macewen to Hughes Bennett, 20th February 1885. Royal College of Physicians and Surgeons of Glasgow Archives, 10/1A/11/2.)

That this latter point refers in some way to the priority claim can be inferred from a passage in Macewen’s draft that did not appear in the letter as sent:

I would not like you to misunderstand my position. As yet, I have advanced no personal claim. I never knew the London press “to suppress” any information sent them. I believe it much too catholic for that. (Undated draft letter from Macewen to Hughes Bennett. Royal College of Physicians and Surgeons of Glasgow Archives, 10/1A/11/1)

Where the charge of suppression came from is not clear. Of course, rivalry between London and Glasgow was in the background of the Whitson-FRS exchange. But, possibly aggravated by M.D.’s jibe that the operations were old news in Glasgow, and the several newspaper editorial comments that focussed on the rivalry (e.g. *Herald* Glasgow 24 December 1884 and *Times* London 5th January 1885), it really came to a head with Whitson’s concluding his second letter with “the new era in the domain of cerebral surgery narrated by ‘F.R.S.’, though only dawning in London in the last few months has been for years an accomplished fact in Glasgow” (*Herald* Glasgow, 30th December 1884). It was that which had provoked F.R.S.’s riposte of “feminine jealousy.”

About 2 months after the Macewen-Bennett correspondence, the *Proceedings of the Royal Medico-Chirurgical Society* recorded a discussion on 12th May by Hughlings Jackson, David Ferrier, Victor Horsley, and, given what we have just seen, perhaps unexpectedly, William Macewen, on a communication received from Bennett and Godlee on the tumour removal (Bennett & Godlee, 1882–1885). Speaking after Jackson and Ferrier, the *British Medical Journal* recorded that Macewen first called “attention to some cases which had been referred to in the papers” (*British Medical Journal*, 1885). This detail is not in the *Proceedings* themselves, which had Macewen beginning by simply saying he was there “at the invitation of Dr. Bennett and Mr. Godlee . . . as he had had a considerable number of cases where the skull had been trephined, and operations performed on the brain.” He gave

some detail of his first operation in 1876 (John McKinley), mentioned more recent cases in which motor symptoms were the only guides to the lesions, gave details of the operation on Mrs. McKirdy, and mentioned that on Francis Newlands. For both of the latter he gave his *May Lancet* paper as a reference, even though it was not published until a few days later (Macewen, 1885).

Bennett replied that Macewen's presence in response to his invitation was "a special source of gratification," and he congratulated him on his "brilliant successes" (Bennett & Godlee, 1882–1885). Nevertheless, before going on to his more general remarks, Bennett "ventured to doubt" if Macewen's cases "were exactly analogous to his own." Macewen had not removed tumours, he seemed to have used "external manifestations" to plan his operations, and the extensive symptoms in others "rendered exact localisation impossible," although "the evacuation of fluid" had doubtless brought relief. Godlee said only that he had been "fortunate in finding the growth so confined" and averred that in the future he would use Macewen's methods for cleansing the head prior to surgery, replacing bone, and draining the site of operation. He said nothing directly or indirectly about priority.

What then does Macewen's case material tell us about the controversy? Who was right: 'F.R.S.' and Bennett or Whitson and 'M.D.'? What of Macewen's 1888 address in Glasgow and the *British Medical Journal's* then recognition of Macewen's priority? Part II contains an analysis of the data on the seven cases in an attempt to answer these questions.

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