Eponyms

Brown-Séquard and his syndrome

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Case presentation

A woman aged 41 years presented with a 5-day history of progressive weakness of the right leg with a pronounced limp and difficulty climbing stairs. For 2 days she had also noticed numbness in her left leg, but no back pain or bladder disturbance. She had previously been fit, did not smoke and drank little alcohol. In the right leg there was sustained clonus at the ankle with pyramidal weakness and an extensor plantar response. The left leg had normal tone, power, and plantar response. Sensory examination showed absence of pain and temperature sensation between the thoracic levels T7–10, and absent vibration and proprioception caudal to T7 on the right. On the left, there was absence of pain and temperature with preserved vibration and proprioception caudal to T7 on the right. On the left, there was absence of pain and temperature with preserved vibration and proprioception sensation below the T10 level. Magnetic resonance (MR) images showed an intramedullary lesion towards the right at the level of T7 and T8; the spinal cord was expanded and active inflammation was seen after gadolinium was administered. Oligoclonal bands in otherwise normal cerebrospinal fluid and on MR images of the brain showing three periventricular high-signal lesions suggested a background of chronic inflammation of the central nervous system (figure 1). The woman was treated for transverse myelitis and given a course of intravenous methylprednisolone after which she made a moderate recovery.

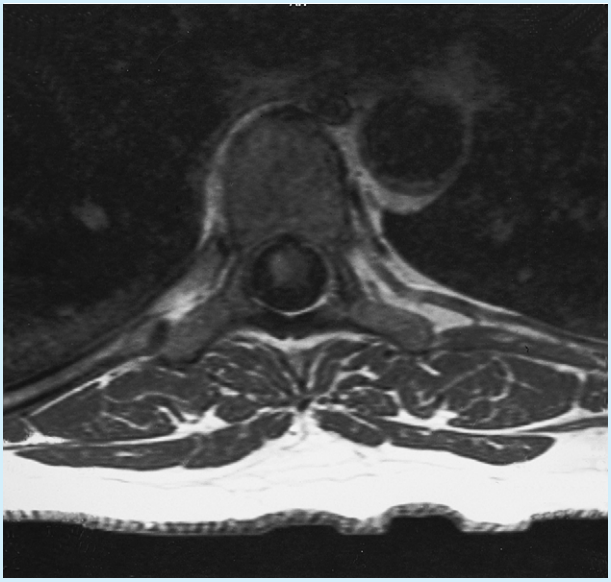

Figure 1: **Magnetic resonance image**
Showing demyelinating lesion in the right side of the spinal cord.

Brown-Séquard syndrome

The physical signs of classic Brown-Séquard syndrome are shown in figure 2. The points to note are total loss of sensation and flaccid paralysis at the level of the lesion due to destruction of nerve fibres at that segment of the spinal cord. The spinothalamic tracts enter the cord and travel ipsilaterally for one to two levels before crossing over, and, therefore, the contralateral loss of spinothalamic sensation begins a few spinal levels below the site of the lesion (figure 3).

Students are taught that this syndrome is caused by hemisection or lateral injury to the spinal cord, and consists of ipsilateral motor weakness and hypoaesthesia with contralateral loss of pain and temperature sensation. Most studies on Brown-Séquard syndrome in the 20th century have been of sporadic cases generally traumatic or neoplastic in origin, but with a variety of causes.[1] The full classic syndrome is normally caused by extramedullary lesions but intramedullary inflammatory lesions, such as in multiple sclerosis can result in partial or complete Brown-Séquard syndrome.

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Charles-Edouard Brown-Séquard

Charles-Edouard Brown-Séquard (1817–94)[2,3] was one of the most remarkable medical men of the Victorian age and is remembered particularly for his contributions to neurology (admiringly) and to endocrinology (pejoratively). He was born in Mauritius to an Irish-American sea captain and a French mother. Mauritius had been ceded to Britain in 1814, thus although he did not learn English until 1852, Brown-Séquard was for most of his life a British subject. He claimed that he used his mother's and father's combined names to distinguish himself from all other Browns. Brown-Séquard had a flair for self-publicity and was as well known in England and the USA as in France. He was an extraordinarily energetic man who frequently worked 20 h a day and published 577 papers. Michael Aminoff speculates that for much of his adult life, Brown-Séquard had periods of malaise and depression—when things became too much for him, he would move, usually to another country. He is said to have crossed the Atlantic more than 60 times and set up residence in the USA four times, France six, and England once.

Neurology

Brown-Séquard moved to Paris intending to become a writer but, after his manuscripts were repeatedly rejected, he became a medical student. He qualified in 1846 by defending his thesis on physiology of the spinal cord. The anatomy of motor and sensory nerves and spinal pathways

of sensation were poorly understood at the time. Before 1825, Charles Bell (1774–1842) and François Majendie (1783–1855) had shown that the anterior nerve roots were motor and the posterior sensory (priority for this discovery was contested but it is now remembered as the Bell-Majendie law). Brown-Séquard's doctoral thesis was separated into two parts. In the first, he noted that immediately after spinal-cord section in the frog, reflexes were lost, but were subsequently recovered and exaggerated; in the second part, he studied the effects of lesions in various parts of the cord, the main conclusion being that the posterior columns were not the main sensory pathways.

The finding for which Brown-Séquard later became famous, that lateral hemisection caused ipsilateral hyperaesthesia and lost or diminished sensation in the contralateral limb, was first published in 1849. In 1858, he made his first visit to England, here he gave six lectures at the Royal College of Surgeons on physiology and pathology of the nervous system. These lectures and some in Glasgow in 1859 were such a success that he was headhunted for the newly established National Hospital for the Relief of the Paralysed and Epileptic (later the National Hospital for Nervous Diseases, Queen's Square, London). Here, Brown-Séquard became a victim of his own success, and it is said that he decided to leave when he looked out of the window of his consulting room and saw the square gridlocked by the carriages of his fashionable patients. At the 1862 annual meeting of the British Medical Association, he described a typical case of his syndrome, a sea captain who had been stabbed in the neck. Immediately after the injury, the patient had had a complete right and partial left hemiplegia, but 8 years later, when Brown-Séquard saw him, the right hemiplegia had partly and the left completely recovered. What interested Brown-Séquard were the sensory findings; in the paralysed limbs tactile sensation to tickling and temperature was greatly increased, but was lost in the non-paralysed left limbs. When he returned to the subject in *The Lancet* in 1869 he stated that "a lesion in one of the lateral halves of the spinal cord produces: 1st, paralysis of voluntary movements in the same side; 2nd, anaesthesia to touch, tickling, painful impressions, and changes of temperature in the opposite side; 3rd, paralysis of the muscular sense in the same side".[4]

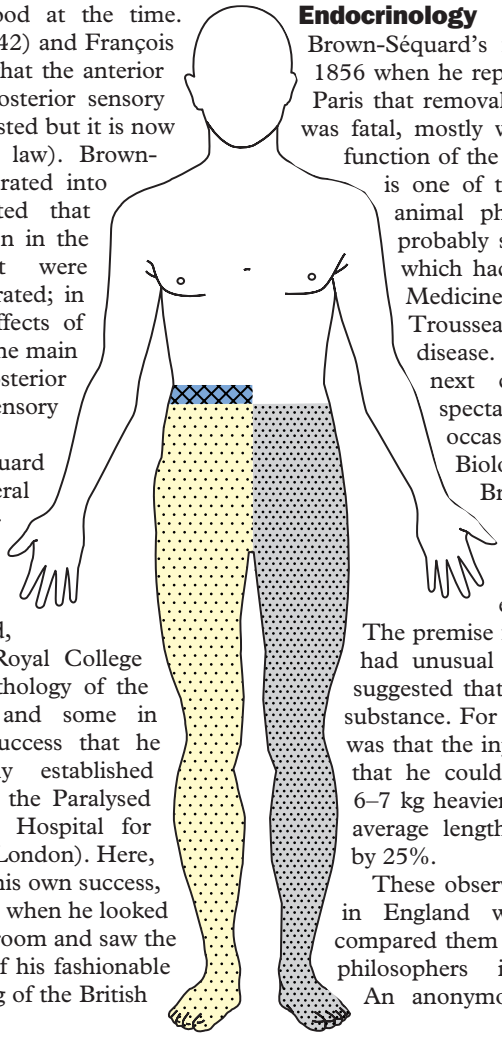

Figure 2: **Features of classic Brown-Séquard syndrome**

Endocrinology

Brown-Séquard's first work in endocrinology was in 1856 when he reported to the Academy of Sciences in Paris that removal of both adrenals in various animals was fatal, mostly within 24 h. He concluded that the function of the adrenal glands is essential to life and is one of the most important functions in the animal physiology.[5] These experiments were probably stimulated by Addison's monograph, which had been discussed at the Academy of Medicine in Paris in August, 1855, when Trousseau suggested the eponym, Addison's disease. Olmstead termed Brown-Séquard's next contribution to endocrinology "a spectacular finish to a spectacular life". The occasion was a meeting of the Society of Biology in Paris on June 1, 1889, when Brown-Séquard reported that he had rejuvenated himself with daily injections of a solution of testicular blood, seminal fluid, and testicular extract from guinea pigs and dogs. The premise for his experiments was that celibates had unusual mental and physical energy, which suggested that the testes produced a dynamogenic substance. For Brown-Séquard the conclusive factor was that the injections had increased his strength so that he could now run upstairs and lift weights 6–7 kg heavier than before. Most impressively, the average length of his jet of urine had increased by 25%.

These observations were greeted with incredulity in England where the *British Medical Journal* compared them with the wild imaginings of medieval philosophers in search of an elixir vitae.[6] An anonymous doctor wrote: "I consider the idea of injecting the seminal fluid of dogs and rabbits into human beings a disgusting one, and when the treatment also involves the practice of masturbation, I think it is time for the medical profession in England to repudiate it. Vivisection may be an open question, but self-abuse is not". The popular press had a field day at Brown-Séquard's expense and most doctors and physiologists in England and Germany were extremely sceptical about his claims. Nevertheless, by the end of 1889, more than 12 000 doctors worldwide were using his fluid with various results. A US correspondent to *The Lancet* reported sarcastically that "In the hands of one experimenter, the paralysed immediately walk, the lame throw aside canes and crutches, the deaf hear, and the blind see. The same experiments failed altogether in the hands of another". Brown-Séquard supplied his organic preparations free to doctors with the

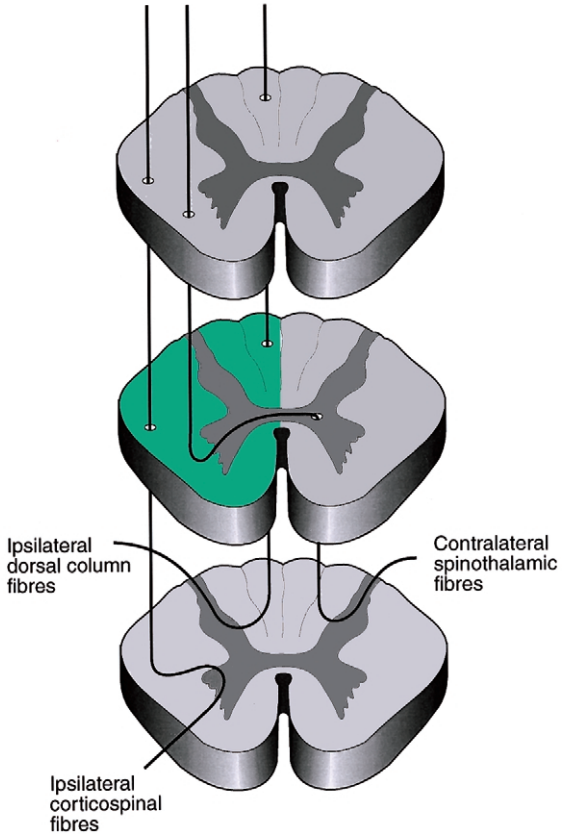

Figure 3: **Major spinal cord tracts and relation to hemisection of cord**
Hemisection shown in green.

proviso that they relayed the results to him. When he presented his last report to the Academy of Sciences in 1893, he claimed that the best results with testicular extract had been obtained in tabes dorsalis (benefit in 314 of 405 cases). Even such difficult conditions as Parkinsonism and diabetes were helped, if not cured. He was careful not to claim that testicular extract was a universal panacea, but suggested that it built up the "nervous force" and added to the body's defences.

In an article in the *British Medical Journal* in 1893, Brown-Séquard claimed that he had founded the science of endocrinology with his adrenalectomy experiments in 1856, and that ever since he had believed that all tissues produced an internal secretion.[7] This belief was supported by Minkowski's (1889) findings that pancreatectomy caused severe diabetes and Murray's (1891) study on the cure of myxoedema by thyroid extract. Immodestly, Brown-Séquard concluded that "the great movement in therapeutics as regards the organic liquid extracts has origin in the experiments I made on myself in 1889, experiments which were at first so completely misunderstood". In an accompanying editorial the *British Medical Journal* commented that: "Though many jeered at him as the discoverer of the secret of perpetual youth, the notion has steadily gained ground that there is, after all, something in it. Since also, the success that has followed the injection of thyroid extract in myxoedema, we can hardly wonder that this belief has increased".

The drought that descended on endocrinology, and the disrepute into which it fell, until the discovery of insulin in 1921 was laid squarely at Brown-Séquard's door. At the time of formation of the Endocrine Society in 1917, it was thought that any young clinician who showed an interest in the subject was straying from the path of "serious medicine" and heading for the "endocrine goldfields". However, history judges Brown-Séquard as a scientist, he comes across as a lively character who is described in the Lives of Fellows of the Royal College of Physicians as a wholly likable and humorous man. It is fitting, at a time when eponyms are shunned, that Brown-Séquard is, like Addison, a name known to all medical students.

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