Original article

William Adams and the spine of Gideon Algernon Mantell

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Gideon Mantell was born in Sussex in 1790, the son of a bootmaker (Fig. 1). Although frugally educated, he became a surgeon and Fellow of The Royal College of Surgeons. He practiced initially in Lewes, where he devoted every spare moment to the study of geology and the excavation of fossils in local quarries. He became one of the leading scientists of the early 19th century. It became apparent to him and others that the fossils were not those of crocodiles and lizards, but of hitherto unrecognised giant reptiles – the dinosaurs. He was elected a Fellow of The Royal Society and eventually won its Gold Medal, the highest honour it could bestow. His discoveries were an important element of the understanding of evolution. His ideas were controversial and he was involved in various scientific disputes.

His devotion to geology lead to the breakdown of his marriage. He moved his practice from Lewes to nearby and fashionable Brighton, in search of wealthy sponsors for his research. Then he moved to Clapham in south London. The last 6 years of his life were spent in Chester Square, Pimlico, where he died.

Details of his life can be gleaned from his journal, which now resides in the Alexander Turnbull Library, Wellington, New Zealand. Much of it was published in 1940.¹ His correspondence with Benjamin Silliman, Professor of Geology at Yale, is quoted by Mantell's biographer, Sidney Spokes.²

Mantell's back pain

Mantell developed crippling back and leg pain in 1841. He attributed this to a variety of causes: his height, prolonged

Figure 1 Portrait of Gideon Mantell.

periods bent treating patients with 'mortification of the foot', which required repeated dressings; nursing his beloved daughter, Hannah, who died in 1840; and a long walk in the cold following the treatment of another patient.

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Figure 2 Drawings of Mantell's spine from front and back. Note that the alignment of the spinous processes is straight and in the midline. This is the axis of rotation of the spine. The palpable swelling was of the spinous processes and vertebral bodies. The consequent hard tumour misled the surgeons of the time to a diagnosis that Mantell had an abscess.

On 11 October 1841, he reports that he jumped from his carriage when his coachman tangled the reins, narrowly escaping serious injury as the wheels just missed his head. On 27 October, he was 'ill with symptoms of paralysis, arising from spinal disease'. On 28 October, 'the paralytic symptoms were more severe, the numbness and loss of feeling extend to the feet: I can scarcely walk. The pelvic viscera are dreadfully affected.' He wrote to Silliman on 30 April 1842: 'I cannot stoop, or use any exertion without producing loss of sensation and power in the limbs...and could I chose my destiny, I would gladly leave this weary pilgrimage'.

On 18 September 1842, he records: 'tumour of considerable size has gradually made its appearance on the left side of the spine; it now evidently contains fluid – probably a lumbar abscess: and my long probation of suffering will be terminated by a painful and lingering death'. This precipitated consultations with colleagues (including Robert Liston and Sir William Lawrence FRS, President of The Royal College of Surgeons, William Coulson and Sir Benjamin Brodie). Brodie and Lawrence diagnosed periostitis, diseased bone and an abscess that required to be opened. One recommended entire rest in a horizontal position and blisters moxa or some other

external stimulant. The latter 'advises no external application, gentle carriage exercise, and sarsaparilla'. Liston and Coulson diagnosed no disease of bone, but rather an abscess that will discharge itself.

Mantell expressed his confusion and despair: 'well may the unmedical sufferer exclaim who shall decide when doctors disagree, when I am at a loss to decide upon the conflicting opinions upon my case!'

Sporadic entries to his journal record continuing symptoms, particularly night pain. On 10 October 1844, he states: 'general health rather better. Attacks of neuralgia much less severe.' There is not much on his health until 1849 when things got worse again, with entries on the various agents he tried to control his pain.

The post mortem

Mantell died on 11 November 1852. The post mortem was carried out on 13 November by Dr Hodgkin and William Adams FRCS. They found a severe lumbar scoliosis and a large dose of anodynes in an otherwise empty stomach.³ The spine was preserved in the Hunterian Museum with a plaster cast of the specimen (4808.1.O.C.2105 A.). An account of their findings was read to the Medico-Chirurgical Society on 27 June 1854, and published in the Society's Transactions the same year.⁴ The paper includes two fine drawings of the specimens from front and back (Fig. 2). The spine and the plaster cast were destroyed in 1969 due to lack of space.

Adams goes on to say: 'the fact of the greatest practical importance which this specimen illustrates and clearly proves is one which I believe has not hitherto been described, viz., that a very severe degree of lateral curvature of the spine with transverse rotation of the bodies of the vertebrae accompanied with lateral absorption of the bones and intervertebral cartilages...may exist with only a very slight deviation of the apices of the spinous processes; in short, that the severest degree of deformity of the spine may exist internally, without the usual indications in respect of the deviation of the spinous processes externally'.

'The condition of the spine here described as transverse rotation of the vertebrae, the centre of motion corresponding to the apices of the spinous processes. I do not find mentioned by any modern authority on these affections; but it appears to have been observed by the late Dr Dods of Bath who, as far as I know, was the first to direct the attention of the profession to the subject of rotation of the spine in lateral curvature. In the year 1824, he published a somewhat remarkable book entitled *Pathological Observations on the Rotated or Contorted Spine, commonly called Lateral Curvature*.' Hodgkin and Adams go on to quote in detail from this work in which it seems Dr Dods arrived at his conclusions by palpation of the transverse processes.

Figure 3 The Adams forward bending test: a mother and daughter with idiopathic scoliosis, standing and bending forward. The rib humps are obvious when they bend forward. Adams realised this when he performed the post mortem on Mantell. This led directly to the forward bending test.

They also quote the observations of M. Guérin in his book *On the Treatment of the Deviations of the Spine by Section of the Muscles of the Back* (1843; originally published in French in 1839) which notes rotation but not the lack of deviation of the spinous processes from the midline. Jules Guérin (1801–1866) was a famous and controversial Parisian surgeon who used myotomy to treat scoliosis.

The Adams forward bending test

Later, Adams became the leading expert on scoliosis in Victorian London. He gave a series of 12 lectures in the Grosvenor Place School of Medicine in 1860–1861. He published these as *Lectures on the Pathology and Treatment of Lateral and Other Forms of Curvature of the Spine* in 1865, with a second edition in 1882.³

Both editions contain an appendix with a detailed account and illustrations from the Mantell dissection. In the introduction to the second edition, he emphasises that 'this case is especially interesting, as being the first which directed my attention to the subject of rotation of the bodies of the vertebrae in lateral curvature of the spine in the year 1852'.

It is in lecture 10 that he describes the forward bending test that is still linked with his name. He emphasises that the accentuation of the truncal asymmetry relates to the rotation of the spine. He distinguishes this from postural asymmetry which corrects on forward bending. There is much more besides this, and surgeons treating scoliosis today could do worse than read these lectures for their clinical vignettes and observations. A mother and daughter with scoliosis are seen in Figure 3.

William Adams

William Adams (1820–1900) was the son of a general surgeon and trained at St Thomas's Hospital. He was appointed Demonstrator in Morbid Anatomy at St Thomas's Hospital in 1842. Later, he was on the staff of the Royal Orthopaedic Hospital from 1851–1872, when he resigned due to interprofessional disputes. He published on subcutaneous tenotomy for clubfoot and Dupuytren's contracture. He developed a subcutaneous osteotomy of the femoral neck in 1871 to treat bony ankylosis. He joined the new National Orthopaedic Hospital in 1873. He visited the US in 1876 and was made a Fellow of the American Orthopedic Association in 1898.

Comment

It is clear that Mantell had a lumbar scoliosis. This would probably today be classified as 'degenerative', although it may well have been superimposed on a mild asymptomatic adolescent idiopathic curve. Scoliosis tends to progress slowly in adults. Lumbar curves can give back pain which is often of a fatigue type, where the pain becomes worse through the day and may be bad enough to make the subject lie down by the afternoon or evening. Mantell seemed to suffer particularly from night pain.

Root pain is common and may be claudicant or continuous. Cauda equina syndrome is not a normal feature of scoliosis, but might be precipitated by a concomitant disc prolapse. Retention may be precipitated by severe pain, especially if treated with large doses of opiates. Adams decided not to open the vertebral canal as he thought it would ruin the specimen. It is a pity that the Hunterian Museum destroyed Mantell's spine as today

we could subject it to CT or MRI scan to find what was within the canal. This illustrates the difficulties of museums and collections with too many specimens for their storage capacity.

My interpretation is that Mantell suffered with root and back pain to his death, although it is clear that the symptoms fluctuated considerably. They did not prevent him walking significant distances on some occasions. There is no record in his journal or letters of further episodes of retention of urine or faeces. He tried out a variety of analgesics including, on at least one occasion, chloroform. An overdose of opiates led to his demise.

The tumour on his back confused the leading physicians and surgeons of the day and sadly this is still sometimes the case today. Fortunately, no one attempted to drain the 'abscess'. Mantell's despair with the multiple and conflicting diagnoses is not unknown today!

Adams' account of the post mortem and his lectures makes it clear that this case gave him a totally new insight into scoliosis and allowed him to see again the nature of the deformity in the museum specimens available to him. The illustrations show that the spinous processes, palpable through the skin, were in a straight line. This misled the many surgeons and physicians who examined Mantell in life. Adams' findings lead directly to his description of the forward bending test, by which his name is still remembered today. This test is in daily use in the clinics of scoliosis surgeons throughout the world. Mantell the surgeon and scientist would have been fascinated to hear the true diagnosis of 10 years of grievous back pain, and delighted that the revelations of his post mortem had such a lasting impact on clinical practice.

A popular account of Mantell's contribution to our knowledge of dinosaurs is given by Deborah Cadbury,⁵ although this is flawed by a number of factual errors in relation to the subject of this article. Truth is not allowed to get in the way of the telling of a good story! This book has been made into a feature film.

References

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