

## Sir Charles Bell, his Palsy and Mona Lisa

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Received, June 1, 2004

Accepted, June 3, 2004

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Acute onset lower motor neuronopathy of the seventh cranial nerve is often referred to as Bell's palsy. Although Sir Charles Bell is best remembered for his observation of asymmetric facial musculature as a result of injury to the seventh cranial nerve, his contributions to surgery and anatomy are vast. A review of the life of Dr. Bell is accompanied by a discussion of diagnostic and therapeutic considerations for acute seventh nerve palsy.

**Key Words:** Bell's palsy, nervous system, Sir Charles Bell

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### The Man

Sir Charles Bell (1774-1842) was a noted surgeon, neuroanatomist, and artist. Although probably not the first to describe facial nerve palsy, the eponym "Bell's Palsy" has come to represent a unilateral lower motor neuron lesion of the seventh nerve.

Bell was the youngest son of 4 children. His father, a Scottish Episcopalian clergyman died suddenly when Bell was 5 years old leaving his mother to raise their children on her own.<sup>23</sup> Unfettered by the trappings of Church, and with keen intelligence and insight, she prioritized a broad and stimulating education for her children.<sup>7</sup> Bell's emerging talent proved to be visual arts and he was further tutored while studying at Edinburgh High School.<sup>18</sup> His brother John sidetracked Bell's fledgling artistic ambitions by introducing him to the study of human anatomy.

With John's help, Charles Bell enrolled in medical school at the University of Edinburgh.<sup>5</sup> As a medical student, he pursued both artistic and medical interests, excelling in both. His first illustrated anatomy text, "A System of Dissection," went to press when he was still training (1798). A year later, at 26, he graduated from medical school and was admitted to the Royal College of Surgeons. He joined his brother John in opening a private school of anatomy and medicine.<sup>10</sup> The Bell anatomy classes proved popular, and as a result, were viewed as competition by their alma mater. In a petty and vindictive move, both were barred from practice or affiliation with the University of Edinburgh.<sup>21</sup>

In 1804, Bell left Edinburgh to establish a practice in London. Within months, he published one of the first anatomic textbooks for artists: "Essays on the Anatomy of Expression in Painting."<sup>14</sup> He continued to lecture extensively on anatomy and gravitated to the anatomy of the nervous system. He published many additional texts over the years, including "A New Idea of the Anatomy of the Brain and Nervous System," in which he attempted differentiating motor and sensory fibers, through studying the paths of cranial nerves five and seven.

In 1812, Bell founded the medical school at Middlesex Hospital in London, and became one of the chief practicing surgeons.<sup>7</sup> His surgical prominence was relied upon during the Napoleonic wars, most notably in the Battle of Waterloo. Facial gunshot injuries provided a unique opportunity to study functional facial anatomy and musculature. Battlefield experiences combined with animal experiments done in his laboratory led to his conclusion that the seventh cranial nerve (CNVII) controlled facial expression. He named CNVII "the respiratory nerve of the face" and described its functions. "In all the exhilarating emotions, the eyebrows, eyelids, the nostrils and angle of the mouth are raised. In the depressing passions it is reverse."<sup>19</sup>

His contributions to the medical sciences were rewarded with a knighthood in 1831, by King George IV. At age 62, he returned home to Edinburgh to take up the Chair of Surgery.<sup>10</sup> He continued to dedicate his life to the service of medicine by lecturing extensively around Europe and was considered one of the foremost physicians of his era. He died suddenly of angina pectoris at age 68.<sup>7</sup>



Figure 1. Sir Charles Bell (Photo courtesy Dr. CN Chua, FRCS, Oxford).

### Bell's palsy

Peripheral seventh nerve palsy is a common and cosmetically devastating cranial neuropathy.<sup>2</sup> Most often idiopathic, it can also develop because of trauma, infection, inflammation, metabolic disruptions, neoplasia, or vascular insults. Growing evidence suggests many “idiopathic” cases may be caused by the herpes family viruses.<sup>9,15,16,20,25</sup> As Bell first localized facial expression to the seventh nerve, this cranial neuropathy bears his eponym.

Incidence of Bell's palsy is approximately 30 per 100,000 population, with no gender bias.<sup>13</sup> Pregnancy increases the risk of Bell's palsy by 3.3 times, and occurs most often in the third trimester.<sup>26</sup>

Onset of illness is relatively acute, and may be preceded by a unilateral headache or skull base pain.<sup>8</sup> Most patients develop acute onset of unilateral upper and lower facial paralysis (usually over a 48 hour period), decreased tearing, hyperacusis, and taste disturbances. Patients report the inability to close their eye or smile on the affected side (or drooling), and an examiner should note upper facial weakness as well. A diagnosis of exclusion, a thorough history and physical examination is often all that is needed. Stroke or other upper motor neuron lesions should display characteristic sparing of the forehead musculature and must be differentiated from a peripheral CNVII compromise that typically would not spare forehead muscles.

Treatment should begin immediately. Patients with symptoms longer in duration than a few weeks are unlikely to benefit from medical therapy.<sup>12</sup> Though treatment remains controversial, evidence suggests that oral steroids and antiviral medications shorten disease course.<sup>3,11,22</sup> To date, no studies have demonstrated a similar benefit in children. Most patients recover completely within a few

months; however up to one-third will have permanent impairment.<sup>17</sup> Of patients with Bell's palsy, 85% achieve complete recovery, and 5% experience severe and permanent deformities.<sup>4</sup> Patients that develop incomplete facial paralysis during the acute phase, are the most likely to recover fully.<sup>24</sup>

Motor regeneration of the nerve may be protracted and incomplete, and may manifest as nasal obstruction, excessive tearing or facial asymmetry. Sensory regeneration may be suboptimal as well, and patients might complain of taste impairment or dysesthesias in the cutaneous distribution of the seventh nerve. Some nerves grow along aberrant pathways resulting in synkinesis, or involuntary contraction of multiple facial muscles in the process of one or more voluntary motions.<sup>27</sup> Many Bell's patients develop “jaw winking” which is closure of the eye when attempting to smile.

Some<sup>1</sup> speculate that the curious and enigmatic smile of the Mona Lisa (la Gioconda) might be the result of Bell's palsy. Careful examination of her portrait reveals a subtle asymmetric smile – perhaps a clue about her medical history?



Figure 2. Portrait of Mona Lisa also known as La Gioconda, the famous art of Leonardo-da-Vinci. The Mona Lisa's enigmatic expression (which could be contributed by a subtle 7<sup>th</sup> nerve palsy), which seems both alluring and aloof, has given the portrait universal fame. (Photo © RMN, 2004)

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