Harvey Cushing: a founding father of neurosurgery

Harvey Cushing died 70 years ago, on 7 October, 1939, in his 71st year, of a myocardial infarction. He founded a school of neurosurgery whose disciples spread throughout the world, introduced the meticulous documentation of the clinical and pathological details of cerebral tumours, developed techniques of operative surgery which are now standard practice, has an endocrine disease which bears his name and even produced one of the best known medical biographies, the two-volume *Life of Sir William Osler*, which won the Pulitzer Prize for 1926.

Cushing was born in Cleveland, Ohio in 1869, preceded by three generations of doctors; his father was a gynaecologist and his elder brother became a paediatrician. Harvey Cushing went to Yale, then to Harvard Medical School, Boston. While still a student, he showed his genius for clinical innovation.

Students in those days gave most of the anaesthetics. Young Cushing devised the first continuous monitoring of the patient – he called it the 'ether chart' – which documented pulse, temperature and respiration, and added blood pressure to this a few years later when the effective sphygmomanometer was invented by Riva-Rocci. Cushing qualified MD cum laude in 1895 and was appointed to the surgical house staff at the Massachusetts General Hospital.

The following year he moved to the new medical school, the Johns Hopkins, at Baltimore, as resident to William Halsted. It was here that he became drawn to neurosurgery, then in its earliest days. One of his early interests was the surgery of trigeminal neuralgia; in 1900 he reported a method of total extirpation of the trigeminal ganglion for this condition by an approach through the temporal bone and, 5 years later, published a detailed account of the sensory distribution of the trigeminal nerve, in no less than five papers in the *Journal of the American Medical Association*.

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The years 1908 to 1912 were amazingly productive, both in clinical and experimental studies. He began the careful documentation of the pathological material obtained from his patients with intracranial lesions. Eventually he had microscopic sections and, in most cases, the original specimens of some 2000 verified brain tumours. Among many contributions was his description, with his pathologist, Percival Bailey, of the medulloblastoma, a highly malignant tumour of the fourth ventricle, usually found in children, which they published jointly in 1924.

A particular interest was the pituitary gland, leading to publication of a 350-page monograph in 1911, which detailed 50 patients with endocrine disturbances of the gland. Apart from sorting out a lot of the complex endocrine effects of the anterior pituitary, Cushing also solved many of the technical aspects of pituitary surgery. He devised the transnasal trans-sphenoidal approach, but used a large frontal bone flap with elevation of the frontal lobe of the brain where there was a marked intracranial extension of the tumour.

Another 20 years were to pass before Cushing described the basophil adenoma of the pituitary, associated with the syndrome that now bears his name.

In 1910, at the age of 41 years, Cushing was appointed to the senior chair of surgery at Harvard and, at the end of 1912, he moved to Boston into the newly built Peter Bent Brigham Hospital – here he was to spend the rest of his surgical career.

At the outbreak of the First World War in 1914, Harvey Cushing was eager to be of service, and in March 1915 he took a surgical team for a 3-month stint to a French military hospital outside Paris. Here he encountered for the first time the problems of gunshot wounds of the head and spine, and it was here that he devised the use of an electromagnet attached to a wire nail to extract metallic shell fragments from the brain. Returning to the USA, Cushing urged the need for medical preparedness, being convinced that his country would be drawn into the war. He duly returned to France in 1917 with an American neurosurgical team, which was attached to the Royal Army Medical Corps. A series of papers emerged from this extensive experience, the most important being a detailed study of wounds involving the brain, which took up a whole issue of the *British Journal of Surgery* in 1918. A technique described by Cushing and still used today was the use of the sucker to debride the missile track – pulped devascularized cerebral tissue disappears up the sucker, healthy brain is unaffected.

One of the important technical problems in neurosurgery that Cushing had to overcome was haemorrhage. That from the highly vascular scalp was dealt with by adrenaline infiltration and the tension of a row of haemostats to the fascial edge of the skin incision. Bleeding from the brain and meninges was even more serious. Cushing devised a small silver clip ('the Cushing clip') which is still used today. In 1926, working with the physicist William Bovie, he used a high frequency current to remove a vascular meningioma – a previous attempt at surgery had failed because of haemorrhage and the electric diathermy machine (still often called 'the Bovie' in the USA) came into use. The following year, Cushing was able to recall many meningiomas and haemangiomas with supposedly inoperable lesions which could now be tackled successfully.

Cushing trained a remarkable series of men, who went on to pioneer neurosurgery all over the USA and Europe. Among these were Norman Dott, who established a unit in Edinburgh, and an Australian from the London Hospital, Hugh Cairns, who became Professor of Surgery in Oxford, opened the neurosurgical unit there, and, in World War II carried on the Cushing tradition by training British neurosurgical teams that served in every theatre of war. Incidentally, he was my professor of surgery and my chief when I worked in a post-war Army neurosurgical hospital.

Cushing was a hard man – tough on himself and ruthless to his trainees. Hugh Cairns, who himself had served in the Australian Army in the First World War, used to say to us: 'A day working with Cushing was worse than a year in the Dardanelles'. **BJHM**

Conflict of interest: none.