Neurosurgical Classic—XIX

ROBERT H. WILKINS, M.D.
Division of Neurosurgery, Duke University Medical Center, Durham, North Carolina

The nineteenth century French surgeon, Pierre Paul Broca, is remembered today for his accomplishments in two fields. As an anthropologist he made valuable studies of human skulls, and he founded the Société d’Anthropologie and the Revue d’Anthropologie.4,10–13 As a neuropathologist he made his most significant contributions when he reported the pathological lesions in two cases of “aphemia.”6–9 These and subsequent reports played a major role in establishing the concept of cerebral localization which was an important prerequisite to modern neurological surgery.16,20,27–29,30

During the first half of the nineteenth century, the brain was thought to act as a whole, with no localization of its functions.1,4,14,15,18,19,26,30,31 Franz Joseph Gall, however, held the opposite view.21,25 He “... placed the faculty of memory for words in the frontal lobes of the brain because of his observation that his schoolmates with prodigious memories had rather prominent eyes, presumably due to the overgrowth of the inferior aspect of the frontal lobes. Gall buttressed this observation from his study of a patient with a fencing foil wound in the frontal lobe of the brain with attendant speech disturbance. Unfortunately, Gall’s name is linked closely with the pseudoscience of phrenology which was strongly advocated by Spurzheim, an early associate of Gall...”20

“Bouillaud, a French physician, in 1825 reiterated the view of Gall and produced autopsy material to substantiate the idea that, ‘the principal lawgiver of speech is to be found in the anterior lobes of the brain.’3 Bouillaud, who later became a popular professor of medicine, repeatedly defended his view in prolonged discussions at medical gatherings. On one occasion, he offered a reward of 500 francs to anyone who could produce a brain from a patient with a significant lesion of the frontal lobes who did not have a disturbance of speech. About this time, Velpeau reported a brain tumor involving both frontal lobes in a patient who not only had no speech difficulty but was actually loquacious. Whether he had the temerity to claim the reward is not known...”20

Further advances in understanding disturbances of speech were made in 1861. “... In February 1861, before the recently formed Société d’Anthropologie, Gratiolet,17 who had previously exhibited a primitive Mexican skull, discussed the significance of the volume of the brain. Auburtin,23 the pupil and son-in-law of Bouillaud, opposed the view that the total volume of the brain gave an exact measurement of intelligence, and opposed Gratiolet’s view that the functions of all parts of the brain were the same. Broca,6 who was Secretary of the Society, joined in the debate.”4

“The discussion aroused so much interest that it was continued at subsequent meetings. Auburtin reported a case in which haemorrhage into both frontal lobes caused no symptoms beyond loss of speech, and another in which pressure with a spatula upon the exposed frontal lobe caused immediate interruption of speech. He localized in the frontal lobes ‘the faculty of co-ordinating the movements peculiar to language’...”4

On April 11, 1861, a patient named Leborgne (“Tan”) was admitted to the surgical service of the Bicêtre, a hospital in Paris for chronic diseases, under Broca’s care. Apart from his acute illness, a diffuse phlegmon of the right lower extremity, the patient had an interesting neurological disorder that had begun with aphasia 21 years previously. Because of the discussions at the Société d’Anthropologie, Broca asked Auburtin to
see “Tan” in consultation. “Tan” died on April 17, 1861, and at a meeting of the Société d’Anthropologie on the following day, Broca described the findings present at autopsy. SIGNIFICANTLY, Broca did not section the brain but left it intact for the anatomical museum.

“Broca concluded from the history, clinical examination, and pathological studies of his patient that the loss of speech was a consequence of a lesion in one of the frontal lobes, probably in the third convolution. Broca referred to this loss of speech as aphemia (from a = not + phême = voice). He extended his observations by asserting that if speech function resided in a specific area, other mental faculties are probably situated in circumscribed loci in the cerebral hemispheres. Thus, Broca unwittingly became one of the champions of discrete localization of function within the brain.”

A few months later a similar case came under Broca’s care. The patient had been admitted to the Bicêtre eight years previously, at the age of 76, because of senile debility. In April, 1860 he had suddenly become unconscious, and although he had partially recovered, he remained aphasic. In October, 1861 the patient fractured his left femur in a fall, and was transferred to the surgical service. There he died twelve days later. At autopsy a lesion was found in the second and third left frontal convolutions, and Broca’s ideas about cerebral localization were reinforced.

“This started a controversy so heated that Head, who extensively reported the writings on the subject at that time, said it became a political issue. The older Conservatives, still frightened by the impact of phrenology, held the holistic view that the specific functions could not be localized. The younger Republicans and Liberals quickly espoused the view put forward by Broca.”

“Hughlings Jackson . . . opposed Broca’s concepts at a medical meeting where Broca made a later report now further strengthened by more autopsy material. Broca’s finding seemed so incontrovertible that he was deemed the winner of the discussion.”

Another detractor was the eminent French clinician, Trousseau, who not only attacked Broca’s hypothesis of localization but also made carping criticism of the term aphemia, that Broca had employed. Trousseau, in consultation with a Greek physician, pointed out that aphemia meant ‘infamy’ in later Greek usage and substituted the term aphasia.

“Over 40 years after ‘Tan’s’ death, his brain was re-examined by Pierre Marie. Marie, one of the most celebrated French neurologists, succeeded to the post of neurology at the Bicêtre in 1897. There he did a careful study of the previously undissected brain of ‘Tan.’ In a series of provocative papers, the first of which was pointedly entitled ‘The Third Frontal Convolution Does not Play Any Special Role in the Function of Language,’ he attempted to demolish the views put forth by Broca. Marie demonstrated that the lesion reported in ‘Tan’ was much more widespread than Broca reported. The frontal areas were destroyed as previously described, but there was also extensive damage in the temporal and parietal areas . . .”

“To emphasize the dubious nature of Broca’s concept of localization and to overlook his contribution establishing the left hemisphere as the dominant half of the brain would be unjust. A few years after the examination of his famous patient and fortified by other autopsy findings, he suggested that the left cerebral hemisphere had a unique role in the formation of speech. Even the honor of establishing this doctrine was contested. Marc Dax in a communication to the Academy of Medicine in 1864 stated that his father, Marc Dax senior, had suggested this nearly 30 years before in 1836. Broca was naturally piqued by this usurpation of priority and could find no mention of this report in the literature. However, Dax actually produced the manuscript and re-published it. Nonetheless, the honor must remain with Broca, who brought this important observation to the general attention of the medical world.”

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