

- 1 Lang CJG, Heckmann JG, Neundorfer B. Creutzfeldt-Jakob disease via dural and corneal transplants. *J Neurol Sci* 1998;160:128–39.
- 2 Japanese Committee of Creutzfeldt-Jakob Disease and Related Disorders (Chief: Sato T). *Report 30 March 2000*. Japan: Ministry of Health and Welfare, 2000. (In Japanese.)
- 3 Lane KL, Brown P, Howell DN, et al. Creutzfeldt-Jakob disease in a pregnant woman with an implanted dura mater graft. *Neurosurgery* 1994;34:737–40.
- 4 Kopp N, Streichenburger N, Deslys JP, et al. Creutzfeldt-Jakob disease in a 52-year-old woman with florid plaques. *Lancet* 1996;348:1239–40.
- 5 Takashima S, Tateishi J, Taguchi Y, et al. Creutzfeldt-Jakob disease with florid plaques after cadaveric dural graft in a Japanese woman. *Lancet* 1997;350:865–6.
- 6 Shimizu S, Hoshi K, Muramoto T, et al. Creutzfeldt-Jakob disease with florid-type plaques after cadaveric dura mater grafting. *Arch Neurol* 1999;56:357–62.
- 7 Will RG, Ironside JW, Zeidler M, et al. A new variant of Creutzfeldt-Jakob disease in the UK. *Lancet* 1996;347:921–5.
- 8 Yamada M, Itoh Y, Fujigasaki H, et al. A missense mutation at codon 105 with codon 129 polymorphism of the prion protein gene in a new variant of Gerstmann-Sträussler-Scheinker disease. *Neurology* 1993;43:2723–4.

HISTORICAL NOTE

Aphasia and Wernicke's arc

Sextus Empiricus (about AD 200) is credited¹ with being the first person to use the word “aphasia”, albeit in a philosophical sense. Carl Wernicke's studies on aphasia, published from 1874, are among the classics of clinical neurology. However, Benton and Joyn² suggest that Johann Schmidt in 1677 gave the first account of paraphasia and alexia. They also observed that:

“Almost all the clinical forms of aphasia—complete motor aphasia, paraphasia, jargon aphasia, agraphia and alexia—had been described before 1800. The unawareness of defect which may accompany paraphasia and jargon aphasia had been noted, as well as the coincidence of aphasia and agraphia...”

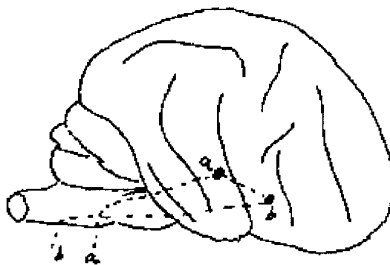
After the studies of Gall³ in 1807, and Bouillaud, there were many exponents of a dynamic view of aphasia. Finkelnburg (1870) regarded speech disorders as part of a wider disturbance, which he called lack of symbolic representation. Word blindness and word deafness, described by Bastian, were disorders of perception, independent of speech defects.

Critical to Wernicke's concepts was his anatomical demonstration of an arc of cerebral matter, in which lesions would be associated with aphasia.⁴ He distinguished three varieties⁵ that still form the broad foundation of modern nosology.

Sensory aphasia, Wernicke attributed to a lesion of the auditory centre, which abolished “sound-images”, and so prevented the patient from understanding words and from recognising his own defects of speech.

Destruction of the third frontal convolution caused motor (Broca's) aphasia, with loss of the images for articulated speech.

A lesion that destroyed the pathway between the two centres caused conduction aphasia, leading to misuse of words but no



Wernicke's illustration of the arc, 1874⁴

defect of understanding. Moreover, a lesion destroying both centres caused loss of understanding both and expression of speech—total aphasia.

The anatomical substrate lay in an arc in the dominant temporal lobe with linked fibres in the left third frontal convolution with central connections (figure). This was known as *Wernicke's arc*. He recognised that an auditory centre was in the first temporal convolution (Wernicke's area), and the centre for articulated speech in Broca's area.⁶

Broca had described: “aphemia . . . the result of a profound, but accurately circumscribed lesion of the posterior third of the second and third frontal convolutions.” Trousseau in 1864 used the word aphasia⁷ to replace aphemias.

Later Broca distinguished two main speech disorders: aphemias, and verbal amnesia—in which the patient lost the memory not only of spoken but also of written words—corresponding to Wernicke's receptive or sensory aphasia.

Both Dax⁸ and Broca had shown that loss of speech was caused by damage to the left half of the brain. But more penetrating analysis was left to Hughlings Jackson⁹ and others, who asked what was meant by loss of speech. He considered the importance of propositional versus emotional speech. The brain's levels of inhibition and disinhibition influenced the language content

The thesis of a precise anatomical localisation as the basis for focal symptoms proved controversial. Freud¹⁰ was critical of the “diagram makers”, thus anticipating Head by

30 years. Freud thought that Wernicke's and Lichtheim's classifications corresponded neither to clinical or pathological facts. He recognised purely verbal, asymbolic, and agnostic varieties of aphasia. Goldstein's later studies¹¹ were founded on Jacksonian concepts. Central, or in Wernicke's terminology—conduction aphasias, were seen as disorders of “inner speech”. He regarded nominal aphasia as more than a loss of words, since, he said, it contained abnormal behaviour that any categorical action was disturbed.

Head (1926) also famously scorned the “diagram-makers” represented by Wernicke and others:

“They failed to appreciate that logical formulae of the intellect do not correspond absolutely to physical events, and that the universe does not exist as an exercise for the human mind . . .”

None the less, Wernicke's arc has proved an invaluable guide to clinical localisation of focal lesions affecting language and speech.

J M S PEARCE
Beverley Road, Anlaby,
East Yorks HU10 7BG

- 1 Benton AL, Joyn RJ. Early descriptions of aphasia. *Arch Neurol* 1960;3:205–9.
- 2 McHenry LC. *Garrison's history of neurology*. Springfield, Illinois: Thomas, 1969, reprint 1997:86.
- 3 Gall FJ. *Cranologie ou découvertes nouvelles concernant le cerveau le crâne et les organes*. Paris: Necelle, 1807.
- 4 Wernicke C. *Der aphasische Symptomencomplex*. Breslau: Tasehen, 1874.
- 5 Wernicke C. *Lehrbuch der Gehirnkrankheiten*. Kassel and Berlin: Fischer, 1881.
- 6 Broca PP. Remarques sur le siège de la faculté du langage articulé suivie d'une observation d'aphémie. *Bull Sac Anat Paris* 1861;36:330–2.
- 7 Trousseau A. Lecture VII on aphasia. *Lectures in Clinical Medicine* 1868;1:218.
- 8 Dax M. Lésions de la moitié gauche de l'encéphale coincident avec l'oubli des signes de la pensée. *Gaz Hebdomadaire Med Chir Paris* 1865;2:259.
- 9 Jackson JH. In: Taylor J, ed. *Selected writings of JH Jackson*. Vol. 2. London: Staples Press, 1958.
- 10 Freud S. *Zur Auffassung der Aphasien*. Leipzig and Vienna; Deuliche, 1891. Translated by E Stengel, London, 1953.
- 11 Goldstein K. *Language and language disturbances*. New York, Grune and Stratton, 1948.