supranuclear palsy, which also affects this loop and in which an abnormal anteroposterior metabolic gradient has also been documented.[8] On the other hand, lesions essentially confined to the substantia nigra, as in Parkinson's disease, do not consistently alter cortical metabolism.[8] It is tempting to envisage dysfunction in the prefronto-striato-pallido-thalamo-prefrontal loop as one possible mechanism underlying both "athymhormia" and the abnormal anteroposterior metabolic gradient.

Mechanisms to account for the altered anteroposterior metabolic pattern in our case, other than disruption of this loop, include neuronal damage at the level of the frontal cortex. Thus although frontal atrophy was only questionable at MRI performed at the time of PET in our case, it was undoubtedly present in her two brothers at postmortem (at a much later stage of the disease), indicating frontal lobe degeneration is part of the entity. Also, the metabolic changes could reflect (and not cause) her abnormal behaviour. Thus a similar metabolic profile has been reported in patients affected by schizophrenic or affective disorders, where a flat affect and loss of drive are common features.[9]

In conclusion, however disabling this abnormal behaviour may be, it seems to be expressed as only mild anteroposterior metabolic imbalance.

Addendum

Since acceptance of this paper, the patient developed, and died from, central hypoventilation.

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1 Lechevalier B, Schupp C, Fallet-Bianco C, *et al.* Syndrome parkinsonien familial avec athymhormie et hypoventilation. *Rev Neurol (Paris)* 1992;**148**:39–46.
2 Perry TL, Wright JM, Berry K, Hansen S, Perry JL. Dominantly inherited apathy, central hypoventilation, and Parkinson's syndrome: clinical, biochemical, and neuropathological studies of 2 new cases. *Neurology* 1990;**40**:1882–7.
3 Habib M, Poncet M. Perte de l'élan vital, de l'intérêt et de l'affectivité (syndrome athymhormique) au cours de lésions lacunaires des corps striés. *Rev Neurol (Paris)* 1988;**144**:571–7.
4 Laplane D. La perte d'auto-activation psychique. *Rev Neurol (Paris)* 1990;**146**: 397–404.
5 Bogousslavsky J, Regli F, Delaloye B, Delaloye-Bischof A, Assal G, Uske A. Loss of psychic self-activation with bithalamic infarction. Neurobehavioural, CT, MRI and SPECT correlates. *Acta Neurol Scand* 1991;**83**:309–16.
6 Laplane D, Levasseur M, Pillon B, *et al.* Obsessive-compulsive and other behavioural changes with bilateral basal ganglia lesions. A neuropsychological, magnetic resonance imaging and positron tomography study. *Brain* 1989;**112**:699–725.
7 Alexander GE, Crutcher MD. Functional architecture of basal ganglia circuits: neural substrates of parallel processing. *Trends Neurosci* 1990;**13**:266–71.
8 Brooks DJ. Functional imaging in relation to parkinsonism syndromes. *J Neurol Sci* 1993; **115**:1–17.
9 Joyce EM. The relevance to psychiatry of recent advances in functional imaging. *J Neurol Neurosurg Psychiatry* 1992;**55**:427–30.

Visual rating of hippocampal atrophy: correlation with volumetry

In a previous paper we described the use of visual rating of medial temporal and hippocampal atrophy as an early diagnostic marker for Alzheimer's disease.[1] Other studies on this subject have used volumetric estimations of the hippocampal complex or temporal lobe.[2 3] These techniques are refined but time consuming. To investigate the correlation between visual rating and volumetric estimation of the hippocampus, we assessed the volume of the hippocampus in 41 subjects (20 patients with Alzheimer's disease and 21 age matched controls), of whom demographic data and MRI had been described elsewhere.[1] The volumetric assessments were carried out by one author, who had been involved in the clinical part of the previous study but had not seen the images before. He performed the analysis blinded to the diagnosis and ages of the subjects.

After magnification of the hard copies of the MRIs by projecting them on a screen with an overhead projector, the outlines of the brain and hippocampus were drawn on transparencies. Only the second to the fifth slices of each MRI were used. These transparencies were then digitalised on a Macintosh IIx with a ScanJet IIc flatbed scanner (Hewlett Packard) with a resolution of 72 dots per inch and were saved on an eight bit grey scale TIFF file (256 shades of grey). Postprocessing of the images was carried out with the public domain program IMAGE 1·35 (from W Rasband, NIH research services branch, Bethesda, Maryland, United States). The area of the hippocampus on each slice was measured and magnified by the slice thickness, thus producing an estimation of the volume. For analysis the eight volumes (four on each side) were added together and divided by four to produce a "mean total hippocampal volume".

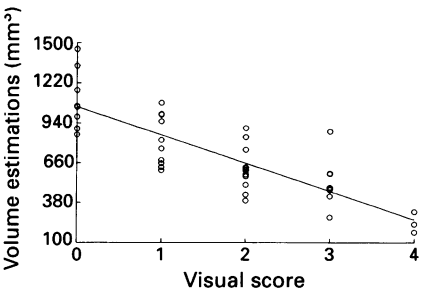

Figure Scatterplot showing correlation between visual score and volumetric estimations. The regression line is drawn in ($r = -0·83$).

The correlation between visual and volumetric assessment of hippocampal atrophy was excellent (figure; $r = -0·83$ $p < 0·001$, one-tailed).

From the figure it may be inferred that overlap occurs between some of the scores, especially between 2 and 3. Based on the volumetric assessments, it would be worthwhile to modify to a 0–2 or 0–3 scale, which would simplify the rating, but could lead to loss of discriminative power. Although drawing from magnified hard copies may introduce several measurement errors, the correlation is surprisingly high. In future research, postprocessing will be carried out on images taken directly from the scanning console, bypassing the use of hard copies.

In general, the main disadvantage of visual ratings in research settings has always been the low interobserver and intraobserver reliability.[4] For clinical practice, however, visual ratings provide a useful and rapid assessment of hippocampal atrophy that correlates well with linear[1] and volumetric measurements and may be used to aid the clinician in diagnosing or ruling out Alzheimer's disease.

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1 Scheltens Ph, Leys D, Barkhof F, *et al.* Atrophy of medial temporal lobes on MRI in probable Alzheimer's disease and normal aging: diagnostic value and neuropsychological correlates. *J Neurol Neurosurg Psychiatry* 1992;**55**:967–72.
2 Seab JP, Jagust WJ, Wong STS, Roos MS, Reed BR, Budinger TP. Quantitative NMR measurements of hippocampal atrophy in Alzheimer's disease. *Magn Reson Med* 1988; **8**:200–8.
3 Kesslak JP, Nalcioglu O, Cotman CW. Quantification of magnetic resonance scans for hippocampal and parahippocampal atrophy in Alzheimer's disease. *Neurology* 1991;**41**:51–4.
4 De Carli C, Kaye JA, Horwitz B, Rapoport S. Critical analysis of the use of computer-assisted transverse axial tomography to study human brain aging and dementia of the Alzheimer type. *Neurology* 1990;**40**: 872–83.

Serum concentrations of 2',5'-oligoadenylate synthetase, neopterin, and β-glucan in patients with chronic fatigue syndrome and in patients with major depression

Chronic fatigue syndrome is characterised by debilitating severe fatigue persisting for more than six months.[1] Furthermore, it is associated with physical symptoms, such as mild fever, sore throat, arthralgia, and myalgia, as well as psychological symptoms such as headache, insomnia, depressive state, and neuropsychiatric symptoms.[1] It has often been claimed that the onset of chronic fatigue syndrome follows an infection or infection-like illness[2]; hence a certain microorganism(s) or virus may cause it. Another possible candidate for inducing chronic fatigue syndrome is cellular or humoral immune dysfunction, which has