Difficult Decisions

How far to investigate dementia?

John M. Kellett

Department of Geriatric Medicine, St George's Hospital School, Cranmer Terrace, Tooting, London SW17 0RE, UK.

Dementia is a diagnosis at the level of shortness of breath, or liver disease, better than malaise but only just. Before discussing the virtue of further investigation it is apposite to examine the value of diagnosis in general. The first function is to distinguish a disease with a specific and effective treatment in order to free the patients from their suffering. The second is to provide information, so that the implications of even an untreatable disease can be known to the patient and their family (e.g. acquired immunodeficiency syndrome). The third is to isolate and define a disease with a similar pathology and aetiology to provide both a focus for research and a profile for the public at large. The latter two functions are likely to lead to treatment in the long term and should not be undervalued.

Before delving deeper it may be helpful to examine the extreme positions in this debate. The view that patients with dementia should not be investigated would take this form. Health service priorities should be devoted to helping those where the treatment is effective and the potential for a future contribution to society is high. Neither of these propositions generally apply to dementia. Furthermore the affected patients are usually unaware of their deficiencies, and are likely to be distressed by what they perceive as unnecessary medical intervention. In the few cases where a treatable condition is discovered the treatment will at best prevent the condition developing further and will leave a chronically disabled subject for society to support indefinitely. Most people who are *compos mentis* would prefer a quick death and would certainly not wish their life to be prolonged when they had lost their faculties. Dementia is largely a disorder of ageing, and medicine should beware of treating ageing, any cure for which would destroy the world by rapid expansion of the population.

The interventionist might argue as follows: every human being deserves respect which should apply especially to the elderly who have contributed so much to our present prosperity. Medicine advances through

curiosity and the temptation to write off patients is not only socially dangerous, but introduces a Luddite attitude into medicine which could stifle advance. Modern techniques of investigation are largely risk-free and painless and even brain biopsy is well tolerated. Knowledge is a precious commodity which should be sought at every opportunity, and the outcome of such research often illuminates other areas as well as the original subject. If we ourselves had a disease of our brain we would wish no stone to be unturned in searching for a treatable cause, our brain being the seat of our soul and our most fundamental organ. Every time we miss a treatable case of dementia we are not only causing distress to the patient and his family but we are committing the state to spend £10,000 a year on their support, which may last many years. Cases that are untreatable today may be treatable tomorrow if we are allowed to study them thoroughly.

The evidence

Most studies show a substantial minority of those with dementia who have a treatable cause. Marsden & Harrison¹ reported on the outcome of investigating 106 patients with presenile dementia. Fifteen patients were considered not to be demented, 8 with depression, one with mania, and one with hysteria, two were confused due to drugs, and in three the memory disturbances were transient though the cause was unknown. In a further seven the dementia was uncertain leaving 84 with confirmed dementia. Their diagnoses are shown in Table I.

Sadly only 15% of the whole series which included those with depression were amenable to treatment, although the study was completed in 1969 and more may have been achieved today. Strictly speaking the title was misleading as more than half were over the age of 65, and the proportion with presumed Alzheimer's disease increased with age from none under fifty to 53% (8/15) over 70.

Smith & Kiloh² reported on the outcome of inves-

Correspondence: J.M. Kellett M.B., F.R.C.P., F.R.C.Psych.
Received: 1 June 1987

Table I Diagnosis in 84 cases of dementia

Intracranial space occupying mass	8
Arteriosclerotic dementia	8
Alcoholic dementia	6
Normal pressure hydrocephalus	5
Creutzfeldt Jakob	3
Huntingdon's chorea	3
Post traumatic atrophy	1
Postsubarachnoid haemorrhage	1
Limbic encephalitis	1
Probable Alzheimer's disease	48

tigating 200 patients with dementia, of whom only 164 had the diagnosis confirmed. The diagnostic breakdown of the 28 patients with non-Alzheimer-type dementia is given in Table II.

Although the authors consider that the first three diagnoses represented treatable conditions only 5 would have appeared to have recovered. No attempt seems to have been made to distinguish vascular dementia, a condition that today would be regarded as meriting treatment. Like the Marsden series the patients covered a wide range and only 53 of the demented were over 65 at the time.

Two smaller studies have been reported by Pearce,³ and Freemon,⁴ which found treatable causes in 8% and 30% respectively. Freemon's figure should be modified by the knowledge that only 12 of the 18 with potentially treatable conditions improved with treatment and in only six would it appear that the improvement was substantial, five of which were drug toxicity.

Larson *et al.*⁵ restricted their study to patients over 60 years of age and unlike the earlier studies used computed tomographic (CT) scanning for all their patients. Their diagnostic breakdown is given in Table III excluding 15 patients where the dementia was not confirmed (a few patients had 2 diagnoses).

Despite being an older population this study found

30 with a treatable cause for their dementia, a similar proportion to the earlier studies.

Jacoby & Levy⁶ reported on the value of the CT scan in a group of 40 patients with dementia where a vascular cause seemed unlikely, and whose mean age was 79. Two patients had space occupying lesions, which were operable and ten had evidence of cerebral infarction. Bradshaw *et al.*⁷ reported on the outcome of 500 patients with dementia given a CT scan. Thirty five percent had infarcts, 42 patients (8%) had tumours, 4 had subdural haematomas, and 6 had hydrocephalus. They concluded that 10% of the sample had potentially treatable structural lesions. The 65 cases aged 75 and over had 11 such lesions. Even those without focal symptoms or signs produced 5% with treatable lesions, whilst the presence of headache or neurological signs greatly increased the proportion with treatable lesions.

Discussion

None of the above samples can be regarded as typical of dementia presenting in general practice. Two of the English studies came from postgraduate teaching hospitals as was the study by Smith & Kiloh.² Such selection may well have resulted in the sample containing more with treatable conditions, and many were concerned with patients below the age of 70 when the vast majority of patients with dementia present above that age. The relative scarcity of multi infarct dementia (MID) is also striking, particularly as in the Jacoby study⁶ which specifically excluded them, 25% turned out to have vascular lesions. Tomlinson⁸ in his post-mortem series found 18% with a relatively pure MID and a further 18% with a mixed picture. Pneumoencephalography may well have misclassified these patients as presumed Alzheimer's disease. If so they will have underestimated the proportion of treatable cases as many of the causes of cerebral infarction can be treated successfully even though they were not so

Table II Diagnosis in 28 cases of dementia²

	Number	%
Normal pressure hydrocephalus	8	4.9
Tumour	3	1.8
Hypothyroid	2	1.2
Huntington's chorea	5	3.0
Traumatic	5	3.0
Epilepsy	2	1.2
Carbon monoxide poisoning	1	0.6
Herpes encephalitis	1	0.6
Kut's disease	1	0.6

Table III Diagnosis in 200 cases of dementia.⁵

	Number	%
Alzheimer's	149	80.5
Drug induced	19	10.3
Alcoholic dementia	8	4.3
Hypothyroid	6	3.2
Multi infarct	3	1.6
Hyperparathyroid	2	1.1
Hyponatraemia	2	1.1
Hypoglycaemia	1	0.5
Benign senescent forgetfulness	3	1.6

classified (e.g. treatment for hypertension, polycythaemia, giant cell arteritis, platelet aggregation on atheromatous plaques, and cardiac arrhythmias). If anything, the more recent studies have found more treatable conditions, and investigations in the elderly were equally if not more productive.

Assuming that outpatient investigation of a patient with dementia, including haemoglobin, red cell, erythrocyte sedimentation rate (ESR), blood urea and electrolytes, calcium, albumen, glucose, thyroid function, serological tests for syphilis, chest X-ray and brain CT scan, would cost less than £300 and the cost of caring for a missed treatable dementia is over £30,000 the investigations are justified if one only picks up one such case in a hundred. The economic case for investigation is irresistible. There remains the question as to who to investigate and how far to go. To take the extremes one would not normally investigate a mildly absent-minded lady of 100, whilst one would investigate a chronically disorientated 30 year old. Many of the treatable causes can be distinguished without full investigation, by stopping toxic medication, being alert to depression, and carrying out a standard brief physical examination. This should include checking the blood pressure in both arms, listening for cardiac and carotid bruits, and a careful neurological examination. Basic cognitive examination should include current orientation, and memory for events occurring within the last week, month, and year. Premorbid intelligence should be assessed on history and a test of reading like the Nelson Adult Reading Test. Other areas to be examined are for receptive and nominal dysphasia, constructional and dressing dyspraxia, spatial agnosia, abstract reasoning, and ability to follow a motor sequence. Abnormalities of mood, perception, and insight should be noted. Such a clinical assessment should be supplemented by laboratory investigations according to the level of suspicion springing from the above data.

In my view everyone should have a haemoglobin and red cell indices because of the ability of this cheap and simple test to reveal so much (macrocytosis, from alcoholism, or deficiencies of B12 and folate, polycythaemia, or anaemia from marrow depression, or blood loss). There is no indication for levels of B12 and folate if the peripheral blood is normal. Thyroid function tests are especially useful in the over eighties, where the signs of hypothyroidism are masked. A useful clue is the presence of hair pigment (Wright).⁹ Next in value is an ESR to alert one to arteritis, occult carcinoma, and, more rarely, macroglobulinaemia. A low sodium or high calcium can present as dementia without other signs especially as the former commonly results from using thiazides combined with potassium sparing agents, and the calcium cannot be estimated without a serum albumen which is often low in dementia. I am less certain of the value of a serological

test for syphilis or equivalent without abnormal neurological signs. When positive it is more likely to indicate yaws or a previously treated syphilitic infection than active neurosyphilis.

The next batch of tests involve the patient in inconvenience so that the threshold for their use has to be higher. I would not consider them justified in a patient over 80 whose history and physical examination were entirely consistent with Alzheimer's disease, or multi infarct dementia. Younger patients and those where accurate diagnosis is required for other reasons such as research should be so investigated, but there will be a borderland where the antipathy of the patient to hospital has to be allowed for. These tests include chest X-ray, electrocardiogram (ECG), and head CT scan. There is no point in a skull X-ray if a CT scan is to be performed,¹⁰ but an electroencephalogram (EEG) would be useful if there is any question of added confusion. A 24-hour ambulatory ECG may be necessary if there is suspicion of intermittent arrhythmia, including atrial fibrillation.¹¹ Doppler studies can help confirm significant carotid stenosis, although a bruit would indicate treatment with aspirin, and surgical intervention produces little benefit.¹² In Larson's study⁵ the CT scan gave rise to no therapeutic initiatives, but the new higher definition scanners can accurately diagnose multi infarct states and any scanner is valuable in confirming space occupying lesions and hydrocephalus. Nuclear magnetic resonance and photoemission tomography (PET) scanning are useful research tools but are hardly justified for routine studies. Standard isotope scans have been superseded by the CT scanner but newer isotopes that accurately portray cerebral circulation may find a place. Similarly much has been claimed for visual evoked potentials in their ability to distinguish Alzheimer's disease but this needs further confirmation.¹³

The role of lumbar puncture was clear when pneumoencephalography was the only way of viewing the brain. It also enabled one to exclude neurosyphilis and alert one to inflammation of the brain. However, two recent studies^{14,15} indicate that it has little place in the routine investigation of dementia to discover treatable causes. The same applies to cerebral biopsy which may be regarded as the best means of establishing a diagnosis of Alzheimer's disease, and relatively safe, but too expensive, and unproductive to perform except as part of a research programme. Year by year new techniques arise which may become useful tools in the elucidation of diagnosis, and the ones mentioned above are only a small selection.

Conclusion

The search for a definitive diagnosis in medicine is like the search for the end of the rainbow. Ultimately every

individual is unique and at some point the research must end and the patient and society given the benefit of the conclusions. Even a histological diagnosis is often an educated guess, assessing the relative importance of the changes of ageing, and contributions from the various insults to which flesh is due, from hypertension to neonatal asphyxia. In so far that dementia is the direct result of damage to the brain one would naturally expect that physical tests would yield more information than psychological, as opposed to a condition like bereavement response. Nevertheless the system degenerations tend to affect the brain in sufficiently characteristic ways that psychological changes may well turn out to be the best predictors of aetiology. Each clinician has his own battery of such tests, some of which have been computerized, my own favourite being the use of matchsticks to copy a simple

design, a skill which is lost early in Alzheimer's disease. A simple physical examination including measurement of blood pressure can often produce the evidence to convict the aetiological agent. What is insupportable is the attitude of some, often elderly physicians, who betray their own loss of discernment by attributing all loss of memory to age, and unworthy of study.

Dementia is often diagnosed by those who are more familiar with social aetiologies like psychiatrists, and social workers, and whilst they may be excellent at the important task of developing the social networks of support, they may place insufficient emphasis on physical diagnosis. The establishing of the physical aetiology is the fundamental contribution of medicine which is given up at the peril, not only of our profession, but also of our patients.

References

1. Marsden, C.D. & Harrison, M.J.G. Outcome of investigation of patients with presenile dementia. *Br Med J* 1972, **2**: 249–252.
2. Smith, J.S. & Kiloh, L.G. The investigations of dementia: results in 200 consecutive admissions. *Lancet* 1981, **i**: 824–827.
3. Pearce, J. & Miller, E. *Clinical Aspects of Dementia*. Bailliere Tindall, London, 1973.
4. Freeman, F.R. Evaluation of patients with progressive intellectual deterioration. *Arch Neurol* 1976, **33**: 658–659.
5. Larson, E.B., Reifler, B.V. & Sumi, S.M. Diagnostic tests in the evaluation of dementia. *Arch Int Med* 1986, **146**: 1917–1922.
6. Jacoby, R.J. & Levy, R. Computed tomography in the elderly. 2. Senile dementia: diagnosis and functional impairment. *Br J Psychiatry* 1980, **136**: 256–269.
7. Bradshaw, J.R., Thomson, J.L.G. & Campbell, M.J. Computed tomography in the investigation of dementia. *Br Med J* 1903, **286**: 277–280.
8. Tomlinson, B.E., Blessed, G. & Roth, M. Observations on the brains of demented old people. *J Neurol Sci* 1970, **11**, 205–242.
9. Wright, C.B. Clinical curio: myxoedema and dark hair in old age. *Br Med J* 1984, **288**: 1517.
10. Tress, B.M. Skull radiography in epilepsy, dementia, and non specific neurological symptoms. *Br Med J* 1984, **289**, 160.
11. Warlow, C. Carotid endarterectomy; Does it work? *Stroke* 1984, **15**: 1068–1070.
12. Pitcher, D., Papouchado, M., James, M.A. & Russell Rees, J. Twenty four hour ambulatory electrocardiography in patients with chronic atrial fibrillation. *Br Med J* 1986, **292**: 594.
13. Harding, G.F.A., Wright, C.E. & Orwin, A. Primary presenile dementia: the use of the visual evoked potential as a diagnostic indicator. *Br J Psychiatry* 1985, **147**: 533–540.
14. Hammerstrom, D.C. & Zimmer, B. The role of lumbar puncture in the evaluation of dementia: the University of Pittsburgh study. *J Am Geriatr Soc* 1985, **33**, 397–400.
15. Becker, P.M., Feussner, J.R., Mulrow, C.D., Williams, B.C. & Vokaty, K.A. The role of lumbar puncture in the evaluation of dementia: the Durham Veterans Administration/Duke University study. *J Am Geriatr Soc* 1985, **33**: 392–396.