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THE DISTINCTION BETWEEN DEPRESSION AND DEMENTIA IN THE VERY OLD

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SUMMARY

Thirty-four elderly residents of local authority homes (mean age 83) with depressive symptoms, some with a primary clinical diagnosis of dementia, others with a primary clinical diagnosis of depression, were further investigated and followed up in order to determine the validity of these diagnostic groupings. The two clinical diagnostic subgroups could not be distinguished by neuroradiological appearance on computed tomography and while those with dementia generally performed worse on psychometric testing, there was no statistically significant overall difference in the psychometric scores between the groups. Prognosis for those subjects with depressive symptoms was poor. There were no differences in outcome between those with a primary diagnosis of depression and those with a primary diagnosis of dementia, with only five subjects showing evidence of improvement in depressive symptomatology at one-and two-year follow-up. These data question the validity and clinical usefulness of a strict categorical distinction between depression and dementia in the very old.

KEY WORDS—Depression, dementia, diagnosis

INTRODUCTION

An overlap in the clinical features of depression and dementia among elderly patients continues to be reported. About a quarter of elderly patients with cognitive impairment, associated with degenerative brain disease, have been shown to meet diagnostic criteria for depression (Reifler *et al.*, 1982; Reding *et al.*, 1985). Conversely, one in 12 patients with a discharge diagnosis of dementia has been shown to have a rediagnosis of depression on subsequent admissions (Kendall, 1974). This diagnostic overlap also pertains in studies of patients using standard psychometric measures such as the Mini Mental State Examination (Folstein and McHugh, 1978; Rabins *et al.*, 1984). The discovery that a proportion of elderly patients with a clinical diagnosis of affective disorder have neuroradiological evidence of ventricular enlargement, more usually associated with degenerative brain disease, is further support to the blurring of the boundary between these conditions (Jacoby and Levy, 1980; Dolan *et al.*, 1985).

Despite such evidence, the two major diagnostic taxonomies — International Classification of Disease (ICD9) and Diagnostic and Statistical Manual of the American Psychiatric Association (DSM III) — continue to maintain a firm distinction between the conditions in which the dominance of one or other symptom pattern, depression or cognitive impairment, leads the clinician to make a primary categorical diagnosis. The disadvantage of this clinical choice, for any elderly patient, might be that depressive symptoms associated with a primary diagnosis of dementia are inadequately treated as they are conceptualized as 'only' symptoms of dementia. Conversely, a protracted dysphoric state associated with evidence of intellectual impairment can be diagnosed as a primary depressive pseudo-dementia and lead to excessively vigorous physical treatments for the patient. In the very old, the uncertainties regarding distinction of depression and dementia are likely to be all the more pertinent, as both these conditions occur with increased frequency (Kay *et al.*, 1985). A strict dichotomy also has implications for research, as certain patients can automatically be excluded from dementia research protocols because of the presence of major depressive symptoms. In this way

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a categorical classification can become self-perpetuating and ideally should be subject to periodic review to confirm that there is evidence of predictive validity to justify separate categories and, if that were shown, that the boundaries of the categories have been drawn in the most useful way.

An opportunity to test the validity of the diagnostic distinction arose as part of a recent intervention study for depression among the residents of local authority Part III homes (Ames *et al.*, 1988; Ames, 1990). This article reports on the relationship between the primary diagnostic category applied to these residents (organic brain syndrome or depression) and concurrent brain appearance on CT scan and psychometric test results, as well as on the relationship of these three assessments to outcome. The aim was to establish whether the current diagnostic categories are associated with relevant differences in the other measures, and whether they predict an expected outcome, probable deterioration in the former and probable improvement in the latter.

METHOD

The population

Ninety-three residents, amongst 390 screened using the Brief Assessment Schedule (BAS) (MacDonald *et al.*, 1982), were classed as having significant depressive symptoms (Ames *et al.*, 1989). Eighty-six were later reinterviewed by a research psychiatrist (DA) for full medical and psychiatric history, physical examination and for a standard measure of mental state — the Geriatric Mental State (GMS) (Copeland *et al.*, 1988). These 86 became part of the intervention study reported elsewhere and included subjects with previous histories of depression (Ames, 1989). Follow-up on all these subjects took place at three months, one year and two years, with a repeat of the BAS measure by raters blind to the intervention procedures.

Fifty-three of the 86 residents consented and were fit enough to travel up to the local hospital for CT scan. While they were attending their cognitive state was assessed by the research psychiatrist by standardized testing and a further brief physical examination was carried out.

Control subjects. For the purpose of demonstrating the changes in neuroradiological appearance of these subjects, the data from the CT scan of control subjects were used for comparison. These control data were drawn from those used in a recent study of paraphrenia in the elderly, 18 of the controls being in the age range of the subjects of this study (Burns *et al.*, 1989).

Classification criteria

Diagnosis. The study subjects were allocated by psychiatric interview to a primary diagnostic category of depression or organic brain syndrome personally by the research psychiatrist using DSM-III criteria, and then independently using the AGECAT programme from the data generated by the GMS.

Outcome. The depression scale of the BAS consists of 21 items with a possible score range from 0 to 24. Scores above 6 indicated that significant depressive symptoms were present and implied a diagnosis of dysthymia or clinical depression would be appropriate (Mann *et al.*, 1984). The BAS was repeated three months, one and two years after initial assessment.

CT scan. Computed tomography was carried out on the study subjects at the Royal Free Hospital and controls at the Maudsley Hospital using a CT 1010 EMI scanner. Contiguous 10 mm slices were obtained parallel to the orbital-meatal line to include the brainstem, ventricular system and uppermost sulci. CT data were then coded and stored on floppy disk for later analysis.

Analysis of CT data comprised a semi-automated computerized measure of ventricular size and a visual grading of sulci. For the former the scans were displayed on a visual display unit and a ventricular brain ratio (VBR) calculated, based on pixel absorption density readings measured in Hounsfield units (HUs), as previously described (Dolan *et al.*, 1985).

Cortical atrophy was rated by visual assessment, blind to diagnosis, by comparison with predefined standards (Burns *et al.*, 1989). The sulcal size was rated on a three-point scale, interhemispheric fissure and sylvian fissure on a two-point scale. These scores were then summed to give a cortical atrophy score with a possible range 0–7. A high degree of interrater reliability was established for both measures (VBR — 0·92; cortical atrophy score — 0·96).

Psychometry. Psychometric testing was carried out using the abbreviated Mental Test Score (AMIS) (Hodkinson, 1972) with a score range of 0–10 and the Middlesex Elderly Assessment of Mental State (MEANS) for which normative data have been reported (Golding, 1989). The latter instrument consists of 10 subtests that tap a wide range of cognitive functions including memory, language, visuospatial and motor function. A maximum score of 10 is possible and subjects scoring 8 or less are considered to be impaired. Non-response is counted as impairment, and failure to respond correctly on any item within a subtest leads to failure on that subtest.

Analysis. Statistical analysis was performed using the SPSS package. Parametric statistics were employed for tests of correlation and for comparison of group means while simple chi-squares were used for comparisons of categorical data.

RESULTS

The study population

Fifty-three of the 86 residents were able to undergo CT scan. Ten scans showed intracerebral low attentuation areas consistent with the presence of cerebrovascular disease. One resident had suffered anoxic brain damage earlier in her life, eight other residents were not classed as 'cases' by the AGECAT programme. The remaining residents, free of focal cerebral disease with an AGECAT diagnosis of either depression or organic disorder, became the subjects of this analysis.

These 34 subjects consisted of 30 females and four males with a mean age of 83 years and an age range from 69 to 97 years. Diagnosis by AGECAT indicated that 20 (59%) had a primary diagnosis of depression at case level (85% female, mean age 81) and 14 (41%) had a primary diagnosis of dementia at case level (93% female, mean age 85). DSM-III diagnoses applied by the research psychiatrist were concordant in all but three cases. In view of the congruence of diagnosis, the AGECAT categorization was used for the rest of analysis.

Comparison of CT measurements in the patient and the control group

The whole study group (the depressed and organic together) had larger ventricular brain ratios (VBRs) than controls (mean 13·3 *vs* mean 9·6) but did not differ on the global measure of sulcal size.

Because of possible confounding factors, two multivariate analyses were carried out. The first examined the interaction between age, cortical atrophy score and ventricular brain ratio in each of the two diagnostic groups and in the control group. Table 1 shows the results of this analysis. The analysis confirmed that the control and the two diagnostic groups differed. In the former, increasing age correlated with increasing cortical atrophy and both ventricular and sulcal size showed a significant positive correlation. However, for each of the diagnostic groups, age and CT measures were not related nor was there an interrelationship between VBR and cortical atrophy score.

A second analysis compared the CT measures for the two diagnostic groups separately with the control groups but eliminated the effects of age upon these measures.

Table 2 shows that both diagnostic groups had significantly larger VBRs than the control group, but the cortical atrophy score differences were not statistically significant. However, there was no difference between those subjects diagnosed as organic or depressed by AGECAT on either of the CT measures.

Table 1. Pearson correlation coefficients in organic, depressed and control subjects between age, VBR and sulcal size (CS)

	Organic $N = 14$	Depressed $N = 20$	Control $N = 18$
Age	85·1 SD 5·9	82·1 SD 7·6	82·4 SD 7·0
Age/VBR	0·18 (NS)	0·3 (NS)	0·2 (NS)
Age/CS	0·1 (NS)	0·2 (NS)	0·7 (0·001)
VBR/CS	0·3 (NS)	0·1 (NS)	0·5 (0·05)

Table 2. Analysis of variance (controlling for age) of mean ventricular and sulcal size in subjects with dementia and in control subjects (brackets = confidence interval)

	Depressed $N = 20$	Organic $N = 14$	Control $N = 18$	*df*	*F*	Sig.
VBR	12·2 SD 5·5 (9·6–14·7)	14·3 SD 4·4 (11·8–16·2)	9·6 SD 4·2 (7·5–11·7)	2	3·8	0·02
Atrophy score	3·5 SD 1·4 (2·9–4·3)	4·1 SD 1·5 (3·2–5·0)	3·7 SD 1·7 (2·8–4·6)	2	0·4	NS

Table 3. Comparison of impairments (% impaired) in GMS depression ($N = 20$) and organic ($N = 14$) on individual items of the MEAMS

MEAMS subtest	Organic $N = 14$	Depressed $N = 20$	Chi sig.
Orientation	100%	70%	NS
Object naming	85%	44%	NS
Comprehension	85%	63%	NS
Simple arithmetic	77%	31%	0·05
Spatial construction	100%	79%	NS
Fragmented letters	50%	36%	NS
Unusual view of objects	100%	93%	NS
Conventional view of objects	90%	79%	NS
Fluency	92%	81%	NS
Motor perseveration	77%	53%	NS

Psychometry. Thirty-four subjects were assessed with the MEAMS and the MTS. There was no relationship between the age or sex of the resident and responses to either of these measures. The mean score on the AMTS was 5·5 (SD 2·8) and overall mean score on the MEANS was 2·1 (SD 1·2). Using the recommended cut-point (8 or less) for cognitive impairment on the MEANS, all 34 subjects scored in the impaired range.

Using both psychometric measures as continuous variables, the overall scores of the subjects on the MEAMS and the AMTS were significantly correlated (r 0·64, $p < 0·001$). There was no association between either of the psychometric test scores and ventricular size or sulcal width in any of the diagnostic groups. However, those with the organic diagnosis on the GMS showed lower mean scores on both the MEAMS (1·2 *vs* 2·9, df 1, $p < 0·05$) and the MTS (3·1 *vs* 7·0, df 1, $p < 0·001$). A comparison of individual items on the MEAMS showed that the organic group generally performed worse on each subtest but only the mental arithmetic subtest successfully discriminated between diagnostic groups at the minimum level of significance (Table 3).

Outcome

The subjects reported here were part of an intervention study to assess the effectiveness of social, psychological and pharmacological intervention for their general welfare (Ames, 1989). The outcome for this treated group, assessed after two years, in terms of mortality and the persistence of depressive symptoms was determined by reinterview with the BAS. Five of the 34 subjects reported here had died by the end of the first year (three from the depression group) and 11 overall by the second year (five from the depression group). Amongst the 23 survivors at two years, 19 could be interviewed with the BAS of whom three had now developed severe cognitive impairment that rendered assessment for depressive symptoms by the BAS impossible. Of the remaining 16, 11 were still showing significant depressive symptoms at two years but five now had scores below the cut-point, indicating improvement.

Analysis using the index CT data, GMS diagnostic group, psychometric test scores and age was carried out to relate these factors to two-year outcome status. No association emerged between any of these initial variables and subsequent mortality or depressive morbidity. The five subjects who showed improvement on the BAS at follow-up were indistinguishable from the remaining patients on any of the index assessments.

DISCUSSION

From this study of a sample of very old people, all with depressive symptoms, no concurrent validity could be demonstrated for a categorical distinction between a diagnosis of organic brain syndrome and of depression from their relationship to the appearance of the brain on CT scan or performance on psychometric testing. Further, the small number of subjects whose depressive symptoms had ameliorated by two years could not be distinguished by index diagnosis, CT appearance or psychometry from those who remained depressed or who had developed evidence of dementia by this time.

The sample is small and selective. However, the main selecting factor, admission to a residential home, implies old age, frailty and the likelihood of depression, thus producing a sample in which a diagnostic dilemma between dementia and depression is most apparent. The small sample size, however, does raise the possibility of a type II error in that significant differences could have been present in a larger sample. Obtaining a larger sample would require the specific circumstances of proximity of many such elderly people to a site for special investigations and a high degree of consent, either from the elderly person or from the carer.

The measures used for assessing subjects in this study are all valid for use in the very old with possible cognitive impairment.

The CT scan findings confirmed those found in earlier studies, in which an enlargement of the ventricular system in some patients with depression to a degree similar to patients with a clinical diagnosis of dementia has been reported (Jacoby and Levy, 1980; Dolan *et al.*, 1985). The difference shown here in the relationship between changes in ventricular size and cortical atrophy in a control group in which the two are positively correlated and in depressed subjects in which they are not is a finding consistent with that previously reported (Dolan *et al.*, 1986). The tentative conclusion remains that, for the depressed subject, a change has occurred in at least some of the sample which has caused ventricular enlargement to occur in the absence of equivalent degrees of sulcal widening. One explanation might be earlier brain trauma, though no definite history of this was elicited.

Both groups of subjects were markedly impaired on the MEAMS test, a disparity from the findings that might be expected to be congruent with the clinical diagnoses. The mean scores of all the subjects with the diagnosis of primary depression fell in the impaired range, though it is worth noting that the norms have been established in a younger aged population of older people than that reported here. This finding may imply a need for revision of cut-points for the very old or that depression in the these subjects is associated with considerable cognitive impairment. Although subjects with a diagnosis of organic brain syndrome were more impaired on all subtests of the MEAMS than the depressed patients, the difference reached statistical significance on one subtest, implying a considerable overlap in the degree of cognitive impairment. Further discrimination between the two groups on their performance on the MEAMS was handicapped by the validation of the subtests as dichotomized variables — normal (1) or impaired (0). This method of validation may be too crude to define subtle differences between the groups. However, the lack of a clear difference on psychometric performance in this elderly population with a clinical diagnosis of depression is striking.

The prognosis for depression in this very old group seems poor, with only five subjects showing some improvement at two years. The remainder had died, remained in a chronically depressed state, or had progressed to develop obvious dementia. This poor outlook for elderly patients with depression is in keeping with earlier reported findings (Jacoby *et al.*, 1981; Murphy *et al.*, 1983). An alternative explanation would be that some of the subjects in the present study who were classed as depressed by the diagnostic schemata were, in fact, in an early stage of dementia. It might be that the five subjects, who appearently, improved despite very old age and being in a Part III home were the true depressed group. The number is much smaller than that suggested by the initial clinical categorization.

This article has attempted to make a contribution in a difficult area for research. The strength of conclusions is hampered by small sample size, which in turn is based upon logistic difficulties. No clear support has emerged for a categorical distinction for the current boundaries between organic brain syndrome and depression, although it is not possible to deny that such a distinction should be made. Certainly, it would seem from prognostic data that those regarded as suffering from a depressive illness *per se* represent a small subgroup of elderly subjects with depressive symptoms.

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