The imaging of cerebral blood flow and metabolism using enitimation as a proving tool for the dementia.  
Emission tomography (PET) studies have demonstrated decreases in reduced cerebral glucose metabolism and blood flow in 14 AD.  
Similarly, single photon emission computerized tomography (SPECT) studies have demonstrated decreases in cerebral glucose metabolism and blood flow in 14 AD.  
The abnormal pattern of asymmetry and unilateral perfusion abnormalities in AD has been demonstrated. Several studies have demonstrated that right hemisphere asymmetry of regional cerebral blood flow with PET, 21 22 is a significant feature of AD. Left hemisphere perfusion decreases have been found to be more significant with respect to probability of AD as well as in correlating the dementia severity with cognitively normal individuals and patients with AD. 23-25 Not all studies however have noted these associations. 26-30 The question of the relative importance of asymmetrical and left sided SPECT perfusion abnormalities in AD requires further evaluation and investigation.  
By contrast, the role of computed tomographic (CT) head scanning in positively identifying AD has been limited. CT scanning has therefore been identified as not being a reliable or cost-benefit pathology in dementia patients. However, the positive diagnosis of AD via CT has been limited due to overlap of atrophy rates between cognitively normal individuals and patients with AD. 31-33 Recently, several studies have demonstrated that certain regional CT atrophy measurements may play an important role in the assessment of AD. Measurements of the degree of temporal lobe atrophy in particular have been shown to be both specific and sensitive in the identification of AD. 34-36 De Leon et al. 37 reported a sensitivity of 91% and a specificity of 99% of diagnosing AD as compared to normal controls when using a quantitative medial temporal width measure as an indicator of AD. However, these measurements involve complex methodologies for volumetric measurement or are taken from CT scans obtained in a non-standard manner. They have remained largely relegated to research settings. There have been reports of potential advantages of combining both SPECT and CT information in the identification of AD. In the OPTIMA project 38 SPECT was combined with CT whereas in another study 39 CT was described as more helpful in the recognition of the highly characteristic pattern for AD of atrophy of the medial temporal lobe combined with perfusion defects in the ipsilateral superior temporal gyri regions. These studies reported improved diagnostic levels of sensitivity and specificity over unimodal studies. The combination of regional SPECT and CT information represents a potentially practical diagnostic tool for AD requires further investigation in a large AD clinic population.  
In the present study regional CT and SPECT variables were combined to improve the accuracy of diagnostic tool for AD from ND beyond the ability of each modality alone. The sensitivity and specificity of enitimation SPECT semiquantitative perfusion ratios in identifying AD was compared to the assigned clinical diagnosis of a dementia referral clinic team. Lateralized variables were developed in order to elucidate differences between left and right sided findings in AD. Cortical regions which best distinguished AD from ND patients were utilized for SPECT perfusion ratios and regional CT atrophy measurements were determined.  
Methods  
Subjects: Between March 1990 and July 1992 there were 197 consecutive patients seen at the UBC Clinic for the diagnosis of Alzheimer's Disease and Related Disorders for the evaluation of cognitive symptomatology. Patients diagnosed as "possible AD" (n=64), "probable AD" (n=79), or "not demneted AD" (n=54) according to the NINCDS-ADRD A work group criteria 40 were considered for this study. All patients underwent a detailed medical and neurolological evaluation, a uniform neurophysiological test battery, CT head scan and enitimation SPECT scanning. Laboratory investigations included CBC, ESR, BUN, folate, serology for syphilis, thyroxine levels and liver function studies. Additional lab investigations were obtained as clinically indicated to ensure that there were no additional modifiable/five risk factors. A diagnosis of dementia was assigned according to DSM III-R. 41 Dementia severity was assessed and scored with the revised functional item Attributional Rating Scale (FRS). 42"
Regional HmPAO SPECT and CT Measurements in the Diagnosis of Alzheimer’s Disease

A. Mattman, H. Feldman, B. Forster, D. Li, I. Stazi, B.L. Beattie and M. Schelte

ABSTRACT: Background: This study investigated the hypothesis that the combination of regional CT brain atrophy measurements and semiquantitative SPECT regional blood flow ratios could produce a diagnostic test for Alzheimer’s disease (AD) with an accuracy comparable to that achieved with the present clinical and laboratory standard of the NINCDS-ADRSA criteria. Methods: Single photon emission computed tomography (SPECT) and CT head scans were performed on 122 subjects referred to UBC Alzheimer clinic and diagnosed on the basis of NINCDS-ADRSA criteria. Stepwise discriminant analysis (SDA) was performed on the bilateral SPECT regions of interest and compared to bilateral CT quantitative assessment in the frontal, parietal and temporal lobes to determine which were most accurate at N/D or AD distinction. Receiver operating curves for these variables individually and for their combined discriminant function are presented. Results: The left temporal qualitative cortical atrophy score (CT) and left temporal perfusion ratio (SPECT) were selected in the SDA. The combined discriminant function was more specific at AD/N/D distinction than either of CT or SPECT alone. The accuracy of AD/N/D distinction with the combined discriminant function was not significantly different from that achieved with SPECT or CT alone as defined by ROC curve analysis. Conclusions: Accurate AD/N/D distinction and the measurements were possible even though the sensitivity and specificity to recommend their use as a diagnostic test for AD.

RÉSUMÉ: Scintigraphie régionale au HmPAO et mesures par CT scan dans le diagnostic de la maladie d’Alzheimer. Introduction et objectifs: Dans cette étude nous avons évalué l’adjonction de la mesure de l’atrophie cérébrale régionale par CT scan et de rapports de débits sanguins régionaux mesurés par SPECT pouvait constituer un test diagnostique de la maladie d’Alzheimer (MA) d’une précision comparable à celle des critères de l’étude de réf. actuelle, le NINCDS-ADRSA. Méthodes: Deux cent douze patients étaient inclus à la clinique de Alzheimer de l’Université de Colombie-Britannique soit en raison de scintigraphie cérébrale par CT scan et soit en raison de scintigraphie cérébrale par SPECT et soit en raison de critères de NINCDS-ADRSA. Nous avons effectué une analyse factorielle discriminante pour les mesures de CT scan et avons examiné l’efficacité de l’association entre les mesures de CT scan et celles de SPECT pour prévoir l’existence de MA. Résultats: La combinaison quantitative de l’atrophie lobe cérébral gauche et du coefficient de perfusion lobe temporal gauche (SPECT) a été sélectionnés par l’AD. La fonction discriminante conduisit à un diagnostic de MA avec un niveau de confiance de plus de 70% en utilisant la fonction discriminante brute. Conclusions: Les mesures de l’atrophie cérébrale et du coefficient de perfusion ont un potentiel pratique pour diagnostiquer la MA et pour le diagnostic différentiel de cette maladie par le diagnostic clinique sur les critères du NINCDS-ADRSA.

The imaging of cerebral blood flow and metabolism using emission tomography has been a powerful investigative tool for the dementia. Emission tomography (PET) studies have demonstrated patterns of regional decreased cerebral glucose metabolism and blood flow in AD. Similarly, single photon emission computed tomography (SPECT) studies in AD using the radiolabeled 99mTc HmPAO have demonstrated characteristic regional patterns of decreased cerebral blood flow.2,9 The abnormal pattern of SPECT regional blood flow ratios and ratio of SPECT to PET studies has been demonstrated to be highly specific for distinguishing AD from other neurodegenerative disorders such as Parkinson’s disease and Wilson’s disease.18,19 The significance of asymmetrical and unilateral perfusion abnormalities in AD has been observed. Several studies have demonstrated that right hemispheric asymmetry of regional cerebral metabolism with PET13 is a significant feature of AD. Left hemispheric perfusion decreases have been found to be more significant with respect to probability of AD as well as in correlating the dementia severity with the semiquantitative perfusion abnormalities in AD.18,19 Not all the studies however have noted these associations.20,21 The question of the relative importance of asymmetrical and left sided SPECT perfusion abnormalities in AD requires further confirmation and clarification.

By contrast, the role of computed tomographic (CT) head scanning in positively identifying AD has been limited. CT scanning has been found to be insensitive to the detection of atrophic or comorbid pathology in dementia patients. However, the positive diagnosis of AD via CT has been limited due to overlap of atrophy between elderly cognitively normal individuals and patients with AD.22,23 Recently, several studies have demonstrated that certain regional CT atrophy measurements may play an important role in the assessment of AD. Measurements of the degree of temporal lobe atrophy in particular have been shown to be both sensitive and specific in the identification of AD.24,25,26 In a series of 120 patients, De Leo et al.26 reported a sensitivity of 91% and a specificity of 99% of diagnosing AD as compared to normal controls when using a quantitative medial temporal width measure as an indicator of AD. However, these measurements involve complex methodologies for volumetric measurement or are taken from CT scans obtained in a non-standard manner. They have remained largely unreformed to research settings.

There have been reports of potential advantages of combining both SPECT and CT information in the identification of AD. In the OPTIMA project27 SPECT was combined with CT where the assessment was made in the parieto-occipital cortex and the occipital lobes. Highly characteristic patterns of atrophy for AD of the medial temporal lobe combined with perfusion deficits in the isilateral superior temporal parietal regions. These studies reported improved diagnostic levels of sensitivity and specificity over unimodal studies. The combination of regional SPECT and CT information is a potential practical diagnostic tool for AD requires further investigation in a large AD clinic population.

In the present study regional CT and SPECT variables were combined to determine whether there was a diagnostic distinguishing AD from ND beyond the ability of each modality alone. The sensitivity and specificity of HmPAO SPECT semiquantitative perfusion ratios in identifying AD was compared to the assigned clinical diagnosis of a dementia referral clinic team. Lateralized variables were developed in order to elucidate differences between left and right sided findings in AD. Coronal regions which best distinguished AD from ND patients utilizing regional SPECT perfusion ratios and regional CT atrophy measurements were determined.

METHODS

Subjects: Between March 1990 and July 1992 there were197 consecutive patients seen at the UBC Clinic for Alzheimer’s Disease and Related Disorders for the evaluation of cognitive symptoms and memory. Patients diagnosed as “probable AD” (n=64), “possible AD” (n=79), “not demnetic AD” (n=10) and “not demnetic N/D” (n=54) according to the NINCDS-ADRSA work group criteria4 were considered for this study. All patients underwent a detailed medical and neurological evaluation, a uniform neuropsychological test battery including CT head scan and HmPAO SPECT scanning. Laboratory investigations included CBC, ESR, BUN, folate, serology for syphilis, thyroxine, and cholesterol levels were measured. Additional laboratory investigations were obtained as clinically indicated to ensure that there were no additional modifiable / reversible disorders. A diagnosis of dementia was assigned according to DSM III-R.28 Dementia severity was assessed and rated with the minimum functional rating scale (FMS).29,30,31 Patients were diagnosed as “probable AD” (n=79) “possible AD” (n=64), or “not demnetic AD” (n=10) according to NINCDS-ADRSA criteria.4 The ND group included those referred patients who following Clinic assessment were classified as not meeting the criteria for AD or any other dementia. These patients were not assigned a further diagnosis such as AAMI32 or cognitively impaired not demnetic (CIND).33 A diagnosis of “possible AD” was assigned to patients who met criteria for “probable AD” but who had comorbid medical diseases, significant extrapyramidal features, or risk factors for alternative causes of dementia. To guard against the inclusion of vascular dementia patients in the AD group patients with ischemic vascular changes in the CT were removed from the study if the lesions corresponded to regions of hyperperfusion on SPECT. Those patients whose scans for technical reasons were of poor quality (either CT/SPECT or both) were excluded from further analysis. One hundred seventy-six subjects remained in the study after these exclusion criteria were applied (Table 1a). Additionally those patients whose CT head scans could not be obtained for review or whose studies had been performed more than 6 months prior to their clinical assessment, were also excluded, leaving 122 patients who were fully evaluable (Table 1b).

SPECT Methods and Analysis: The HmPAO was supplied as a freeze dried vial of 200-400 µg/ml in 0.78% Perchtetone solution. A dose of 10 - 15 mCi was injected intravenously within 10 minutes of preparation. During injection patients lay in a dark quiet room with a towel over their eyes.

Table 1a: Demographic Data for Patients with SPECT Perfusion Ratios.

<table>
<thead>
<tr>
<th>Total (SD)</th>
<th>ND (SD)</th>
<th>AD (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>176</td>
<td>48</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>69.17±9.7</td>
<td>67.40±9.7</td>
</tr>
<tr>
<td>Sex</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>Mean TFRS</td>
<td>0.58±0.14</td>
<td>0.64±0.17</td>
</tr>
<tr>
<td>(SD = standard deviation)</td>
<td>(&quot;post&quot; = possible AD, &quot;prob&quot; = probable AD)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1b: Demographic Data for Patients with CT Atrophy Measurements.

<table>
<thead>
<tr>
<th>Total (SD)</th>
<th>ND (SD)</th>
<th>AD (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>127</td>
<td>35</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>66.25±9.7</td>
<td>66.11±9.7</td>
</tr>
<tr>
<td>Sex</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Mean TFRS</td>
<td>0.58±0.14</td>
<td>0.64±0.17</td>
</tr>
<tr>
<td>(SD = standard deviation)</td>
<td>(&quot;post&quot; = possible AD, &quot;prob&quot; = probable AD)</td>
<td></td>
</tr>
</tbody>
</table>

Downloaded from https://www.cambridge.org/core. 3rd Party's IP address: 54.70.40.11 on 25 July 2019 at 03:00:14, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. DOI: 10.1017/S0317167100021041
were CORLT and TL (Table 3). The function derived from the linear combination of the CORLT and TL variables (COMB = (0.7899*CORLT) + (0.48785*TL)) produced a jackknife discriminant classification with a sensitivity of 70.6% and a specificity of 75.7% (Table 4).

**RESULTS**

Classification Ability of SPECT: The group of 176 patients with SPECT data were first classified at AD or ND patients on the basis of either a bilateral temporal or bilateral parietal abnormal SPECT perfusion ratio. This method correctly identified clinically diagnosed AD with a sensitivity of 55.9% and a specificity of 75.0% (Table 2). When the criteria for AD SPECT diagnosis were adjusted to include the presence of either a unilateral or bilateral temporal or a unilateral or bilateral parietal abnormal perfusion ratio, the sensitivity increased to 78.9% while specificity decreased to 64.6%. The bilateral perfusion ratios of the frontal, temporal, and parietal lobes were all significantly more asymmetrical in the AD group as compared to the ND group (p<0.01 for all t-tests).

**Identification of Most Relevant SPECT and CT Variables**

SPECT: A stepwise discriminant analysis (SDA) was used to determine which perfusion ratios were most useful in classifying the patients into the AD versus the ND groups. The left temporal (TL) perfusion ratio alone was selected (p<0.05). The jackknife discriminant classification of the TL variable produced a sensitivity of 60.2% with a specificity of 68.5%.

CT: Grading of the CT cortical atrophy of 122 subjects was performed by two independent radiologists (BF, DL). The relationships between the two radiologists were considered adequate (kappa = 0.70 and 0.89). Subsequent CT data analysis was performed using the data from the first radiologist (BF).

SDA revealed that left temporal cortical atrophy (CORLT) was the most important SPECT CT variable in distinguishing AD from ND patients (p<0.05). None of the linear measures of central atrophy were selected in the analysis. The jackknife discriminant classification of the CORLT variable produced a sensitivity of 91.8% with a specificity of 48.6% (N=122).

**DISCUSSION**

The clinical criteria of the NINCDS-ADRDA have been previously validated to have a diagnostic sensitivity of 80-100% with specificity 73-100%. In applying these clinical diagnostic criteria as the "gold standard" in the present study only 53.9% of AD subjects had the described characteristic bilateral temporal or bilateral parietal SPECT perfusion defects of AD. The diagnostic sensitivity of bilateral defects for AD would clearly be quite low and of limited practical diagnostic utility. An additional 25.0% had either a unilateral temporal or unilateral parietal perfusion defect improving the diagnostic sensitivity to 78.9% while having an associated decrease in specificity to 64.6% from 75.9%.

These diagnostic sensitivity values for regional CBF are consistent with some prior reports. A prospective study of over 100 patients with complaints of memory or cognitive impairment...
RESULTS

Classification Ability of SPECT: The group of 176 patients with SPECT data were first classified at AD or ND patients on the basis of either bilateral temporal or bilateral parietal abnormal SPECT perfusion patterns. This method correctly identified clinically diagnosed AD with a sensitivity of 55.9% and a specificity of 75.0% (Table 2). When the criteria for AD SPECT diagnosis were adjusted to include the presence of either unilateral or bilateral temporal or unilateral or bilateral parietal abnormal perfusion pattern, the sensitivity increased to 78.9% while specificity decreased to 64.6%. The bilateral perfusion ratios of the frontal, temporal, and parietal lobes were all significantly more asymmetrical in the AD group as compared to the ND group (p<0.01 for all tests).

Table 2: Prevalence of SPECT Perfusion Abnormalities by Group.

<table>
<thead>
<tr>
<th>AD (25)</th>
<th>ND (48)</th>
<th>NPV</th>
<th>PPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral T/P</td>
<td>69 (53.9%)</td>
<td>12 (25.0%)</td>
<td>95.2%</td>
</tr>
<tr>
<td>Unilateral T/P</td>
<td>70 (78.9%)</td>
<td>17 (35.4%)</td>
<td>85.6%</td>
</tr>
</tbody>
</table>

CT Analysis: Non-contrast axial cranial CT scans were performed on all subjects in the study. The scan angle was parallel to the orbital axial line on the 122 CT scans that were available for review (Table 1b) and analysis, 93 were done at the University Hospital with a Siemens DR-H whole body scanner. Contiguous scan sections were taken from skull base to vertex. The remaining CT scans were taken at outside hospitals and the slice thickness varied from 3mm to 10mm. Twelve different measures of atrophy were taken from each scan including several linear ratio measures of central atrophy and six qualitative measures of cortical atrophy.

Linear Ratios: These linear ratios were calculated for each hemisphere of the brain. These ratios are variations of well-known measures described in the literature which have been shown to be significantly different in AD compared to normal controls. The suprarenal cistern width ratios (LW/K) were used as measures of left and right temporal atrophy. The anterior horn ratios (AHR) were used as measures of left and right frontal lobe atrophy. The superciliary cistern width ratios (LV/WK) were used as measures of left and right parietal lobe atrophy.

Qualitative Measures: Subjective estimates of cortical atrophy were made in the four lobes and parietal lobes bilaterally. Atrophy in each region was graded on a score of 0-3. A reference scan for each grade of atrophy was provided to the reviewing radiologist. Two radiologists assessed each CT scan independently of one another and were blinded to all information from the SPECT scans as well as clinical information other than the age of the patient.

Statistical Analysis: Analysis of data included discriminant classification receiver operating curve (ROC) analysis, paired t-tests, and Steiger’s test for comparing two correlated correlation coefficients.

Severity: The six SPECT perfusion ratios each had a significant negative correlation with the total FRS score (p<0.05) (Table 5). The left sided temporal, frontal and parietal ratios each had negative correlations of magnitudes larger than the corresponding right sided values; however, the relative magnitudes of the corresponding left and right sided correlation coefficients were not significantly different (Steiger’s test p>0.1 for temporal lobe).

Table 5: Correlations between SPECT ROI and Total FRS score in AD.

<table>
<thead>
<tr>
<th>ROI</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal</td>
<td>-0.431</td>
<td>-0.167</td>
</tr>
<tr>
<td>Parietal</td>
<td>-0.379</td>
<td>-0.266</td>
</tr>
<tr>
<td>Frontal</td>
<td>-0.341</td>
<td>-0.240</td>
</tr>
</tbody>
</table>

Discussion

SPECT: The clinical criteria of the NINCDS-ADRDA have been previously validated to have a diagnostic sensitivity of 80-100% with specificity 73-100%. In applying these clinical diagnostic criteria as the “gold standard” in the present study only 53.9% of AD subjects had the described characteristic bilateral temporal or bilateral parietal SPECT perfusion defects of AD. The diagnostic sensitivity of bilateral defects for AD would clearly be low and of limited diagnostic value. An additional 25% had either unilateral temporal or unilateral parietal perfusion defect improving the diagnostic sensitivity to 78.9% while having an associated decrease in specificity to 64.6%. These diagnostic sensitivity values for regional CBF are consistent with some prior reports.42,57,58 A prospective study of over 100 patients with complaints of memory or cognitive

Figure 1: ROC Curves.
The specificity values obtained in the present study are lower than values obtained in other SPECT studies where a specificity of about 80% could be anticipated for a comparable level of lesion detection.23,24,25,26,27,28,29 The discrepancy in specificity results could be partly attributable to the control group chosen for this study. The present study was designed to determine if SPECT could be used to distinguish individuals clinically diagnosed as AD from those who were not deemed according to formal research criteria. The ND group referred for the assessment of neuropsychological symptoms included individuals without objective cognitive deficits, with cognitive deficits not predicting of developing AD20,21 as well as those in the incident stages of AD short of meeting clinical criteria.22,23,24,25,26,27,28,29 The AD group included patients who were not diagnosed as AD at the time of the control clinic were found to have been clinically diagnosed as AD in this study, the left lateral temporal variable were found to be of greater interest in distinguishing AD from ND subjects. The perfusion ratios of the temporal, parietal and frontal lobes were all found to be significantly more asymmetrical in the AD patients as compared with the ND patients. Additionally, the left temporal perfusion ratios had a numerically larger correlation with the severity of dementia (as measured by total FRS scores) than did the corresponding right lateral ratios though this relationship was not statistically significant. The ratings of the AD patients were more severe for both the frontal and parietal lobes. These results suggest the possibility that the left hemisphere is affected more severely and as a consequence the right hemisphere in AD as well as in the cognitive disease effects.

CONCLUSIONS

1) The most useful SPECT and CT variables in the identification of AD were the temporal perfusion ratios and the temporal cortical atrophy scores respectively. The left hemispheric derived variables were potentially more indicative of the presence of AD than the right hemispheric variables.20,21

2) SPECT and CT variables complement each other as diagnostic aids in AD. Specifically, the combination of SPECT and CT SPECT information provides a more specific identifier of AD than either modality alone. However, the overlap between the two modalities in AD appears to be too large to justify the routine use of both for diagnostic purposes.22,23

SPECT and CT Combined: The combination of CT (CORL) and SPECT (LTL) data performed better in accurately classifying subjects as AD or ND than did the perfusion ratios or the quantitative CT measures. CORL was the most useful CT variable while TL was the most useful SPECT variable with a diagnostic sensitivity of 83% and a diagnostic specificity of 78% previously reported. The CORL variable had a greater diagnostic sensitivity than the diagnostic specificity but its specificity for AD was very limited. The TL perfusion ratio better specified CORL but was far less sensitive.

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improvement Holman et al. noted that 65% of AD patients had bilateral posterior association cortex defects and a further 15-20% had unilateral defects. The group had a mean difference of 2.5 mm in the COMIT CT, which is considered to be a significant difference in the clinical setting.

The specificity values obtained in the present study are lower than those obtained in other studies, which may be due to the small sample size and the specific population studied. The sensitivity values are comparable to those reported in previous studies.

The use of CT scans in the diagnosis of Alzheimer's disease is currently under debate. Some studies have shown that CT scans can be useful in the early detection of the disease, while others have found that they are not accurate enough to be used as a diagnostic tool alone. Further research is needed to determine the role of CT scans in the diagnosis of Alzheimer's disease.

REFERENCES
Frontal Behavioral Inventory: Diagnostic Criteria for Frontal Lobe Dementia

Andrew Kertesz, Wilda Davidson and Hannah Fox

ABSTRACT: Objective: To utilize the diagnostic criteria of frontal lobe dementia (FLD). Methods: We studied 12 patients with FLD diagnosed clinically, with radiological confirmation in 10 and autopsy confirmation in 2, sixteen patients with Alzheimer’s disease matched for stage and severity to FLD and 11 patients with depressive dementia were used as control groups. A 24-item Frontal Behavioral Inventory (FBI) using the most relevant behavioral manifestations of FLD was administered in these populations. Results: FLD patient scores on the FBI were much higher compared with control groups (AD and DD). Item analysis showed loss of insight, indifference, distractability, personal neglect and apathy as the most frequent negative symptoms. Perserveration, disinhibition, inappropriate aggressiveness, impulsivity, and irresponsibility were the most significant positive symptoms. An operational definition of FLD included a minimum FBI score of 27. Only one false positive was shown in the depressive group and none among the AD group, indicating little overlap between patient groups, and a high discriminating value of the FBI. Conclusions: The FBI appears to be a useful diagnostic instrument and a method to operate the behavioral criteria of FLD. Further prospective studies are warranted to establish validity.

RéSUMÉ: Évaluation du comportement frontal: Critères diagnostiques de la démence frontale. Objectif: De rendre opérationnels les critères diagnostiques de la démence frontale (DF). Méthodes: Nous avons étudié 12 patients atteints de DF diagnostiquée cliniquement, avec confirmation radiologique du diagnostic chez 10 et autopsie chez 2; 16 patients atteints de la maladie d’Alzheimer (MA) ayant pour la stade et la sévérité de la DF et 11 patients atteints d’une démence dépressive (DD) ont servi de contrôles. Une grille d'évaluation du comportement frontal (CEP) comportant 24 items ciblent les manifestations comportementales les plus pertinentes à la DF a été administrée à ces patients. Résultats: Les scores des patients atteints de DF à l’ECF étaient beaucoup plus élevés comparés à ceux des groupes contrôles (MA et DD). L’analyse par item a montré une perte de la conscience, de l’indifférence, de la distractibilité, et de la négligence de leur personne et de l’apathie comme symptômes les plus fréquents. La persévérance, la disinhibition, l’inappropriété, l’impulsivité et l’irresponsabilité étaient les symptômes positifs les plus significatifs. Une définition opérationnelle de la DF inclut un score minimum de 27 à l’ECF. On a constaté un seul faux positif dans le groupe DD et aucun dans le groupe MA, ce qui indique qu’il y a peu de chevauchement entre les groupes de patients et que la valeur discriminative de l’ECF est élevée. Conclusions: L’ECF semble être un outil diagnostique utile et une méthode pour rendre opérationnels les critères comportementaux de la DF. Des études prospectives sont justifiées pour en établir la validité.


Frontal lobe dementia (FLD) has been distinguished from Alzheimer’s disease (AD) by clinical, neuropsychological, and pathological features.2 The clinical features of FLD resemble closely those of Pick’s disease and often overlap with reported cases of primary progressive aphasia (PPA).3 In addition, the association of these conditions with motor neuron disease4 and the similarity of pathology in corticobasal ganglionic degeneration (CeBGD)5 suggested a biological relationship between these entities we called “Pick complex.”

The clinical diagnosis of FLD depends on the prominence of personality changes and behavioral alterations that are characteristic of the frontal lobe syndrome. A consensus has been achieved by the Land and Manchester groups6 concerning the main features of what they began to call frontotemporal dementia (FTD). The core diagnostic features of PTD were listed as early loss of personal hygiene, social awareness, disinhibition, mental rigidity and inflexibility, hyperorality, perseverative behavior, utilization behavior, distractibility, and loss of insight. Affective symptoms were: indifference, remoteness, inertia, and aspontaneity. Reduction of speech, and finally mutism, was also considered common. In addition, preserved spatial function and the absence of severe amnesia were notable. The consensus criteria also included neuropsychological and neuromaging features.