Original Research Paper

Comparison in cognitive function in alzheimer's disease and vascular dementia: Contributions to the differential diagnosis

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INTRODUCTION

Demential syndromes are characterized by the presence of deficit progressive cognitive function. Vascular dementia (VD) is the most prevalent between secondary dementias, ranking second among all dementia after Alzheimer’s disease (AD). The aim of this study was to evaluate the cognitive aspects of elderly patients with diagnoses of AD and VD. Participants were 256 elderly patients with mean age of 78 years and both sexes who received a diagnosis of Alzheimer’s disease by the Diagnostic Statistic Manual (DSM-IV) and National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA). The diagnosis of vascular dementia was done according to National Institute of Neurological Disorders and Stroke (NINDS) and the Association Internationale pour la Recherche et l'Enseignement en Neurosciences (NINCDS-AIREN). The results showed that the prevalence of AD was superior to VD, mean age increases the ratio DA / VD, with women and people with lower education levels most affected. VD and AD patients have had similar cognitive abilities and VD patients exhibit more temporal orientation impairments than AD.

Key Words: Neuropsychological assessment, vascular dementia, alzheimer disease, cognition
diagnosis (Galluci et al., 2005).

Besides, it is suggested that psychometric testing can also help to support the VD diagnosis by means of the history of cognitive decline (Ballard et al., 2004; Hall et al., 2000; Jorm et al., 1989; Tatsch et al., 2006). In China, around 30% of people develop post-stroke cognitive impairment instead the prevalence of vascular cognitive impairment that affects all cognitive domains is greater than for other kinds of vascular accidents. In India, AD patients have more hallucinations and affective disorders than VD patients and cognitive performance is associated with higher rates of depression in Yoruba (Baijewu et al., 2007; Pinto et al., 2006). Despite cognitive aspects have been studied in AD and VD, few researches focused on cognitive aspects that differ these disorders. So for further elucidation of the subject, this study aims to assess the cognitive aspects of elderly patients with diagnoses of AD and VD.

**METHODOLOGY**

**Participants**

Cross-sectional study enrolled 256 elderly patients with both genders who received Alzheimer’s disease diagnosis by DSM-IV (APA, 1994) and the NINCDS-ADRDA (McKhann et al., 2011). Vascular dementia diagnosis was based on NINDS-AIREN (Roman et al., 1993) criteria. Participants are patients of an Institute of Geriatrics and Gerontology of a particular clinic in a city of the São Paulo State. As exclusion criteria in addition to the GDS (Yesavage et al., 1983) score above 8 points, patients under 60 years old, illiterate, schooling over 9 years with severe visual and motor impairment, diagnosis of Parkinson’s disease and elderly who refused to join the research were also excluded. Ethics procedures were also attained (approval number 54/11; Jundiaí Medical School). It was verified an average age equal to 78.01 years (minimum = 60, maximum = 98, standard deviation [SD] = 6.19). We also observed a large number of female participants, 76.6% corresponding to 196 women and 198 (77.30%) participants had education between 1-4 years. Of 256 participants, 210 (82%) had a diagnosis of AD and 46 (18%) diagnosed with VD.

Patients were not submitted to any neuroimaging technique and considering educational level as a factor that affect cognitive performance in demential disorders, we choose to not select individuals with greater educational level as this could affect results (Cecato et al., 2014; Montiel et al., 2013).

The average age of the group with a diagnosis of AD was equal to 78.40 (minimum = 62, maximum = 98, SD = 6.19), and 172 (81.9%) females, 162 (77.10%) with schooling 1-4 years and only 48 (22.90%) with 5-8 years of study. The group diagnosed with VD presented similar average age when compared to the AD group (mean = 76.26; minimum = 60, max = 89, SD = 5.94) (p=0.540). Another interesting fact is that in the VD group the percentage of male participants is very close to female, ie, with 22 men (47.80%) and 24 women (52.20%). Regarding schooling, so as in the AD group, the VD group also present similarities with 36 respondents (78.30%) with 1-4 years of study, and 10 participants (21.70 %) between 5-8 years of study.

**Instruments and procedures**

Patients have undergone clinical history and cognitive assessment by means of Mini-Mental State Examination (MMSE) (Folstein et al., 1975) and Verbal Fluency (VF) version animals, fruits and words with the letter “M” (Brucki et al., 2003). To exclude the possibility of depressive disorder, the Geriatric Depression Scale (GDS) short with 15 items was collected and patients who scored above 8 points on this scale were not included in the survey. The degree of impairment in activities of daily living was assessed using the Functional Activities Questionnaire of Pfeffer (PFAQ) (Pfeffer et al., 1982). All the analyzes were done in the SPSS version 15.0 statistical program. According to the sample, descriptive analyzes were made regarding age, gender and education (1-4 years and 5-8 years). Diagnostic groups (AD and VD) were analyzed according to the Mann-Whitney test, with a significance level of 5% (p >.05) because all measures were not normally distributed in the sample.

**RESULTS AND DISCUSSION**

The Mann-Whitney analyzes to the comparison between AD and VD group showed no statistically significant differences between the MMSE score (p = 0.158), FV animals (p = 0.543), FV fruit (p = 0.492) and FV words with the letter “M” (p = 0.696), as shown in Table 1. We also analyzed the MMSE screening test, and ascertain that only the temporal direction (p = 0.010) was able to distinguish between the two diagnostic groups (Table 2).

Both the AD and VD groups presented cognitive impairment. We must be attentive to the clinical particularities that differentiate them. In meta-analysis, the most frequently events found in VD compared to AD are the following: deterioration in "steps", fluctuating course, history of hypertension or cerebrovascular accident (CVA), and the presence of focal neurological deficits (Moroney et al., 1997). Like in our study, there was a prevalence of AD (82%) vs VD (18%) in the study of Lopes et al. (2002) that, after survey in different world regions, identified that AD was more prevalent than VD in all regions surveyed, highlighting south America region (Brazil), which presented 2-3 times higher AD prevalence than other regions.

Psychometric tests are recommend to be included in VD assessment as a way to help distinguish points for
Table 1. Values of the MEEM test, verbal fluency, animals, fruits and words with the letter "M" between the diagnostic groups. \( p = \text{Mann-Whitney} \)

<table>
<thead>
<tr>
<th>Test</th>
<th>AD Mean Rank</th>
<th>VD Mean Rank</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>18.54</td>
<td>19.63</td>
<td>0.158</td>
</tr>
<tr>
<td>VF animals</td>
<td>8.05</td>
<td>8.32</td>
<td>0.543</td>
</tr>
<tr>
<td>VF fruits</td>
<td>7.25</td>
<td>7.82</td>
<td>0.492</td>
</tr>
<tr>
<td>VF &quot;M&quot;</td>
<td>5.22</td>
<td>4.91</td>
<td>0.696</td>
</tr>
</tbody>
</table>

Table 2. Values of sub MEEM between diagnostic groups. \( p = \text{Mann-Whitney} \)

<table>
<thead>
<tr>
<th>Test</th>
<th>AD Mean Rank</th>
<th>VD Mean Rank</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>OE</td>
<td>3.87</td>
<td>4.09</td>
<td>0.151</td>
</tr>
<tr>
<td>OT</td>
<td>2.36</td>
<td>3.09</td>
<td>0.010</td>
</tr>
<tr>
<td>Memory immediate</td>
<td>2.85</td>
<td>2.87</td>
<td>0.658</td>
</tr>
<tr>
<td>Subtraction of &quot;7&quot;</td>
<td>1.68</td>
<td>1.80</td>
<td>0.615</td>
</tr>
<tr>
<td>Memory Evocation</td>
<td>0.50</td>
<td>0.63</td>
<td>0.508</td>
</tr>
<tr>
<td>Nomination</td>
<td>1.98</td>
<td>2.00</td>
<td>0.346</td>
</tr>
<tr>
<td>Repetition</td>
<td>0.89</td>
<td>0.85</td>
<td>0.476</td>
</tr>
<tr>
<td>Control</td>
<td>2.51</td>
<td>2.54</td>
<td>0.321</td>
</tr>
<tr>
<td>Read sentence</td>
<td>0.95</td>
<td>0.91</td>
<td>0.289</td>
</tr>
<tr>
<td>Write phrase</td>
<td>0.66</td>
<td>0.57</td>
<td>0.240</td>
</tr>
<tr>
<td>Pentagon</td>
<td>0.29</td>
<td>0.33</td>
<td>0.587</td>
</tr>
</tbody>
</table>

Interventions. MMSE and verbal fluency tests are screening instruments and, despite useful in differentiating AD (Cecato et al., 2014; Montiel et al., 2013) from Mild Cognitive Impairment and Normal elderly, may not differentiate other clinical disorders such as VD with exception of temporal orientation that was useful in VD discrimination. Hence, similar executive functions impairments can be found among this two disorders and this study shows that even with screening instruments, cognitive impairments in VD can be detected and help differentiate from AD. Nevertheless, new studies can investigate specific functions with other measures that yields wider variance in each cognitive domain as Montreal Cognitive Assessment (MoCA) or CAMCOG.

Also, the NINCDS-AIREN criteria for VD is not the best for this diagnosis as the American Heart Association / American Stroke Association published revised criteria for VD that does not require memory impairments. The classification of patients based on such impairments can also influence the found results, once it mixes and confound diagnostic (as AD is based on memory impairments). Nevertheless, even with this problem, temporal orientation still distinguishes both groups. Besides, memory is not the most important domain in cognitive functions and, despite may have produced bias, should not affect the results too much. Such an influence call for further research also.

The use of MMSE and verbal fluency tests are well established to assist in guiding the diagnosis of dementia. Your application is simple, fast and self-explanatory. Determines the extent of cognitive assessment in subjects with moderate and severe dementia. It consists of several questions characteristically grouped into seven categories, each with the purpose of evaluating specific cognitive functions such as orientation, retention and data record, attention and calculation, memory and language. Although, do not replace a clinical assessment and is very sensitive evaluation to detect subtle variations in cognition, the MMSE is widely used by health professionals. Among the most commonly used clinical criteria for diagnosis include memory impairment and at least one other disorder such as apraxia, agnosia and aphasia. Such decline interfering with activities of daily living and individual autonomy (Abreu et al., 2005).

Gender variable shows a predominance of the number of dementia cases among women in 75% of studies reviewed by Lopes et al. (2002), which is mainly due to the distribution of Alzheimer's disease cases in both sexes. Our study also had a higher percentage of women with dementia, but only on VD the amount of men and women was similar. Schooling is one of the most consistently described as associated with MMSE scores, described in several studies (Crum et al., 1993; Herrera et al., 1998). The results of the work of Valle et al (2009) are also consistent with these findings, since they found a strong association.
between poor education and lower MMSE scores. These studies confirm our findings in 77.3% of participants had schooling up to 4 years.

The average age of our patients was high in both the AD (78.4) and in VD patients (76.26). In the study by Herrera et al. (1998) the percentage of patients with AD increases as the average age rises, going from 0.3% in the elderly 65 to 69 reaching 30.6% in patients of 85 years or more. Like our study, where the average age of the VD was slightly less than the average age of the AD, form et al. (1987) and Hebert et. al. (1998) also observed an accentuation of the relation AD / VD in centenarians, indicating a greater influence of age on the AD cases compared with the VD frames.

Our data suggest that both the AD and VD patients evidenced cognitive impairment, without statistically significant difference between them except for the reduction of temporal orientation which was more pronounced in AD. Other studies show that VD patients have less cognitive impairment compared with patients with AD (Galluci et al., 2005; Sudo et al, 2013). Patients with AD have poor performance in tasks involving appointment, verbal fluency and correct use of sentences and vocabulary, all these used to form semantic memory, better defined as a mental representation of words, significance of objects and actions for long-term memory. Thus, actions to perform activities of daily life would be compromised, either by neglect or by deficits in the very concept of action itself (Rezende et al, 2013; Roman et al, 1993).

It’s interesting to note that in this study, the same cognitive aspects were impaired in both samples (AD and VD), contrarily to the mentioned studies. Hence, similar cognitive declines can be observed in both Demential frames and only temporal orientation is more impaired in VD patients, suggesting a direction to screening for the differential diagnosis between these diseases. Most of studies in literature focused on motor aspects that can distinguish VD from other clinical disorders because of its better accuracy in do so and few researches investigated cognitive aspects. In this sense, the present research suggests that almost the same cognitive impairments can be observed in both cases and temporal orientation is the one that most differ (Kalaria et al., 2008; Plassman et al., 2008).

All other researches were performed in other countries and cultural effects can be an possible explanation to differences in cognitive aspects differing these two disorders. Then, cultural differences in disorders expression can be better explored in further research, once in Brazil, cognitive aspects are similar independently of schooling years, what can also affect results (APA, 1994; Yesavage et al., 1983; Lopes et al., 2002).

According to the mean scores in MMSE, severity of dementia of both groups might be considered moderate, which might also have influenced the results, since moderate AD patients might exhibit global cognitive impairment. If the sample included milder dementia patients, differences between groups might have been more evident – and maybe this is another aspect of the study that should be commented. These are limitations of this study and must be considered for further research.

**Final considers**

Seniors with higher mean age are more likely to be demented. The prevalence of AD was superior to VD, and higher average age increases the ratio AD / VD. Importantly, both AD as VD compromise cognition, performing daily activities and quality of life of the individual as well as their family. The temporal orientation seemed to differentiate vascular dementia from Alzheimer’s and new research on this topic should be made. Other researchers as Sudo et al. (2013) have found executive functions impairment in vascular MCI including temporal orientation. Considering that MCI can turns into AD, further studies could analyze if temporal orientation in vascular MCI would predict progression to AD.

Also, the most common measure that differentiates AD and VD is trail, suggesting that praxis, cognitive flexibility and visual tracking are useful within this aspect. Nevertheless, this research shows that other measures such as temporal orientation can also be included in a test battery to help differentiate AD and VD.

**REFERENCES**


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