Original article

Demonstration of a lexical access deficit in relapsing-remitting and secondary progressive forms of multiple sclerosis

Démonstration d’un défaut d’accès lexical dans les formes rémittente et secondairement progressive de la sclérose en plaques

H. Joly *, M. Cohen, C. Lebrun
Service neurologie, hôpital Pasteur, CHU de Nice, 30, voie Romaine, 06001 Nice cedex1, France

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ABSTRACT

The commonly used test to evaluate naming ability in multiple sclerosis (MS) is the Boston Naming Test (BNT). In previous studies the BNP has not shown any specific deficit in MS patients. The BNT score is obtained by adding spontaneously correct answers to correct answers obtained after semantic and phonological clues are given. Our hypothesis was that due to a lexical access deficit based on executive dysfunction, MS patients would need more clues than control subjects to normalize their performances. Fifteen relapsing-remitting (RR) and 17 secondary progressive (SP) MS patients, and 32 controls matched for sex, age, and educational level, took the BNT. The 32 MS patients also took the BCCog (Short French battery used in MS to evaluate cognitive functions) in order to evaluate their executive functions. MS patients needed significantly more clues than matched controls to normalize their performances (P < 0.001). This lexical access deficit was more frequent in the SP than in the RR group (P < 0.05). A lexical access deficit inducing a denomination problem has thus been shown in MS patients. Further research should aim to better evaluate the executive functions of patients with a lexical access deficit.

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RÉSUMÉ

Le test classiquement utilisé pour évaluer les capacités de dénomination dans la sclérose en plaques (SEP) est le test Boston Naming (BNT). Les études précédentes ne montrent pas de trouble particulier avec ce test. Le score est calculé grâce au total de réponses correctes spontanées additionné au nombre de réponses obtenues suite à l’apport d’un indice (sémantique puis phonologique). Nous formulons l’hypothèse que les patients atteints de SEP aient besoin de plus d’indices que des sujets normaux afin de normaliser leurs...
1. Introduction

Literature data tends to indicate the absence of language deficits in multiple sclerosis (MS). Indeed, multicenter studies do not show language deficits [1], except for the rare cases of real phasic disorders in relation to left hemisphere brain damage [2,3], and verbal fluency abilities evaluated through phonemic and semantic fluency tasks in different forms of MS [4–6]. As a result, when patients formulate a complaint of naming issues, it is often attributed to fatigue and attention problems. The test generally used in order to evaluate naming in MS studies is the Boston Naming Test [7]. The score of the test is the total of spontaneous correct answers plus the answers obtained after clues are given, first semantic, then phonological clues. This aggregate score can easily mask difficulties in lexical access. In clinical observations of MS, patients often complain about naming problems. Sepulcre showed a lexical access deficit in MS through verbal fluency performances, and an improvement of naming at the BNT after cuing in both control and MS groups [8]. We formulate the hypothesis that MS patients would need more clues than normal subjects in order to normalise their performance in naming. In terms of cognitive processes, the mechanism to access the word seems to involve executive functions of active memory search. Executive dysfunctions have been described in MS; not only in secondary progressive form (SP), but also in relapsing-remitting form (RR) [9,10]. It has also been shown, that they appear at the early stages of the disease [11,12]. These dysfunctions become more important as the form evolves [13]. We expected a lexical access deficit to correlate with executive dysfunctions in MS patients. As cognitive and executive dysfunction is shown to increase as the form of MS evolves, the access deficit should be more severe in SP than in RR forms. This study aims to evaluate whether an access deficit is detected in MS.

2. Patients and methods

Three groups were prospectively recruited and evaluated. The evaluation was proposed when a cognitive complaint was detected during the clinical examination to patients, which did not have a change in disease modifying and psychotropic treatments for at least three months. The characteristics of the groups are described in Table 1. The first group included 15 RR-MS patients (12 women, 3 men), mean age 40 (22–63), duration of the disease: 138 months (6–300), mean education level 12.4 years (6–17), and median EDSS score of 2 (0–3.5). The second group was made up of 17 MS patients with the SP form (8 women, 9 men), mean age 53 (35–80), duration of the disease: 243 months (84–612), mean education level 10.4 years (5–18), and median EDSS score 6 (3–8). The third group included 32 control subjects matched with MS patients with a mean age of 45 (14 women, 8 men), and mean education level of 11.5 (5–18). Each patient of MS groups was paired to a control subject with identical sex and study level, age equivalent between plus or minus 5 years. The patients performed the BNT and the BCCog (French version of the Brief Repeatable Battery of Neuropsychological Test used in MS to evaluate cognitive functions) [14,15]. The control group only performed the BNT. In this test, subjects had to name images shown to them.

<table>
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<th>Table 1 – Characteristics of the 3 groups: patients with relapsing-remitting MS (RR), patients with secondary progressive MS (SP), total patients with multiple sclerosis (MS), and controls subjects matched to MS patients (C).</th>
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When they did not name an image spontaneously, first a semantic, then a phonological clue was given. Executive functions in MS were considered impaired when 2 or more scores were pathological in tests considered as executive in the BCCog: the reverse span, PASAT 3 sec, Contrary orders (sensitivity to interference) and Go-no Go (inhibitory control).

3. Results

Several analyses of variance (ANOVA) were conducted on the neuropsychological measures to determine between groups differences (MS versus Control, RR versus SP). As expected, based on previous studies the BNT total score was normal in the MS group (53.3/60). In contrast, the score without clues was impaired in the MS group (44.8/60), but not in the control group (51.7/60), and the difference (mean difference = −6.9; SD = 2) was highly significant, F(1, 62) = 13.8, P < .001. In fact, MS patients needed more clues in order to normalise their performances than control subjects, (mean difference = 3.12; SD = .99, F(1, 62) = 17.03, P < .0001). The phonological cluing were more useful to MS patients (7.28 number of clues) than the semantic one (1.25 number of clues), P < 0001. The number of semantic paraphasias was equivalent in the MS (2.4) and control groups (1.5), F(1, 62) = 3.72, ns. The number of semantic paraphasias was also equivalent in the MS (.7) and control groups (.5), F(1, 62) = 2.06, ns. Following our hypothesis, the access deficit was more important in the SP group (41.1/60) than in the RR group (48.9/60), F(1, 30) = 8.85, P = .006. Results are illustrated in Fig. 1. Qualitatively, every patient from the RR group normalised their performance after clues were given, while 5 patients from the SP group did not. The EDSS score did not significantly correlate with the without clue score at the BNT (r = −.51, P = .15). The two groups of MS patients (RR and SP) were significantly different based on age, study level, and disease duration, which could potentially explain the difference observed between the groups in naming performances. A multivariate analysis showed that the form of the disease was the only significant predictor of the without clue score at the BNT (beta = −.37, t (60) = −2.17, P = .034) compared to age, study level and disease duration (all P > .05). The score without clues at the BNT did not significantly correlate with the executive dysfunction as evaluated in this study (all P > .05). However, 50% of patients with an access deficit and 100% of those who did not normalise their performance after clues were given had executive dysfunctions.

4. Discussion

A lexical access deficit was observed in the MS groups with RR and SP forms. This deficit was more severe in the SP group than in the RR group. This observation matches the description of more important cognitive deficits in SP than in RR forms [12, 13]. Through a multivariate analysis, it has been shown that among age, study level and disease duration the best and only predictor of lexical access deficit is the form of the disease. As the EDSS score did not correlate significantly with the BNT without clue score the possibility that it impacts on it was not further investigate. The fact that semantic cluing was less efficient than phonological cluing suggested that the difficulty laid not so much in accessing the meaning of images, but rather the lexical form. The number of paraphasia cases was equivalent in the MS group compared to the matched control group. This suggested that the lexical access deficit was not connected to a proper phasic deficit. The relationship between the lexical access deficit and executive dysfunction was not demonstrated in this study. This could be due to the low number of patients, and also to the fact that the tasks used to evaluate executive functions were not specific enough as for the classical tests (Stroop, Wisconsin Card Sorting Test). The study has then few limitations. First the number of patients included is not wide, second there is no evaluation of executive functions in the control group, and third the evaluation of executive functions through the BCCog is not sufficient. Further research should then aim to better evaluate the executive functions of patients with a lexical access deficit. The early detection of a lexical access deficit in MS is even more relevant, because cognitive dysfunction in MS is a factor in the diminution of the quality of life [16, 17], and may also be a predictor of disability outcome several years later [18]. Rehabilitation of executive functions showed some efficiency in MS patients [19]. In conclusion, the language functions of MS patients should be taken in account and qualitatively evaluated in order to offer the patient efficient therapeutic care.

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