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SHORT COMMUNICATION

COMPARISON OF REHABILITATION OUTCOME IN PATIENTS WITH APHASIC AND NON-APHASIC TRAUMATIC BRAIN INJURY

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Objective: **To compare the functional, cognitive and disability status of aphasic and non-aphasic traumatic brain injury patients.**
Design: **A prospective comparative study in which 103 patients with traumatic brain injury participated.**
Subjects: **Fifty-one aphasic and 52 non-aphasic patients with traumatic brain injury.**
Methods: **Functional Independence Measure and Disability Rating Scale were used to determine functional status and disability. Cognitive status was evaluated by the Mini-Mental Status Examination. Aphasic patients were evaluated using the Gülhane Aphasia Test for language disorders.**
Results: **The most frequent type of aphasia was Broca aphasia at 26.49% followed by anomic at 19.6% and trans-cortical motor at 15.6%. Functional Independence Measure, Disability Rating Scale and Mini-Mental Status Examination scores at admission and at discharge showed significant differences in aphasic patients ($p < 0.001$). There were no significant differences in the Functional Independence Measure, Disability Rating Scale and Mini-Mental Status Examination gains between the aphasic and non-aphasic patients ($p > 0.01$).**
Conclusion: **Although aphasia could be accepted as a negative prognostic indicator in patients with traumatic brain injury, we could not detect any difference in functional and cognitive gains between the aphasic and non-aphasic patients.**

Key words: traumatic brain injury, aphasia, rehabilitation.

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INTRODUCTION

Communication disorders, especially aphasia, are common sequelae of traumatic brain injury (TBI), particularly when damage affects specialized areas and/or connections in the dominant hemisphere (1). Epidemiological data on the prevalence of aphasia and related conditions in TBI are scarce (2). The reported frequency of aphasia in the literature varies between 11% and 30% (3, 4). In many cases, aphasia tends to resolve in the first 6 months following TBI (1, 3). Language disorders add psychological and social problems to the existing medical problems of a patient in a rehabilitation programme by affecting the patients' verbal or written communication (4). Aphasia also negatively affects recovery by preventing patients from taking part in rehabilitation programmes (5, 6). Patients with TBI differ from language-impaired patients with other neurological disorders, in that they are typically younger, have lesions that are more diffuse, have a longer recovery period and have academic and vocational re-entry as significant functional goals (1, 7). The aim of this study was to compare the functional, cognitive and disability status of aphasic and non-aphasic patients with TBI.

MATERIAL AND METHODS

Fifty-one aphasic and 52 non-aphasic patients with TBI who were accepted and rehabilitated in our centres were enrolled into the study. The demographic and clinical characteristics of all patients were evaluated. Before the patients were accepted into the study, the non-aphasic patients were evaluated with the Galveston Orientation and Amnesia Test (GOAT) and the aphasic patients were evaluated with a modified multiple-choice format of the GOAT (AGOAT). According to the test results, the patients whose amnesia had resolved were included in the study (8).

Functional outcome and independence were measured using the Functional Independence Measure (FIM™) (9) and disability scores were collected through the Disability Rating Scale (DRS) (10). Cognitive status was evaluated with the Mini-Mental Status Examination (MMSE) (11).

Language evaluation was performed using the Gülhane Aphasia Test (GAT), which was developed and validated for the Turkish population (12). It evaluates fluency of speech, auditory and reading comprehension, oral repetition, object naming and writing (Table I). The same physiatrist applied the FIM™ and DRS and the same psychologist applied the MMSE and GAT on the second day after the patients were hospitalized and 1 day before they were discharged. Descriptive statistics were performed for statistical analysis of date. A p-value less than 0.01 was considered significant.

RESULTS

The difference between the groups with regard to age, gender, aetiology and duration of disease was insignificant (Table II). Duration of coma and post-traumatic amnesia was shorter in non-aphasic patients. These differences were significant. There was a significant difference in the duration of rehabilitation between the aphasic and non-aphasic patients. All of the patients had completed the 5-year period of mandatory basic

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Table I. *Description of Gülhane Aphasia Test*

Variable	Number of items
Fluency	4
How are you?	1
What is your complaint?	1
Where are you now?	1
Tell me what you see in the picture	1
Auditory comprehension	20
Simple orders	9
Questions with "right" or "wrong" type answers	5
Complex orders	6
Reading comprehension	19
Match letters to spoken word	1
Match written word to spoken word	1
Match syllables to spoken word	1
Match number symbol to spoken word	1
Follow the orders written on the card	9
Match written word to picture	6
Oral repetition	19
Object naming	13
Naming the picture	7
Naming the colours	6
Writing	3
Spontaneous	1
Copy	1
Dictation	1

education. No significant difference was found in the level of education between the aphasic and non-aphasic patients when the patients were separated into 2 groups according to those who had received 8 years or more and 9 years or more of education.

The distribution of aphasia types according to the aphasia test scores is presented in Table III. There was no correlation between demographic variables and aphasia type.

The mean values of cognitive and functional test scores in patients with aphasic and non-aphasic TBI are shown in Table IV. The FIM™, DRS and MMSE scores at admission and discharge were significantly different in aphasic patients ($p <$

Table II. *Demographic variables*

	Aphasic ($n=51$) Mean (SD)	Non-aphasic ($n=52$) Mean (SD)	p
Age (years)	28.4 (14.2)	27.6 (13.6)	>0.01
Gender, men/women	39/12	38/14	>0.01
Aetiology			
Motor vehicle accident	27 (52.9%)	26 (50%)	>0.01
Gun shot wounds	18 (35.2%)	17 (32.6%)	
Falls	4 (7.8%)	6 (11.5%)	
Assaults	2 (4%)	3 (5.7%)	
Duration of disease (days)	196.5 (128.6)	198.9 (132.8)	>0.01
Duration of coma (days)	25.8 (31.7)	20.4 (12.8)	<0.001
Duration of PTA (days)	51.2 (14.4)	38.27 (11.8)	<0.001
Duration of rehabilitation (days)	89.6 (45.9)	78.5 (39.3)	<0.001

PTA = post-traumatic amnesia.

Table III. *Distribution of aphasia*

	n (%)
Broca	13 (26.5)
Anomic	10 (19.6)
Transcortical motor	8 (15.7)
Transcortical mixed	5 (9.8)
Conduction	4 (7.8)
Global	4 (7.8)
Dysarthritis	3 (5.9)
Unclassified	3 (5.9)
Wernicke	1 (2.0)

0.001). Patients with aphasia showed higher disability scores and lower functional and cognitive scores. During the rehabilitation period there were no significant differences in the FIM™, DRS and MMSE gains between the aphasic and non-aphasic patients ($p >0.01$). When we evaluated the employability of our patients according to part 8 of the DRS admission scores, 29% of the non-aphasic patients were in the selected jobs, 59% were in a sheltered workshop and 12% were not employed. Of the aphasic patients, 4% were in the selected jobs, 31% were in a sheltered workshop and 65% were not employed. There was a significant difference in favour of the non-aphasic patients between the 2 groups according to employability ($p <0.001$).

DISCUSSION

Aphasia is defined as a defect or loss of the capability of expression by speech, writing or signs, or of comprehending spoken or written language, which develops as the result of any cerebral lesion. The effect of age on recovery from aphasia is controversial. Some studies report that age has no effect on recovery from aphasia, while others suggest a more rapid improvement in younger patients compared with older patients, regardless of the type of the aphasia and extent of the lesion (13, 14). In our study, the mean age was 28.4 years for aphasic patients and 27.6 years for non-aphasic patients. No age differences were found between the aphasic and non-aphasic patients with TBI. Although it is controversial whether the incidence, type and severity of aphasia is related to gender, it is

Table IV. *Cognitive and functional scores*

	Aphasic $n=51$ Mean (SD)	Non-aphasic $n=52$ Mean (SD)	p
FIM™ at admission	45.2 (23.8)	60.2 (17.6)	<0.001
FIM™ at discharge	71.1 (25.4)	84.5 (18.5)	<0.001
DRS at admission	11.4 (7.4)	8.1 (2.4)	<0.001
DRS at discharge	9.1 (3.6)	5.2 (2.3)	<0.001
MMSE at admission	15.2 (7.1)	18.5 (8.4)	<0.001
MMSE at discharge	20.1 (8.2)	22.9 (7.3)	<0.001
FIM™ gains	25.9 (24.5)	24.3 (16.4)	>0.01
DRS gains	−2.3 (5.5)	−2.9 (1.2)	>0.01
MMSE gains	4.9 (6.3)	4.4 (6.0)	>0.01

FIM™ = functional independence measure; DRS = disability rating scale; MMSE = Mini-Mental Status Examination.

widely believed that there is no significant difference between men and women (1). The frequency of aphasia according to gender has been studied and in general, even though it is observed that it develops more frequently in men, there is no consensus of opinion on this subject (14). In our study, 76% of the aphasic patients and 73% of the non-aphasic patients were men. No difference could be determined for gender between the groups. The fact that TBI is observed most frequently in young adult male age groups could be an important factor in not determining a significant difference between the 2 groups with regard to age and gender. Gill et al. (3) reported the distribution of the types of aphasia patients with TBI as 56.4% amnesiac, 20.5% receptive, 10.3% expressive, 7.7% global and 2.6% conduction aphasia. Thomsen (15) reported the amnesia and verbal paraphasia to be the most frequent symptom in 12 patients who became aphasic after a closed head injury. In our study, the most frequent types of aphasia were Broca at 26.49%, anomic at 19.6%, and transcortical motor at 15.68%.

Psychological damage cannot be avoided in the patients with TBI when limitation of communication is added to the anxiety and depression accompanying aphasia. It is believed that this situation prevents the patient from taking part in the rehabilitation programme and functional improvements of aphasic patients are slower and limited. The attention disorders in aphasic patients with left hemispheric lesions are thought to be because of the relationship to the left hemispheric language and attention centres (16). Because depression, anxiety and memory disorders are more frequent in aphasic patients, their daily living activities and social lives are also significantly upset (1, 7). Gill et al. (3) found no correlation between aphasia and locomotor improvement and reported that 72% of non-aphasic patients were independent vs 95% of aphasic patients. In addition to this, they reported that there were no differences in incidences of cognitive and behavioural disorders between the 2 groups and that returning to work was also similar in both groups. Even if the functional status of the aphasic patients at admission is low, their rehabilitation benefits with long-term and comprehensive rehabilitation programmes are no different from other patients (12). The functional and cognitive values of our aphasic patients at admission and discharge were significantly lower than those of the non-aphasic patients, but no difference was determined in the gains obtained from therapy. There was a significant difference between the 2 groups according to employability.

The improvements obtained in the FIM™ and DRS during the rehabilitation period can predict about the patient's long-term disability and participation in the community. Less disability and more participation in the community is related to a higher quality of life (17). In our study, it appears that on discharge from the hospital the non-aphasic patients may have a higher quality of life, because they have fewer disabilities and a higher functional capacity. However, in our study, the average period of illness in both groups was around 6 months. More significant results can be obtained with an evaluation of the quality of life in the longer period (1 year or more) after hospitalization.

It has been reported that patients who start the rehabilitation programme early have a better prognosis related to their motor, perception, speech and other cognitive functions (18). It was determined that patients who applied late for rehabilitation received a rehabilitation programme that was twice as long (19). There was a significant difference between the 2 groups in the rehabilitation period of our patients. The rehabilitation period of the aphasic patients was definitely longer. Although the physical problems in patients with TBI improve faster, the improvement in linguistic function, cognitive and psychological disorders takes longer. Surprising improvements in cognitive function and behaviours of some patients may be observed, even years later.

Although aphasia could be accepted as a negative prognostic indicator for functional and cognitive development in patients with TBI, we could not detect any difference in functional and cognitive gains between aphasic and non-aphasic patients. However, the long rehabilitation period of aphasic patients might increase the cost of the process.

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