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Prevalence of apraxia among patients with a first left hemisphere stroke in rehabilitation centres and nursing homes

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Objective: To investigate the prevalence of apraxia in patients with a first left hemisphere stroke.

Subjects: Left hemisphere stroke patients staying at an inpatient care unit of a rehabilitation centre or nursing home and receiving occupational therapy (n = 600).

Measures: A short questionnaire on general patient characteristics and stroke-related aspects was completed by occupational therapists for every left hemisphere stroke patient they treated. A diagnosis of apraxia or nonapraxia was made in every patient, on the basis of a set of clinical criteria.

Results: The prevalence of apraxia among 492 first left hemisphere stroke patients in rehabilitation centres was 28% (96/338) and in nursing homes 37% (57/154). No relationship was found between the prevalence of apraxia and age, gender or type of stroke (haemorrhage or infarct).

Conclusions: This study shows that approximately one-third of left hemisphere stroke patients has apraxia.

INTRODUCTION

Apraxia is defined as the inability to carry out learned and purposeful activities. This inability cannot be explained by primary motor or sensory impairments, or deficits in motivation, memory or comprehension.^{1,2} Apraxia can lead to severe disabilities in daily living activities.²⁻⁴

Similar to aphasia, apraxia appears to be one of the more frequent impairments after a left hemisphere stroke.^{3,5} However, little is known on the exact prevalence of apraxia. A computerized search in several reference databases (MEDLINE, PSYCHLIT, EMBASE and CINAHL) in combination with intensive reference searching yielded 10 studies.⁵⁻¹⁴ These studies are summarized in Table 1.

[TABLE 1]

The occurrence of apraxia after brain damage was first mentioned by Liepmann in the early twentieth century.⁶ In the late 1960s and throughout the 1980s some studies appeared which focused on neuroanatomical correlates of apraxia, but also addressed the prevalence of apraxia. Eight of the 10 studies listed in Table 1 are from two collaborating Italian research groups (University of Milan^{5,7-9,13} and the University of Modena^{10,11,13,14}). It is unclear to what extent data from these studies concern overlapping patient groups.

From Table 1 it is apparent that in all studies the patient groups were of relatively moderate size, ranging from 40 to 177 patients. Therefore, the reliability of the prevalence estimates is limited. The patients in these studies were mainly recruited at the neurological wards of the university hospitals. In several studies the patient group was partly recruited from an outpatient aphasia/speech unit.^{5,8-10,13} This implies that the patient groups were not unselected: because of a strong association between aphasia and apraxia, the prevalence of apraxia might be overestimated. The most common aetiology in the different studies was stroke (61–100%). In only four studies the patient group consisted exclusively of stroke patients.^{5,9,12,13} In the other seven studies the composition of the patient groups was unclear or heterogeneous.^{6-8,10-12,14} Trauma and tumour are the other aetiologies mentioned.

The studies found in the literature demonstrated that the prevalence of apraxia differs enormously in right and left hemisphere-damaged patients. In left hemisphere brain-damaged patients, the prevalence of apraxia ranged from 28% to 57% (median score 45%). In the six studies that addressed the prevalence of apraxia in right hemisphere brain-damaged patients, the prevalence of apraxia ranged from 0% to 34% (median score 8%). Thus, apraxia seems to be strongly associated with left hemisphere stroke, and only occurs infrequently with right hemisphere stroke.

In conclusion, the number of studies on the prevalence of apraxia is small; several of these studies concerned heterogeneous or selected patient groups, reducing the number of valid studies even more. Therefore, the aim of the present study was to investigate the prevalence of apraxia among patients with a first left hemisphere stroke hospitalized in rehabilitation centres and nursing homes.

METHOD

Study design

The data for this study have been accumulated during the recruitment process of a clinical trial on the effect of strategy training in left hemisphere stroke patients with apraxia. A convenience sample of 48 institutes (14 rehabilitation centres and 34 nursing homes) in the Netherlands participated in the study. In these 48 institutes all patients who (a) were staying at an inpatient department, (b) were referred for occupational therapy, and (c) had a left hemisphere stroke, were screened for the presence of apraxia. Patients with a recurrent stroke were excluded from this study. The period of recruitment was from November 1996 to August 1998.

Assessment

Occupational therapists completed a questionnaire, providing information on the following topics:

1. General patient characteristics: date of birth and gender.
2. Stroke-related aspects: date of stroke and type of stroke (haemorrhage/infarction and first/recurrent).
3. Diagnosis of apraxia (yes/no).

Because there are no standardized tests of apraxia, a clinical diagnosis was used.² The patient was diagnosed as apraxic if (a) the patient showed the inability (or restriction in the ability) to carry out purposeful activities and (b) this inability was not the result of a primary motor or sensory impairment, or a deficit of comprehension or motivation.¹ Patients were diagnosed as apraxic or nonapraxic by their treating medical team. This medical team consisted of the attending physician and occupational therapist; representatives of other disciplines (e.g. a neuropsychologist, physical therapist or speech therapist) could participate in the medical team. The diagnosis of apraxia was based on a combination of observations of daily activities, imitation tasks, and use of object tasks which were part of the standard clinical procedure.

Statistical analysis

The prevalence of apraxia was calculated separately for rehabilitation centres and nursing homes, because there is reason to expect that patients in these two settings differ with regard to specific patient characteristics (e.g. age, gender and rehabilitation prospects). Differences in frequencies were tested by means of a chi-square test. A *t*-test was used to investigate age differences. For all tests the significance level was set to 0.01. Analyses were performed using SPSS-X.

RESULTS

Patients

Over a period of 22 months (November 1996 to August 1998) 600 patients were screened. A total of 108 patients from these 600 were excluded because they had a recurrent stroke. In these cases it was unclear if the apraxia resulted from the first or a recurrent stroke. Table 2 summarizes the general characteristics of the remaining patients with a first left hemisphere stroke ($n = 492$). Approximately two-thirds of the population was recruited from rehabilitation centres ($n = 338$) and approximately one-third from nursing homes ($n = 154$). As can be seen in Table 2 the composition of these two patient groups was quite different. The mean age in the rehabilitation group was 59.8 years versus a mean age of 75.1 in the nursing home group. In the rehabilitation centres more male than female patients were included (60% versus 40%) while in the nursing homes it was just the opposite (40% versus 60%).

[TABLE 2]

The aetiology was found to be similar in both patient groups; approximately 60–70% of the patients has had a cerebral infarction and approximately 18% a cerebral haemorrhage.

Prevalence of apraxia

Table 3 shows the results with regard to the prevalence of apraxia. The prevalence of apraxia in the rehabilitation centre group was 28% (95% confidence interval (CI) 23–33%). In the nursing home group the prevalence was 37% (95% CI 29–45%). For 12 patients in the rehabilitation centres and 15 in the nursing homes the diagnosis of apraxia was uncertain. In the nursing home group relatively more patients were found to be apraxic compared to the rehabilitation group ($p < 0.01$); this comparison concerns patients with/without apraxia (patients with an uncertain diagnosis were excluded). The prevalence of apraxia in patients ($n = 108$) with a *recurrent* stroke was 30% (19/64) in the rehabilitation centres and 55% (24/44) in the nursing homes (not in Table).

[TABLE 3]

Next, the association between patient characteristics and the prevalence of apraxia was studied. Patients with an uncertain diagnosis were excluded from these analyses. The prevalence of apraxia was not associated with gender, age or type of stroke.

CONCLUSION AND DISCUSSION

The results of the present study show that the prevalence of apraxia is 28% in patients with a first left hemisphere stroke in rehabilitation centres and 37% in nursing homes. The study did not show a relationship between patient characteristics and the prevalence of apraxia: no significant association was found with gender, age and type of stroke (haemorrhage or infarction).

The patients in the present study were recruited from rehabilitation centres and nursing homes. Thus, our study is not a population-based study. Assuming that the patients with less severe impairments are not admitted to a rehabilitation centre or nursing home, our data probably over- estimate the prevalence of apraxia in the population. However, in those patients who are referred to a rehabilitation centre or a nursing home the prevalence of apraxia appears to be rather high (28% and 37% respectively). These prevalence rates are lower than those found in other studies on first left hemisphere stroke.^{5,9,13} In these studies, patients were recruited from neurological wards and aphasia units. Because there is a strong association between aphasia and apraxia, this has probably resulted in an overestimation of the prevalence of apraxia.

[FIGURE 1]

In the absence of standardized tests, the diagnosis of apraxia necessarily had to rely on clinical judgement. The diagnosis of apraxia was made by the treating medical team, based on a clear definition of apraxia (see Method section). Of course one can question the validity of a clinical diagnosis. In this context, it should be mentioned that we have recently developed a test for apraxia, which can be used to objectify and support the clinical diagnosis of apraxia.¹⁵ This test was applied in a subgroup of 100 patients clinically diagnosed as apraxic: only seven patients did not meet the criterion for apraxia on this test. Thus, the clinical diagnosis of apraxia could be confirmed in almost all patients. On the other hand, the medical team could have missed certain cases of apraxia. We believe this is not very likely, because we urged the medical team to point out every single case of apraxia. For these reasons we tend to trust the validity of the clinical diagnosis of apraxia, as made by the medical team and based on a clear definition of apraxia.

The present study shows that apraxia occurs in about one-third of left hemisphere stroke patients. Although it may have a favourable prognosis in some cases, apraxia is frequently associated with severe disability. Thus, there is a need to increase research efforts on apraxia and its treatment.

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TABLES AND FIGURE

Table 1 Studies on the prevalence of apraxia

First author	Patients			Aetiology	Characteristics	Procedure to diagnose apraxia	Results: % apraxia	
	Number of patients	Setting					Left brain damaged	Right brain damaged
Liepmann ⁶ 1908	LBD 41 RBD 42	-	-	-	-	Execution of gestures	50%	0%
Pieczuro ⁷ 1967	LBD 70 RBD 35	-	-	All aphasic		Imitation (symbolic and nonsymbolic gestures)	46%	9%
De Renzi ⁸ 1968	LBD 160 RBD 45	Neurological wards of Milan University and Outpatient Aphasia Unit	Stroke Neoplastic Other	Right-handed		Imitation (symbolic gestures) Object use	28%	0%
Basso ⁹ 1980	LBD 123	Neurological wards of Milan University and Outpatient Aphasia Unit 1977/78	Stroke (first ever)	Right-handed Mean age: 55.9 Mean years schooling: 7.5 Time since stroke: from 15 days		Imitation (symbolic gestures)	39%	-
De Renzi ¹⁰ 1980	LBD 100 RBD 80	Neurological wards and outpatient speech unit Modena University, Italy	Stroke (80%) Tumour Trauma	Right-handed Mean age: LBD 55.9, RBD 57.7 Time since stroke: from a few days to several years		Imitation (symbolic and nonsymbolic gestures)	50%	20%
De Renzi ¹¹ 1982	LBD 150 RBD 110	Hospital wards Modena University, Italy	Stroke (61%) Tumour (37%) Trauma (2%)	Right-handed Mean age: 54.75 Time since stroke: 10-30 days		Imitation (symbolic and nonsymbolic gestures) Object use pantomime verbal visual tactile	32%	2%
							34%	6%
							39%	-
							34%	-
							21%	-

Author	Study	Stroke	Right-handed	Command and imitation	55% (acute) 40% (chronic)
Kertesz ¹² 1984	LBD 177	Stroke (single ischaemic)	62% male/38% female Mean age: 62.9 Time since stroke: from days to months	Command and imitation	55% (acute) 40% (chronic)
Basso ¹³ 1985	LBD 152	Stroke (first ever)	70% male/30% female Mean age: 56.55 Mean years schooling: 8.4 Time since stroke: from days to years	Imitation (symbolic and nonsymbolic gestures)	45%
Basso ⁵ 1987	LBD 129	Stroke (first ever)	67% male/33 female Mean age: 58.9 Mean years schooling: 7.3 Time since stroke: 15-30 days	Imitation	43%
Barbieri ¹⁴ 1988	LBD 56 RBD 38	Stroke (68%)	Mean age: LBD 60.7, RBD 58.3 Mean years schooling: LBD 6.4, RBD 6.1 Time since stroke: acute phase	Imitation Object use	57% 50%
					34% 13%

LBD, patient group with left hemisphere brain damage; RBD, patient group with right hemisphere brain damage.

Table 2 Patient characteristics

	Rehabilitation centres		Nursing homes		<i>p</i> -values
	<i>n</i>	(%)	<i>n</i>	(%)	
Total	338	(100)	154	(100)	
Gender ^a					
Male	199	(60)	61	(40)	<i>p</i> < 0.001
Female	134	(40)	93	(60)	
Age ^b					
20–50 years	72	(22)	3	(2)	<i>p</i> < 0.01
51–70 years	200	(60)	41	(27)	
71 and older	60	(18)	106	(71)	
Mean age (SD)	59.8	(11.6)	75.1	(9.5)	
Stroke type					
Haemorrhage	59	(18)	29	(19)	NS
Infarction	245	(72)	98	(64)	
Different/unknown	34	(10)	27	(18)	

NS, not significant.

^aFor 5 patients in the Rehabilitation Centre group data on gender are missing.

^bFor 6 patients in the Rehabilitation Centre group and 4 patients in the Nursing Home group data on age are missing.

Table 3 Prevalence of apraxia

	Apraxia		Nonapraxia		Uncertain	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Rehabilitation centres	96	(28)	229	(68)	12	(4)
Nursing homes	57	(37)	82	(53)	15	(10)

p < 0.01.

For 2 patients in the apraxia group and 2 patients in the nonapraxia group data on type of institute are missing.

Clinical messages

- Studies on the prevalence of apraxia are scarce and concern heterogeneous and selected patient groups.
- Apraxia occurs in about one-third of left hemisphere stroke patients in rehabilitation centres and nursing homes.
- Prevalence of apraxia is not associated with gender, age, or type of stroke.

Fig. 1. Clinical messages