Vascular Aphasias
Main Characteristics of Patients Hospitalized in Acute Stroke Units

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Background and Purpose—Aphasia is frequent in stroke patients and is associated with poor prognosis. However, characteristics and determinants of vascular aphasias remain controversial. The aim of this study was to evaluate aphasia characteristics at the acute stage in patients admitted to a stroke unit.

Methods—The study was performed in 308 patients consecutively assessed with a standardized aphasia battery.

Results—Aphasia was observed in 207 patients; global and nonclassified aphasias accounted for 50% of aphasic syndromes at the acute stage, whereas classic aphasias (Wernicke's, Broca's, transcortical, and subcortical aphasias) were less frequent. Age differed across aphasic syndromes in ischemic stroke patients only; patients with conduction aphasia were younger, and patients with subcortical aphasia were older. Sex did not significantly differ across aphasic syndromes. The presence of a previous stroke was more frequent in nonclassified aphasia.

Conclusions—This study shows (1) that vascular aphasias are frequently severe or nonclassic at the acute stage, a finding explained in part by the presence of a previous stroke; (2) that the age effect is due mainly to its influence on infarct location; and (3) that the main determinant of aphasia characteristics is lesion location. (***Stroke***. 2002;33:702-705.)

Key Words: aphasia ■ neuropsychology

Stroke is the leading cause of disability in western countries, and dependent living is related mainly to motor and cognitive deficits.[1] Among cognitive deficits, aphasia is observed with a frequency ranging from 21% to 38% at the acute stage,[2-4] and stroke accounts for ≈80 000 new cases of aphasia annually in the United States.[5] The presence of aphasia is an index of poor prognosis, with more severe motor, cognitive, and social disability[1,3,6] and higher mortality.[3,4] Finally, aphasia outcome remains poor: 32% to 50% of aphasics still suffer from aphasia 6 months after stroke.[3,4] Consequently, the need to evaluate and treat poststroke aphasia has been underlined.[7]

However, characteristics of vascular aphasias remain partly unknown for 3 main reasons. First, previous studies were performed before the stroke unit era, and characteristics of aphasia in patients admitted to acute stroke units have not been reported. Second, studies focusing on vascular aphasia have included either selected samples with extensive evaluation of language[1,8,9] or large series of consecutive patients examined with shortened testing.[2-10] Although the latter studies provide important findings, they usually focus on oral expression and do not determine the type of language disorder. This leads to confounding of very different disorders such as dysarthria and aphasia, or Broca's and global aphasias, which have different severities and outcomes. Third, factors determining the occurrence and severity of vascular aphasia remain a subject of controversy. Lesion location has long been regarded as the major determinant of aphasia characteristics. However, several CT-based studies have shown that an unexpectedly large proportion of aphasias deviate from classic clinical-anatomic correlations.[11-14] This suggests that other factors influence clinical outcome. A few studies have suggested age and sex, with a higher frequency of nonfluent aphasia in young patients,[10,15-17] a lower frequency of aphasia in women,[2,18] and a better outcome in young patients.[17,19,20] These results have been obtained in series of selected patients and were not replicated in other studies.[4,8,21]

The goal of the present study was to determine aphasia characteristics at the acute stage and the influence of general factors. The role of lesion location is examined in another study of a subgroup of 107 patients examined with MRI.[22]

Subjects and Methods

The study was performed in patients admitted to the Lille acute stroke unit between May 1994 and August 1997. This department usually admits 2 types of stroke patients: those living in Lille-Metropole and admitted directly as emergency cases and those referred from other hospitals in the region. Patients of both types were included in the study provided that they were examined for language disorders. Modalities of admission and care have previously been reported.[23] All patients suffering from language difficulties were referred to the speech therapist. During this 39-month period, 365 consecutive patients were examined by a speech therapist for language disorders, corresponding to 14% of patients admitted for acute stroke. Fifty-seven patients were excluded because of insufficient assessment, mainly because of premature discharge or death. The remaining 308 patients were characterized

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TABLE 1. General Characteristics According to Language Status

	n	Age, y	Sex, M/F	Handedness, Right/Left/Ambi	Delay, d	Previous Stroke, n
No language disorder	50	59.7±18 (16–86)	26/24	45/2/3	8.4±11.6	2
Dysarthria	22	66.3±12 (25–81)	13/9	18/1/3	5.3±4.8	1
Word-finding difficulty	16	65.9±18 (34–90)	9/7	14/1/1	21.9±43.7	2
Other language disorder	13	64±17 (17–83)	8/5	13/0/0	16.6±9.6	3
Aphasia						
Global	52	61±15 (20–90)	26/26	51/1/0	17.1±29.1	3
Broca's	22	60±17 (24–86)	11/11	19/0/3	12.2±10.3	1
Transcortical motor	17	59.4±18 (29–83)	11/6	17/0/0	10.5±7.1	0
Subcortical	10	68±15 (44–90)	4/6	10/0/0	7.9±6.5	1
Wernicke's	30	64.6±15 (29–87)	12/18	29/0/1	7.3±3.2	3
Conduction	7	50±15 (35–74)	4/3	7/0/0	6.3±3.9	0
Transcortical sensory	7	61.3±14 (38–75)	5/2	7/0/0	8±5.7	0
Anomic	5	66±8 (58–76)	4/1	4/0/1	19±21.3	0
Crossed	2	68±1.4 (67–69)	1/1	2/0/0	5.5±2.1	0
Nonclassified	55	64.2±14 (27–86)	31/24	53/2/0	10.5±15.4	10*
Total	308	62±16 (16–90)	165/143	289/7/12	11.4±18.5	26

Ambi indicates ambidextrous. Age and delay values are mean±SD; values in parentheses are ranges.

*P<0.05.

by a mean age of 62 years and a mild prominence of male sex (Table 1). Most patients were right handed, and illiteracy was observed in 6, including 2 non-French native speakers. The index stroke was ischemic in 263 patients (85.4%) and hemorrhagic in 45 (14.6%). Fifty-six patients (18%) were referred from another hospital or department (mainly neurosurgery and acute care unit). Twenty-six patients (8.4%) had had a previous stroke, 11 that were responsible for aphasia. Motor weakness of the preferred hand was present in 169 patients, and a severe sensory disorder—mainly hemianopia and deafness—was seen in 36 patients.

Language was assessed when the neurological condition became favorable, usually within the first month after stroke. It used a battery based mainly on the Montreal-Toulouse battery[24] and some subtests of the Boston Diagnosis Aphasia Examination[25–28] (Table 2). The battery could be administered within 1 hour and, if necessary, in the patient's room. Criteria for classic aphasic syndromes (global, Broca's, Wernicke's, conduction, transcortical motor and sensory, anomic) were those of the Montreal-Toulouse battery.[24] We added the 2 following disorders: subcortical aphasia, when hypophonia was associated with a transcortical motor aphasia,[11,29] and word-finding difficulties, when the sole abnormality consisted of mild impairment of picture naming. The aphasia was considered nonclassified when the disorder did not meet the criteria for any of the classic aphasic syndromes.

Results

Among the 308 patients (Table 1), 50 no longer had language disorder at the time of examination, 22 had a pure dysarthria disorder, 207 had aphasia, 16 had isolated word-finding difficulties, and 13 had various disorders (pure word deafness, n=1; agraphia and alexia, n=4; visual agnosia, n=3; frontal syndrome, n=2; dementia, n=3).

Global and nonclassified aphasias accounted for 50% of all aphasic syndromes. Nonclassified aphasia included 37 patients (17.9%) with language disorders close to anomic aphasia associated with other impairments ("anomic-plus aphasia"). The remaining 18 patients (8.7%) had various combinations of impairments that did not correspond to a clearly established aphasic syndrome. Wer-

nicke's, Broca's, and subcortical and transcortical motor aphasias were less frequent, accounting for 40%. Other syndromes were rare. In the 207 aphasics, written language was assessable in 188 and was impaired in 168 patients (written expression, n=107; reading and comprehension, n=77).

Patients were examined within a mean delay of 11 days after stroke, and 11 patients were assessed after the first month mainly because they were referred from another hospital or suffered

TABLE 2. Aphasia Battery

Main subtests
Fluency
0=Mutism or stereotyped utterances
1=Nonfluent aphasia
2=Normal or increased fluency
Automatic speech[25]
Word and sentence repetition[24]
Oral comprehension
Word and sentence-picture matching[24]
Command subtest[25]
Picture naming test[24]
Written comprehension and expression; reading[24]
Severity rating[25]
Optional subtests
Bucco-facial apraxia[24]
Verbal fluency
Shortened token test[27]
Complex ideational material[25]
Picture naming[28]
Reading sentences and paragraphs[25]

TABLE 3.   Mean (SD) Scores on Aphasia Assessment According to Aphasic Syndrome

		Oral Expression					Oral Comprehension	
	n	Fluency (/2)	Jargon-Aphasia, n	Stereotyped Utterances, n	Automatic Series (/9)	Picture Naming (/31)	Word Repetition (/30)	Word-Picture Matching (/13)	Command Subtest (/15)
No aphasia	50	2 (0)	0	0	9 (0)	29.5 (1.4)	29.9 (0.2)	12.7 (0.7)	14.7 (0.5)
Global	52	0.2* (0.4)	0	17*	1.4* (2.2)	3.1* (5.2)	2.9* (8)	3.6* (3.2)	4* (3.7)
Broca's	22	0.5* (0.5)	0	8*	4.5* (3.3)	11.5* (11)	22* (9.4)	9.9* (2)	11.8 (2.3)
TC motor	17	1.4* (0.5)	0	0	8.9 (0.4)	19.4* (8.6)	29.2 (1)	11.2 (1.7)	14.2 (1.6)
Subcortical	10	1.2* (0.4)	0	0	8.8 (0.4)	22.7* (3.2)	28.8 (2)	11.5 (1.1)	13.5 (0.9)
Wernicke's	30	1.9 (0.3)	8*	0	6.8 (2.6)	8.9* (8.4)	15.3* (12)	7.3* (2.9)	7* (3.9)
Conduction	7	2 (0)	0	0	8 (1.3)	20.3 (9.8)	16.7* (12)	12.5 (0.5)	13.5 (0.9)
TC sensory	7	1.7 (0.5)	0	0	8.7 (0.5)	13.9* (7.8)	29.4 (0.8)	6.6* (4.1)	5.8* (4.2)
Anomic	5	2 (0)	0	0	9 (0)	15.8* (15)	29.8 (0.4)	11.4 (4.2)	13.8 (0.9)

TC indicates transcortical. Values in parentheses are maximum scores.
*$P < 0.0001$.

from vigilance disorders. The delay did not differ according to language status ($P > 0.2$). Language disorders of referred patients did not differ ($P > 0.6$) from those of directly admitted patients.

Performance on the aphasia battery was examined across aphasic syndromes (global, Wernicke's, Broca's, subcortical, anomic, conduction, transcortical motor and sensory) by use of Fisher's exact test (jargonaphasia, stereotyped utterances) and an analysis of variance (ANOVA; spontaneous verbal fluency, automatic series, repetition, and oral comprehension) with a rank transformation of scores.[30] Posthoc analysis was performed with the Ryan Einot Gabriel Welsch test,[31] and a value of $P < 0.0001$ (corrected for multiple analysis) was regarded as significant. The results (Table 3) showed that the present battery allowed classification of the main aphasic syndromes. The word and sentence-picture matching subtest also assessed syntactic comprehension, and this accounted for the mild impairment observed in Broca's aphasia.

We examined the effect of general factors (age, sex, handedness) and previous stroke on the occurrence and type of language disorders. The 13 patients with various disorders were excluded, and the analysis was performed in the remaining 295 patients with the Kruskal-Wallis test (age) and Fisher's exact test (sex, handedness, previous stroke). Age ($P = 0.6$), sex ($P = 0.8$), and handedness ($P = 0.4$) did not differ across syndromes (Table 1), whereas the presence of a previous stroke did differ ($P = 0.04$) because of the higher frequency of previous stroke in nonclassified aphasia.

The absence of an age effect on the aphasic syndrome contrasted with findings from some previous reports[10,15–17] and was reexamined according to the 3 methods previously reported. First, age was compared across aphasic syndromes separately in men and women. No difference was observed in men ($P = 0.8$) and women ($P = 0.5$). Second, age was compared according to spontaneous verbal fluency (mutism or expression restricted to stereotyped utterances, n=51; nonfluent aphasia, n=59; fluent aphasia, n=97). Age did not differ ($P = 0.6$) according to fluency (mutism, 61.2±17; nonfluent, 61±16; fluent, 63.7±15). Third, age was compared across aphasic syndromes separately in ischemic and hemorrhagic stroke patients by use of an ANOVA with the Ryan Einot Gabriel Welsch test[31] as a posthoc test. Age

differed across syndromes in ischemic stroke ($P = 0.04$) but not in hemorrhagic stroke ($P = 0.5$). In ischemic stroke, patients with a conduction aphasia were younger (mean age, 50±15 years), and patients with subcortical aphasia were older (mean age, 76.5±11 years). The absence of a significant difference between Broca's (mean age, 60.1±18 years) and Wernicke's (mean age, 69.95±12.5 years) aphasias was due to correction for multiple comparisons because the direct comparison with a *t* test reached significance ($P = 0.05$).

These results indicate (1) that age differed across aphasic syndromes in ischemic stroke only, with patients with conduction aphasia being younger and patients with subcortical aphasia being older; (2) that sex did not influence the variety of language disorder; and (3) that a previous stroke was more frequent in nonclassified aphasia.

Discussion

The results showed (1) that global, "anomic-plus" and nonclassified aphasias were the most frequent syndromes at the acute stage of stroke, whereas Wernicke's, Broca's, and subcortical and transcortical motor aphasias were less frequent; (2) that the frequency of fluent and nonfluent aphasias was similar; (3) that age differed across aphasic syndromes in ischemic stroke only; (4) that sex did not influence the aphasic syndrome at the acute stage; and (5) that a previous stroke was more frequent in nonclassified aphasia.

The study was not designed to assess the frequency of aphasia in stroke. Thus, the finding of language disorder in ≈14% of patients at the acute stage may have underestimated the frequency of aphasia, reported in 16% to 25% of stroke patients.[2–5] Because our primary aim was to examine aphasia characteristics encountered in daily practice, all stroke patients, including those with a previous stroke, were analyzed.

The first result of this study was that classic syndromes that represent the core of aphasiology such as Wernicke's, Broca's, conduction, pure anomic, and transcortical aphasias accounted for only 40% of aphasias. Global aphasia accounted for a quarter of aphasic syndromes within the first weeks after stroke, indicating that stroke practitioners are more frequently confronted with severe or nonclassic disorders. The prominence of global

aphasia, the most severe aphasic syndrome, has already been reported in series using an aphasia battery[2,8,13,17] and is frequently underestimated on clinical grounds or shortened testing.[2–4] This finding argues for the use of formal assessment of aphasia. In previous studies, the frequency of nonclassified aphasias varied from 0% to 45%[2,8,13,14,32] and depended mainly on patient selection, the delay of assessment, and criteria of aphasic syndromes. In the present study, 25% of aphasia was not classifiable, which is explained by the use of restrictive criteria of anomic aphasia and by the inclusion of patients with previous stroke. If less restrictive criteria were used, 37 patients would have been classified as having anomic-plus aphasia, which represents a very important proportion of aphasics. From a practical point of view, the separation of pure anomia from anomic-plus aphasia is unclear and deserves further study. Nonclassified aphasia was more frequent in patients with previous stroke. This is likely a result of the unusual combination of language disorders in patients with several lesions.

Finally, this study supports an age effect on the aphasic syndrome in ischemic stroke only; patients with conduction aphasia were younger, and patients with subcortical aphasia were older. In addition, patients with Broca's aphasia were younger than those with Wernicke's aphasia, but the difference did not reach significance after correction for multiple analyses. This result is consistent with studies suggesting a higher frequency of nonfluent aphasia, particularly Broca's aphasia, in young patients.[10,13,15–17] The age effect might be due to its influence on patterns of recovery, the cerebral organization of language areas, and infarct locations. The influence of age on patterns of recovery has been documented primarily after 3 months from onset,[21] and this is unlikely to account for our findings that concerned the first month after stroke. Age-related changes in the organization of language areas predict different frequencies of aphasic syndromes regardless of brain pathology. This prediction was not matched by our findings of an age influence specific to ischemic stroke. Thus, our results strongly suggest that the age effect on aphasic syndromes at the acute stage is related to its influence on the vascular pathology and consequently on infarct locations. Such an interpretation is supported by the previous finding of a relation between age and the anterior-posterior location of infarcts in Broca's and Wernicke's aphasias.[10] These data and those obtained in the clinical-anatomical correlation study[22] converge to support the finding that the main determinant of aphasia type is lesion location.

Acknowledgments

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