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Relationship of Post-Stroke Aphasic Types with Sex, Age and Stroke Types

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Abstract

Aim: To explore what is the relationship of the types of post-stroke aphasia with sex, age and stroke types. Methods: Retrospective analysis was administrated on data of 421 patients with acute stroke. Western battery aphasia was used to measure aphasiac type and aphasia quotient (AQ) score. The patients were divided into three age groups: young, middle-aged and elderly. The stroke types were classified into cerebral infraction (CI) and intracerebral hemorrhage (ICH). Results: All subjects were right-handed, which males and females accounted for 69.60% and 30.40%, respectively. There were 116 cases of Broca's aphasia (85 males), 35 cases of Wernicke's aphasia (20 males), 15 cases of conductive aphasia (10 males), 63 cases of transcortical motor aphasia (50 males), 11 cases of transcortical sensory aphasia (8 males), 27 cases of transcortical combined aphasia (13 males), 73 cases of anomic aphasia (47 males) and 81 cases of global aphasia (60 males). Male patients (69.60%) have a significantly higher morbidity of aphasia than that of females (30.40%) after stroke (χ^2 = 11.57, P = 0.003), especially those under 65 years old (73.38%). For people 65 years and older, the morbidity of female (42.97%) tends to increase with age. Sex has no significant influence on the types of aphasia (χ^2 = 13.84, P = 0.054). Broca's aphasia is the most common type in both male and female (29.01%, 24.22%, respectively). The distribution of aphasic types has no obvious difference among three age groups (χ^2 = 14.94, P = 0.382). Aphasia induced by CI (306 cases) is more common than that by ICH (115 cases), but there was no difference in distribution of types of aphasia (χ^2 = 13.23, P = 0.067). Conclusions: Male patients have a significantly higher level of morbidity of aphasia than females after stroke and a lower average age of onset than females. Broca's

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aphasia is the most common one in both male and female. Broca's aphasia, global and anomic aphasia are the most common aphasic types in both CI and ICH patients, except the female with ICH.

Keywords

Type of Aphasia, Sex, Age, Type of Stroke

1. Introduction

About 82.37% of stroke patients suffer from speech disorder [1]. The patients of aphasia, as one kind of speech disorder, have a prevalence of 30.25% - 42.4% [1]-[4] in stroke patients. Aphasia has heavily influenced the life quality of patients and is one of the most important indicators to evaluate the patients' social outcomes [5]. Previous studies [6]-[10] have shown that many factors can affect the types of aphasia, such as lesion location, types of stroke, age, sex, and intervals between the onset and examination. This study aims to further analyze the distribution of aphasia types in post-stroke aphasia patients and explore the relationship of the types of aphasia with sex, age and stroke types.

2. Materials and Methods

2.1. Participants

We recruited 421 patients with acute stroke from Department of Neurology of Beijing Tiantan Hospital, Capital Medical University from July 2005 to July 2012. They met the inclusion and exclusion criteria (see below). They were divided into three groups of different ages: youth one (≤40 y), middle-aged one (41 - 65 y) and elderly one (>65 y).

2.2. Inclusion Criteria

1) The diagnosis of stroke accorded with the criteria [11] of the Fourth National Cerebralvascular Conference and was confirmed by the computed tomography (CT) or magnetic resonance imaging (MRI); 2) The patients were from inpatients of neurology department; 3) Their native language was Chinese language; 4) Patients had clear consciousness and could cooperate; 5) The degree of formal education was above the elementary school, intelligence was normal prior to the onset of stroke, and there was no the history of mental illness; 6) There was no speech disorder before the onset, whether the stroke was Initial or repeated; 7) Aphasia quotient (AQ) scores calculated by the Western battery aphasia were less than 93.8.

2.3. Exclusion Criteria

1) Patients had speech disorders, while CT or MRI images could not support the diagnosis of cerebral infraction or intracerebral hemorrhage; 2) They had a consciousness disturbance and could not cooperate; 3) They had speech disorders before the onset of stroke, or combined with other diseases which could affect the speech; 4) They combined with cognitive dysfunction such as dementia and mental disorder; 5) They combined with severe liver, kidney or other medical diseases and audio-visual and comprehensive difficulties; 6) His or her AQ scores was more than 93.8.

2.4. Handedness Judgment

Patients' handedness was evaluated following the criteria of handedness of Aphasia Battery of Chinese instituted by Department of Neurology Peking University First Hospital [12].

2.5. Aphasic Type Evaluation

The aphasic type of each patient was assessed by professional language therapist, using Western Battery Aphasia Test. It was administrated within three weeks after recruitment.

2.6. Imaging Data Collection

Every patient was collected CT or/and MRI imaging data.

2.7. Statistical Analysis

SPSS 19.0 software package was used to analyze this set of data. The independent sample *t*-test was for the intergroup comparison and chi-square test for the intergroup comparison. The threshold with $P < 0.05$ was implemented.

3. Results

3.1. Basic Information

Four hundred and twenty-one patients (293 males) met the inclusion and exclusion criteria. The mean age was 56.58 years of all patients ($SD = 13.94$, range: 15 - 87), 55.28 years of male ones ($SD = 13.32$, range: 15 - 87) and 59.54 years of female ones ($SD = 14.90$, range: 21 - 87). The mean age of stroke onset in male patients was significantly higher than female ones ($F = 2.562$, $t = -2.907$, $P = 0.004$, $\alpha = 0.05$).

3.2. Handedness

All the 421 patients were right-handed.

3.3. Types of Aphasia

Western Battery Aphasia Test revealed that our patients showed eight types of aphasia (**Table 1**). They were Broca's aphasia: 116 patients (85 males), Wernicke's aphasia: 35 patients (20 males), conductive aphasia: 15 patients (10 males), transcortical motor aphasia: 63 patients (50 males), transcortical sensory aphasia: 11 patients (8 males), transcortical combined aphasia: 27 patients (13 males), anomic aphasia: 73 patients (47 males) and global aphasia: 81 patients (60 males).

Table 1 shows that the incidence rate of post-stroke aphasia in the middle-aged and elderly population was higher than that in the youth population (55.82%, 31.35%, 12.83% respectively). Broca's aphasia was the most common type in the three age groups, followed by global and anomic aphasia. Distribution of aphasic types was equivalent among three age groups ($\chi^2 = 14.94$, $P = 0.382$, $\alpha = 0.05$). In other words, age had no significant effect on the types of aphasia.

Male patients had a significantly higher level of morbidity of aphasia than that of females after stroke ($\chi^2 = 11.57$, $P = 0.003$, $\alpha = 0.05$). After 65 years old, the morbidity of female tended to increase with age (42.97%), and the gap of morbidity between males and females diminished (26.28%). Sex had no significant influence on the types of aphasia ($\chi^2 = 13.84$, $P = 0.054$, $\alpha = 0.05$). Broca's aphasia was the most common type in both male and female (29.01%, 24.22%, respectively). Global, Wernicke's and anomic aphasia were also common, but transcortical sensory aphasia was the most rare.

Table 1. The distribution of the types of aphasia in different age and sex groups [n (%)].

Types of aphasia	Male			Female			Total
	Youth	Middle-aged	Elderly	Youth	Middle-aged	Elderly	
Broca's	14 (4.78)	51 (17.41)	20 (6.83)	2 (1.56)	14 (10.94)	15 (11.72)	116 (27.55)
Wernicke's	4 (1.37)	11 (3.75)	5 (1.71)	2 (1.56)	8 (6.25)	5 (3.91)	35 (8.31)
Conductive	3 (1.02)	4 (1.37)	3 (1.02)	1 (0.78)	4 (3.13)	0 (0.00)	15 (3.56)
Transcortical sensory	2 (0.68)	2 (0.68)	4 (1.37)	1 (0.78)	1 (0.78)	1 (0.78)	11 (2.61)
Transcortical motor	2 (0.68)	36 (12.29)	12 (4.10)	1 (0.78)	7 (5.47)	5 (3.91)	63 (14.96)
Transcortical combined	0 (0.00)	10 (3.41)	3 (1.02)	2 (1.56)	5 (3.91)	7 (5.47)	27 (6.41)
Global	8 (2.73)	34 (11.60)	18 (6.14)	1 (0.78)	10 (7.81)	10 (7.81)	81 (19.24)
Anomic	8 (2.73)	27 (9.22)	12 (4.10)	3 (2.34)	11 (8.59)	12 (9.38)	73 (17.34)
Total		293 (69.60)			128 (30.40)		421

3.4. Imaging Data

The patients included 306 cases of cerebral infraction (CI) (72.68%) and 115 cases of intracerebral hemorrhage (ICH) (27.32%). The distributions of aphasic types with different age and sex were summarized in **Table 2** and **Table 3**.

The distribution of types of aphasia had no significant difference among the different type of stroke groups (χ^2 = 13.23, P = 0.067), different age sub-groups (χ^2 = 14.94, P = 0.382) and different sex group (χ^2 = 13.84, P = 0.054). Broca's and Wernicke's aphasia were most common in CI patients. However, among ICH patients, the most common types were Broca's, anomic and global aphasia. Except for the females with ICH (may be caused by the small sample size), the above pattern could also be observed in different types of stroke, age and sex sub-groups.

4. Discussion

Aphasia refers to the loss or impairment of language communication skills owing to the brain disease [3] [13]. With the increasing morbidity of cerebrovascular disease in China, aphasia, as one of the common complications, is paid more and more attention. With Benson Classification [14] as reference, combined with clinical requirement, aphasia of Chinese can be divided into the following types based on the fluency, comprehension and naming ability: non-fluent aphasia (including Broca's aphasia, transcortical motor aphasia, global aphasia and transcortical combined aphasia) and fluent aphasia (including anomic aphasia, conductive aphasia, Wernicke's

Table 2. The distribution of the types of aphasia of ICH patients in different age groups [n (%)].

	Youth (≤40 y)		Middle-aged (41 - 65 y)		Elderly (>65 y)		Total
	Male	Female	Male	Female	Male	Female	
Broca's	7 (38.89)	0 (0.00)	10 (23.81)	4 (16.00)	3 (20.00)	1 (11.11)	25 (21.74)
Wernicke's	3 (16.67)	0 (0.00)	3 (7.14)	4 (16.00)	1 (6.67)	1 (11.11)	12 (10.43)
Conductive	1 (5.56)	1 (16.67)	1 (2.38)	3 (12.00)	0 (0.00)	0 (0.00)	6 (5.22)
Transcortical sensory	1 (5.56)	1 (16.67)	1 (2.38)	1 (4.00)	2 (13.33)	0 (0.00)	6 (5.22)
Transcortical motor	1 (5.56)	0 (0.00)	10 (23.81)	1 (4.00)	3 (20.00)	2 (22.22)	17 (14.78)
Transcortical combined	0 (0.00)	2 (33.33)	5 (11.90)	3 (12.00)	0 (0.00)	1 (11.11)	11 (9.57)
Global	3 (16.67)	1 (16.67)	9 (21.43)	6 (24.00)	4 (26.67)	1 (11.11)	24 (20.87)
Anomic	2 (11.11)	1 (16.67)	3 (7.14)	3 (12.00)	2 (13.33)	3 (33.33)	14 (12.17)

Table 3. The distribution of the types of aphasia of CI patients in different age groups [n (%)].

	Youth (≤40 y)		Middle-aged (41 - 65 y)		Elderly (>65 y)		Total
	Male	Female	Male	Male	Female	Male	
Broca's	7 (30.43)	2 (28.57)	41 (30.83)	10 (28.57)	17 (27.42)	14 (30.43)	91 (29.74)
Wernicke's	1 (4.35)	2 (28.57)	8 (6.02)	4 (11.43)	4 (6.45)	4 (8.70)	23 (7.52)
Conductive	2 (8.70)	0 (0.00)	3 (2.26)	1 (2.86)	3 (4.84)	0 (0.00)	9 (2.94)
Transcortical sensory	1 (4.35)	0 (0.00)	1 (0.75)	0 (0.00)	2 (3.23)	1 (2.17)	5 (1.63)
Transcortical motor	1 (4.35)	1 (14.29)	26 (19.55)	6 (17.14)	9 (14.52)	3 (6.52)	46 (15.03)
Transcortical combined	0 (0.00)	0 (0.00)	5 (3.76)	2 (5.71)	3 (4.84)	6 (13.04)	16 (5.23)
Global	5 (21.74)	0 (0.00)	25 (18.80)	4 (11.43)	14 (22.58)	9 (19.57)	57 (18.63)
Anomic	6 (26.09)	2 (28.57)	24 (18.05)	8 (22.86)	10 (16.13)	9 (19.57)	59 (19.28)

aphasia, transcortical sensory aphasia and subcortical aphasia) [3]. Some foreign and domestic studies suggested that there were many factors affecting the types of post-stroke aphasia, such as lesion location, age, sex and stage of stroke. Some domestic scholars [15] thought the lesion location was the major factor influencing the aphasic type in acute phase of stroke, while other studies [16] showed that the association between the lesion location and the types of aphasia was not totally accorded with the classic aphasia models, so we could not completely rely on the lesions to determine the aphasic type. Recently, it's well acknowledged that age had the following characteristics of the effect on the types of aphasia: patients of Broca's aphasia were younger than that of Wernicke's aphasia, and this difference only can be seen in ischemic stroke. However, our study found that the age has no significant effect on aphasic types in both CI and ICH patients ($\chi^2 = 14.33$, $P = 0.425$; $\chi^2 = 10.46$, $P = 0.728$, $\alpha = 0.05$). On the one hand, this result may be explained by the small sample size, and on the other hand, we didn't have a further analysis about the specific lesions, which may lead to the different results. In regard to gender, there were few relevant studies. Some [17] [18] thought male patients tended to suffered from Broca's aphasia and females tended from Wernicke's global or anomic aphasia. However, our study found that the Broca's aphasia was the most common type in both male and female. We also got some similar conclusion with other studies: sex had no significant effect on the types of aphasia. Some domestic researchers demonstrated that sex had effect on the severity and recovery of aphasia. That is, the degree of speech disorder in male patients was more worse and the recovery was slower than females [19]. The association between sex and aphasia can be explained by the difference of cerebral hemisphere structure and behavior [20]. During the fetal brain development, different sex hormones caused the different structure of language processing of brain in males and females, and recently the functional magnetic resonance imaging had confirmed this view [21] [22]. The language processing was governed by the bilateral cerebral hemisphere in females and by the unilateral hemisphere in males. When executing language tasks, activating areas in females were larger than males, the former located in bilateral and the latter located in unilateral.

Relevant clinical experiences and studies [23]-[25] showed that the incidence rate of stroke in males and females had remarkable difference in different ages. Male patients had a significantly higher level of morbidity of stroke and a younger average age of onset than females. For cerebral infraction, the peak ages of onset were 45 - 59 years old in males and 60 - 69 years old in females. Our study had gotten the similar result. To some degree, the higher level of morbidity of aphasia and stroke in males may be related with the unhealthy life styles in males and the brain and vascular protection of estrogen in females.

Note that the present study has some limitations. The data size of female patients was too small to draw a reliable and more scientific result. We failed to collect the AQ scores of most patients after recovery.

5. Conclusion

To be concluded, age, sex and stroke types have no significant influence on the types of aphasia. Male patients have a significantly higher level of morbidity of aphasia and younger average age of onset than females after stroke. Broca's aphasia is the most common type of aphasics in both male and female, followed by anomic and global aphasia.

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