Evaluation of Language in Post-CVA Patients: A Clinicophonological Study

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ABSTRACT

Aims and objectives:

- To assess patients with cerebrovascular accidents (CVA), in order to ascertain the presence and types of language deficits.
- Assess for any possible association between lesion site and pattern and degree of language impairments.
- To determine if the degree of language deficits are more in left hemisphere pathology.

Materials and methods: An observational study was conducted over a period of 1 year in the Department of ENT and Head-Neck Surgery and Department of Neuromedicine in a Tertiary Care Hospital. Poststroke patients were evaluated. Stable patients were selected. Both hemorrhagic and ischemic stroke patients were included. We had used the Western Aphasia Battery (WAB) to assess the faculty of Language in the study population and computed the Aphasia Quotient, based on which we categorized language function.

Results: In our study, the number of patients with Infarction as the pathologic process was greater than those with hemorrhage. A total of 40% of cases had exclusively subcortical lesions. In our study, young stroke (stroke in patient under 50 years of age), was present in 14%. Aphasia was present in 40% of the patients. Crossed aphasia was seen in one patient (4%). Based on the aphasia quotient obtained from WAB, we categorized the aphasia as mild (4%), moderate (12%), and severe (24%). We had a preponderance of nonfluent aphasia.

Conclusion: The frequency of poststroke aphasia was higher in our study (40%) than that seen in earlier studies. We have seen a preponderance of nonfluent aphasia in our study with global aphasia (50%) being the commonest subtype. Significant association ($p < 0.05$) was found between left-sided lesions and the presence of aphasia.

Keywords: Aphasia, Post-CVA, Poststroke, WAB.

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INTRODUCTION

In the US, stroke is the most significant contributor to long-term adult disability and the 5th most common cause of death.^{1,2}

Disability is multifactorial and is determined by the site of the lesion, the degree of neurological recovery, premorbid status, and the environmental support systems.

Localization of the Stroke

In certain stroke varieties, there is a proclivity to occur in particular areas. For example: Lacunar stroke in the Subcortex.³ Damage occurring in one brain region impairs the specialized centers in the affected region and also loss of input from the injured part affects the entire brain. Arterial territories are used to localize stroke.

Arterial Territory-errors Mapping

- Contralateral hemiparesis/hemiplegia
- Contralateral sensory loss: ACA
- Contralateral homonymous hemianopia
- Left hemispheric: aaphasia
- Right hemispheric: Visual perceptual deficits including left neglect
- Contralateral hemiparesis/hemiplegia
- Contralateral sensory loss: MCA(Superior Division)
- Left hemispheric: Expressive aphasia
- Right hemispheric: Visual perceptual disorders
- Superior quadrantanopia or homonymous hemianopia MCA (Inferior division):
- Left hemispheric: Wernicke's aphasia
- Right hemispheric: Left visual neglect.

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Right Hemisphere Disorders

Injury to the right hemisphere results in:

- **Visual-spatial Perceptual Disorders**

Left-sided hemi-neglect, constructional apraxia, and asternognosis.

- **Emotional Disorders**

Indifference or flat affect, impulsivity, and emotional lability. Lack of insight is characteristic.

- **Communication Problems**

Aphasia is common in left hemispheric strokes, however, Aphasia has been observed after right hemispheric strokes in 30% of left-handed people and 5% of right-handed people.⁴

Left Hemisphere Disorders

Injury to left hemisphere results in:

- Aphasia
- Apraxias

- Emotional disorders: Depression is seen after stroke in 50% of patients⁵ and is more common with frontal damage.

Poststroke Aphasia

Of all the impairments in stroke, aphasia is both common and highly debilitating.^{6,7} Aphasia has a prevalence of about 21–38%, following acute stroke. A majority of individuals are right-handed (93%), of whom the left hemisphere is dominant for language in 99%. Language control in left-handed individuals is in the left hemisphere in 70%, in the right hemisphere in 15%, and in both hemispheres in 15%.⁸ Hence, 97% of the population has the seat of language control in the left hemisphere (Table 1).

Assessment of Aphasia Poststroke

Diagnostic criteria for aphasia vary among different studies⁹ resulting in variations in statistics. Stroke studies show that language pathology is seen in 15¹⁰–42%^{11,12} patients of acute stroke. The number of first-time stroke patients recorded in 2013, was about 10.3 million.¹³ With such a high global burden, the accurate validation of poststroke aphasia assessments is vital for resource allocation.⁹

Neuroimaging reveals a correlation between lesion site and aphasia occurrence with recovery being dependably predicted based on lesion site and size.^{14,15} Imaging methods only characterize the lesion¹⁶ and further defining of language impairment will require additional bedside tests and clinical evaluation.¹⁷

Commonly used stroke scales are:

- The ESS- European Stroke Scale¹⁸
- CNS- Canadian Neurological Scale¹⁹
- NIHSS- National Institutes of Health Stroke Scale.²⁰

Many of these scales have not been specifically validated for use in hyperacute stroke, despite being used for managing the same.²¹

Brief screening tools such as the Frenchay screening test,²² may be used by health professionals who are not specialists,^{21,24,25} to identify and promptly refer patients who are at-risk.^{21,22-25} Such tools usually do not test writing and reading.²³ They are thereby not comprehensive and thereby not useful in isolation, for diagnosis.²⁶ Other common, more elaborate speech pathology tools are:

- Acute aphasia screening protocol²⁷
- Western aphasia battery-bedside²⁸
- Mount wilga high-level language test²⁹
- Sklar aphasia scale³⁰
- Aachen aphasia bedside test³¹
- The Bedside evaluation screening test (BEST-2)³²
- Aphasia language performance scales³³
- Aphasia screening test.³⁴

The shortfall of these tests is that their metrics are reported in their test manuals and not within peer-reviewed journals.

WAB has been utilized in our study.

Western Aphasia Battery (WAB)

The WAB is a Language assessment tool, used to test for Aphasia in patients between 18 and 89 years of age. The WAB has positive attributes such as validity and high consistency.³⁵ The WAB, by design, has several subtest criteria and tests all language modalities. It also tests "higher cortical functioning." Pearson Assessments published the revised edition (WAB-R) in 2006, which also included a bedside screening test (Table 2).

MATERIALS AND METHODS

Study Design

An observational study was done at a tertiary center in West Bengal.

Study Population

Patients admitted to the Neurology ward.

Table 1: Characteristic features of types of aphasia

Type	Fluency	Comprehension	Repetition
Broca's	Nonfluent	Good	Poor
Transcortical motor	Nonfluent	Good	Good
Wernicke's	Fluent	Poor	Poor
Transcortical sensory	Fluent	Poor	Good
Global	Nonfluent	Poor	Poor
Conduction	Fluent	Good	Poor

Table 2: Taxonomy of WAB

Criteria for classification				
	Fluency	Comprehension	Repetition	Naming
Global	0–4	0–3.9	0–4.9	0–6
Broca's	0–4	4–10	0–7.9	0–8
Isolation	0–4	0–3.9	5–10	0–6
Transcortical motor	0–4	4–10	8–10	0–8
Wernicke's	5–10	0–6.9	0–7.9	0–9
Transcortical sensory	5–10	0–6.9	8–10	0–9
Conduction	5–10	7–10	0–6.9	0–9
Anomic	5–10	7–10	7–10	0–9

Sample Design

Inclusion criteria

Cerebrovascular accident (CVA) patients, including:

- Patients with ischemic stroke.
- Patients with hemorrhagic stroke.
- Medically stable patients.

Exclusion Criteria

- Recurrent stroke.
- Hemodynamically unstable patients.
- Unconscious patients.
- Subarachnoid hemorrhage.
- Agitation and possible inability to cooperate.
- Severe movement disorders (Dyskinesia)
- Patients with any other progressive neurological condition such as parkinsonism, schizophrenia.
- Mentally impaired patients who cannot provide proper informed consent and who would be uncooperative for examination.
- Patients of childhood stroke syndromes with various underlying genetic defects are excluded as they may skew the inferences, as a result of the differences in their baseline physiology.

Sample Size

- Total 50 cases.

Study Tools

- History including Past History of any Cerebrovascular event.
- Basic Hematology includes Complete blood count, platelets, BT/CT, urea, creatinine, and serology.
- Evaluation of Mode of communication (verbal/nonverbal).
- Western Aphasia Battery (WAB) for language status evaluation.

Study Technique

- This is a time-bound cross-sectional study.

- The study was done for a period of 1 year.
- Minimum of 50 post CVA patients will be selected consecutively based on inclusion and exclusion criteria.
- The region of CNS involved will be ascertained based on the expert radiological opinion of the imaging that would have already been done and if documentation is unavailable, the necessary radiological imaging will be performed.
- Language function will be assessed clinically, to look for the presence and type of defect if any, and then using the WAB scoring system the degree of impairment of language will be ascertained in the four dimensions of fluency, auditory-verbal comprehension, repetition, and naming. Subscores will be based on the taxonomic table. Accordingly, aphasia can be classified and an Aphasia quotient (AQ) can be determined. The language was classified as normal if an AQ of 93.8 or above was achieved.

The findings of our study have been summarized in (Tables 3 to 9). (Fig. 1) represents the ages of subjects in the present study. (Fig. 2) represents the relative percentages of the various types of Aphasia we had observed in the present study. (Fig. 3) depicts the percentage of CVA patients who had normal speech and those with varying degrees of Aphasia as determined by Aphasia Quotient. (Fig. 4) represents the significant association observed between Left sided lesions and presence of Aphasia.

Table-4 states the relationship with type of pathologic process with presence of Aphasia. There was no statistically significant relationship present ($p > 0.05$)

From Table-5, we infer that the parameters were not associated with each other ($p > 0.05$)

Table 3: Frequency of different cerebrovascular insult in our study

Insult classification	Frequency	%
Hemorrhage	16	32.0
Infarct	34	68.0
Total	50	100.0

Table 4: Type of pathologic process—presence of aphasia

Insult	Present		Absent		Total		Results
	No	%	No	%	No	%	
Hemorrhage	6	12.0	10	20.0	16	32.0	$\chi^2 = 0.061$ df = 1 $p = 0.804$
Infarct	14	28.0	20	40.0	34	68.0	
Total	20	40.0	30	60.0	50	100.0	

Table 5: Site of lesion with type of aphasia

Type	Cortical		Corti-cosubcortical		Subcortical		Total		Results
	No	%	No	%	No	%	No	%	
Anomic	2	10.0	0	0	0	0.0	2	10.0	$\chi^2 = 16.306$ df = 10 $P = 0.091$
Broca's	0	0.0	1	5.0	2	10.0	3	15.0	
Global	4	20.0	1	5.0	5	25.0	10	50.0	
T/C sensory	3	15.0	0	0.0	0	0.0	3	15.0	
TCM	0	0.0	1	5.0	0	0.0	1	5.0	
Wernicke's	0	0.0	0	0.0	1	5.0	1	5.0	
	9	45.0	3	15.0	8	40.0	20	100.0	

From Table 6, we observe that the frequencies of Anomic, Broca, Global, T/C sensory, T/C Motor and Wernickes aphasia were 10%, 15%, 50%, 15%, 5% and 5%, respectively.

Table-7, states the frequency of the different classes of aphasia in our study. Out of the aphasics, 30 % were fluent, and 70 % were nonfluent

Table-8, categorizes the AQ values from our study. Among them, the values were normal in 60% and mild aphasia was 4%, moderate aphasia was 12% and severe aphasia was 24% (Fig. 3)

From Table 9 Figure 4 we can infer the association of left side lesions with aphasia incidence ($p < 0.05$)

RESULTS

In our study (Fig. 1),

- The mean age of females was observed to be 58.1 ± 11.3 years.
- The mean age of males was 70.0 ± 7.7 years.
- The range of ages was 38–79 years.

Table 6: Types of aphasia

S. No.	Types of aphasia	Frequency	Percentage
1	Anomic	2	10.0
2	Broca's	3	15.0
3	Global	10	50.0
4	T/C sensory	3	15.0
5	TCM	1	5.0
6	Wernicke's	1	5.0
Total		20	100.0

Table 7: Class of aphasia

S. No	Types of aphasia	Frequency	Percentage
1	Fluent	6	30.0
2	Nonfluent	14	70.0
Total		20	100.0

Table 8: Category of aphasia according to the AQ values

S. No.	Severity	AQ values	Frequency	%
1	Normal	93.8	30	60.0
2	Mild	75–93.8	2	4.0
3	Moderate	50–74	6	12.0
4	Severe	< 50	12	24.0
Total			50	100.0

Table 9: Association of aphasia incidence with lesion side

Insult side	Present		Absent		Total		Significance
	No	%	No	%	No	%	
B/L	0	0.0	1	3.3	1	2.0	$\chi^2 = 12.508$ $df = 2$ $P = 0.002$
Left	19	95.0	14	46.7	33	66.0	
Right	1	5.0	15	50.0	16	32.0	
Total	20	100.0	30	100.0	50	100.0

Fig. 1: Representation of ages of subjects

Fig. 3: Categories of aphasia

Fig. 2: Distribution of types of aphasia

Fig. 4: Association of aphasia incidence with lesion side

DISCUSSION

- In our study, the ages of patients lie between 38 and 80 years of age, with a maximum number in the age group of 51–60 years (36.7%). All patients were right-handed.

In our study, there was a greater number of patients with Infarction as the pathologic process, than the ones with Hemorrhage as the pathologic process. In a similar study done for poststroke aphasia, the ischemic stroke had predominance.³⁶

Pure subcortical lesions were seen in 40% of our cases. In our study young stroke (stroke in patient under 50 years of age), was present in seven cases (14%) which was lower than the count seen in another earlier study.³⁶

- Aphasia was present in 20 patients (40%). In similar studies, the frequency of poststroke Aphasia ranged between 21 and 38%.³⁷ In our study, there was no significant association between the type of vascular insult and the type of aphasia. A similar result was seen in another study in patients with stroke-related aphasia.³⁶

Our study had one patient with crossed aphasia (4%). In earlier stroke studies, crossed aphasia had an observed prevalence between 0.4 and 3.5%.^{38,39}

- In our study, nonfluent aphasia was predominant, with the descending order of frequencies of the subtypes being:
- Global aphasia (50%)
- Broca's aphasia (15%)
- Transcortical sensory aphasia (15%),
- Anomic aphasia (10%),
- Transcortical motor aphasia (5%),
- Wernicke's aphasia (5%)
- Conduction aphasia- Nil.

Overall, 70% of the aphasics in our study had nonfluent aphasia. Prior studies³⁹⁻⁴¹ have also reported a similar incidence of nonfluent aphasia.

Anomic aphasia had a frequency of 16–25% in earlier studies^{40,42} but was seen in only 10% of cases in our study. The frequency of other subtypes was also seen to differ from earlier studies.

- Using the Aphasia Quotient derived from WAB to classify the aphasia in the affected patients, we had a greater number of cases in the "Severe" grade. An earlier study had similar results.³⁶
- In our study, the site of stroke and the observed type of aphasia were not correlated to any significant extent. Certain earlier

studies in stroke patients⁴²⁻⁴⁴ had seen a correlation between the aphasia type and location of lesion, while certain other studies did not.^{45,46}

CONCLUSION

- The frequency of poststroke aphasia was higher in our study (40%) than that seen in earlier studies.
- Based on the Aphasia Quotient obtained from the Western Aphasia Battery, we categorized the aphasia as mild (4%), moderate (12%), and severe (24%).
- The aphasia types observed in our study were:
 - Anomic (10%)
 - Broca (15%)
 - Global (50%)
 - Transcortical sensory (15%)
 - Transcortical motor (5%)
 - Wernicke's aphasia (5%).
- Vascular insult type and the variety of aphasia present were not associated significantly.
- We have seen a preponderance of nonfluent aphasia in our study with global aphasia (50%) being the commonest subtype.
- We had also attempted to determine the presence of any association between the localization of lesion and type of aphasia. However, no such significant association was found.
- A significant association was detected between lesions located topographically on the left side and the occurrence of aphasia.

LIMITATIONS

- The study was retrospective in nature.
- In our study, we divided the lesions according to clinical features and therefore lesion classification depended on the investigator's discretion.
- The study would have been more useful if the functional recovery and other characteristics associated with the subitems were investigated with a follow-up visit with patients who showed various aphasias.
- In our study, we had not given weightage to lesion volume and severity.
- Our study had only right-handed patients.

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