

The Dynamics of Aphasia (Paraphasia and Perseveration) During the Stroke Recovery Period

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Abstract This study investigates the clinical presentation and temporal progression of aphasia—specifically, literal paraphasia, verbal paraphasia, and perseveration—during the acute and recovery phases of ischemic stroke. Aphasia remains one of the most disabling consequences of stroke, affecting nearly one-third of patients and significantly hindering their ability to communicate, thereby disrupting personal, social, and emotional well-being. The research involved 110 aphasic patients treated between 2021 and 2024 at the multidisciplinary clinic of the Tashkent Medical Academy, divided into two groups: 65 in the acute stage and 45 in the recovery stage. Analysis revealed that literal (phonemic) paraphasia was significantly more common in the acute phase (69.2%) than in the recovery phase (26.7%), indicating that early post-stroke speech impairments are largely phonological in nature. In contrast, verbal (semantic) paraphasia increased during the recovery stage (57.8% versus 30.8%), suggesting a shift toward higher-level language processing deficits as neural reorganization occurs. Perseveration, characterized by the involuntary repetition of words or syllables, was not observed during the acute stage but emerged in 15.6% of patients in the recovery group, indicating deeper cortical involvement and the possible effects of insufficient rehabilitation. These findings demonstrate the dynamic nature of post-stroke aphasia and underscore the need for phase-specific and individualized rehabilitation strategies. Emphasis should be placed on correcting phonemic errors during the acute phase and addressing semantic deficits and stereotyped speech patterns during recovery. Without timely and appropriate intervention, these impairments may worsen and lead to persistent communication dysfunction, adversely affecting reintegration and quality of life. The statistically significant differences observed ($\chi^2 = 19.3$ and $\chi^2 = 7.97$; $P < 0.01$) further validate the clinical relevance of these symptom patterns and support their use in evaluating rehabilitation outcomes.

Keywords Cerebrovascular disease, Stroke, Paraphasia, Perseveration, Recovery period

1. Introduction

Each year, approximately 12.2 million individuals worldwide are affected by stroke [1]. As many as 40% of individuals who survive a stroke initially develop aphasia [2], a condition that impairs both language comprehension and production. Since language is fundamental to communication in familial, social, and professional settings, aphasia often leads to substantial psychosocial challenges [3] and a diminished quality of life related to health [4]. Speech and language therapy has been shown to be an effective intervention for individuals with aphasia [5,6,7], and meta-analyses of extensive patient-level data indicate that those who receive therapy that is intensive, frequent, and personalized tend to experience more favorable outcomes [8]. In real-world clinical settings, individuals with aphasia often receive only minimal therapy [9,10,11], and the limited availability of clinical resources

may be used suboptimally due to insufficient knowledge about which specific treatments are most effective for different patient profiles [12,13]. Providing effective and personalized aphasia treatment that maximizes the use of available resources requires a comprehensive understanding of the individual characteristics of people with aphasia—such as their sociodemographic background, type and severity of stroke, and specific features of their language impairment—as well as insight into the quality and type of care they receive and the outcomes they value and attain. At present, there is a lack of routinely collected data to inform this understanding [14,15], and only limited benchmarks exist to measure therapy success from the patient's perspective, making it difficult to determine when meaningful progress has been achieved [16]. Speech is a fundamental means of human communication, a marker of etiquette and moral values, and an indicator of intellectual development. It is one of the most essential functions that distinguishes humans. Normal speech production depends on the coordinated function of various parts of the brain. Speech impairments are observed in approximately one-third of stroke patients. Deficiencies in speech significantly impact the patient's personal,

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family, and social life, leading to social and psychological maladaptation.

2. The Aim of the Study

To assess the clinical manifestation and dynamics of aphasia (literal and verbal paraphasia, and perseveration) during the stroke recovery period.

3. Materials and Methods

Between 2021 and 2024, we studied 110 patients with post-stroke aphasia who were treated under inpatient conditions at the intensive neurology and neurology departments of the multidisciplinary clinic of the Tashkent Medical Academy. For the purpose of investigating speech disorders, the patients were divided into two groups: Group 1: 65 patients with aphasia in the acute stage of stroke; Group 2: 45 patients with aphasia in the recovery stage of stroke. During the stroke recovery period, the most common speech symptoms observed were paraphasia and perseveration. Paraphasias are characterized by the incorrect or inappropriate use of sounds or words, often involving their substitution with irrelevant or mismatched speech elements.

When individual, unstable sounds are incorrectly replaced (e.g., saying “TALEB” or “TALBE” instead of “TABLE”), this is referred to as literal (phonemic) paraphasia. Patients with literal paraphasia may misuse or omit certain phonemes or add new ones. These substitutions result from disruptions in the sensory or motor control of speech.

When an entire word is replaced with another word that is phonologically or semantically similar (e.g., using “MAP” instead of “CAP” or “HAT” instead of “KAT”), this is known as verbal (semantic) paraphasia. In such cases, patients tend to substitute target words with alternatives that are meaningfully close, relying only on partial cues. For example, instead of saying “water,” a patient might say “to drink” or “that thing.” These verbal paraphasias are considered to result from semantic and mnemonic disturbances associated with widespread damage to the frontal, temporal, and parietal lobes. The presence of paraphasias in stroke patients indicates impaired comparative processing of individual phonemes and words. The nature of paraphasias can vary across aphasia types, often providing important diagnostic clues.

Perseveration refers to the involuntary, persistent repetition of a word, syllable, or even motor activity. It is typically due to the inertia of neural processes, where the signal to terminate a speech act is delayed. Clinically, perseveration may resemble clonic stuttering, manifesting as frequent, involuntary repetitions of a sound or syllable (e.g., “ma-ma-ma-machine”).

4. Results and Discussion

During the stroke recovery phase, 65 patients demonstrated paraphasic speech patterns. Paraphasia, in this context, was

defined as the inaccurate or inappropriate use of speech sounds or words in response to a given speech task, often involving substitution with irrelevant elements.

The misuse, omission, or addition of individual phonemes was classified as literal paraphasia, stemming from disruptions in sensory or motor speech control mechanisms.

As patients progressed in recovery, their speech showed a tendency to substitute entire words with semantically related alternatives — a phenomenon categorized as verbal paraphasia.

Table 1. Indicators of Speech Recovery Dynamics in Aphasic Patients During the Post-Stroke Recovery Period

	Group 1 (n=65)		Group 2 (n=45)		χ^2	P
	abs	%	abs	%		
Literal Paraphasia	45	69,2	12	26,7	19,3	<0,01
Verbal Paraphasia	20	30,8	26	57,8	7,97	<0,01
Perseveration	-	-	7	15,6	-	-

The dynamics table (Table 1) reflecting the recovery phase of aphasic patients' speech presents the distribution of the primary speech impairments—literal paraphasia, verbal paraphasia, and perseveration—across two patient groups. The table allows for comparative analysis of the progression of these disorders and the effectiveness of rehabilitation between the groups.

In the acute phase of stroke, literal paraphasia (phonemic errors) was the most frequent type of impairment, observed in 45 out of 65 patients (69.2%) in Group 1, compared to 12 out of 45 patients (26.7%) in Group 2 during the recovery phase ($\chi^2 = 19.3$; $P < 0.01$). This significant difference suggests that literal paraphasias are more prevalent during the acute stage, indicating more severe phonemic disruption in early stroke.

Verbal paraphasia was observed in 20 patients (30.8%) in Group 1, which was relatively lower compared to literal paraphasia. This reflects more prominent damage to Broca's area, typically associated with phonemic disturbances in the frontal lobe during the acute stage.

In Group 2, during the recovery stage, literal paraphasias were observed less frequently (12 patients, 26.7%), indicating positive dynamics of phonemic recovery over time. However, verbal paraphasia became more common, present in 26 patients (57.8%). This indicates increased semantic substitution errors and wider disruption in semantic processing. The statistical significance ($\chi^2 = 7.97$; $P < 0.01$) confirms that these changes can be used as a reliable indicator to assess the differential effectiveness of rehabilitation or treatment approaches.

These findings suggest that, during the recovery phase, speech impairments shift from the phonemic level (sounds, letters) to the lexical-semantic level (words, meanings). In dynamic progression, patients demonstrate increased lexical range and use of complex structures, though meaning-related errors may persist.

Another prominent and severe speech disorder is perseveration. In the recovery stage, speech may not fully disappear but may fail to perform its communicative

function; still, some "sparks" of speech may remain, often in the form of perseverative emboli.

Perseveration, a severe speech impairment, was not observed in Group 1 during the acute phase. However, during the recovery phase, it emerged in 7 patients (15.6%) in Group 2, manifesting as stereotyped verbal expressions replacing meaningful speech. These were sometimes reflexive repetitions of a syllable or word like "da-da-da" in response to any stimulus, including greetings or questions. Even when trying to initiate speech, the patient repeated the same sound or phrase in varying intonations.

Perseveration was observed only in Group 2, indicating that it may develop later as a consequence of more extensive damage to cortical speech zones, which becomes clinically evident over time. The χ^2 and P values for both types of paraphasia and perseveration were statistically significant ($P < 0.01$), further supporting the validity of the observed intergroup differences.

5. Conclusions

In summary, the dynamics of aphasia during stroke recovery reveal key differences in the manifestation of speech disorders between the acute and recovery phases:

1. Literal paraphasia (phoneme-level errors) was significantly more common during the acute phase (69.2%) and markedly decreased during the recovery phase (26.7%), indicating phonemic improvement over time.
2. Verbal paraphasia (semantic substitutions) was less frequent in the acute phase (30.8%) but increased during recovery (57.8%), reflecting an expansion of the speech lexicon despite ongoing semantic inaccuracies.
3. Perseveration (involuntary repetition of a word or sound) was observed only during the recovery phase (15.6%), indicating delayed onset of deeper cortical damage when rehabilitation was inadequate.

These findings emphasize the need for individualized and staged rehabilitation approaches in post-stroke aphasia treatment. Attention should be paid to phonemic errors during the acute phase and to semantic and stereotyped errors during the recovery period. If appropriate rehabilitation measures are not implemented in time, speech disorders may worsen, progressing to severe forms such as perseveration, which significantly impair social integration and quality of life.

The results of statistical analysis ($\chi^2 = 19.3$ and $\chi^2 = 7.97$; $P < 0.01$) confirm the reliability of these findings and demonstrate their importance as key indicators in evaluating the effectiveness of various rehabilitation strategies.

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