



Rare and Mysterious Speech Disorders in Acute Stroke: A Prospective Observational Study

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KEYWORDS

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ABSTRACT:

Background: Rare motor speech disorders in acute stroke, including aphemia, foreign accent syndrome, acquired stuttering, and opercular syndrome, are often misdiagnosed as aphasia despite preserved comprehension and writing skills. Early recognition is crucial for targeted therapy and accurate lesion localization.

Aim: To identify and characterize rare motor speech disorders in acute stroke, document their lesion correlates, and compare findings with existing literature.

Methods: This prospective observational study included acute stroke patients with speech-output impairment but preserved comprehension and writing ability, admitted between June 2023–December 2024. Diagnosis was made using a structured bedside protocol. MRI lesion mapping was performed for all patients.

Results: Thirty patients (mean age 58.2 ± 11.7 years; 18 males) were included. Ischemic stroke occurred in 24 (80%) and hemorrhagic stroke in 6 (20%). Apraxia of speech and dysarthria each occurred in 33.3%, aphemia in 13.3%, opercular syndrome in 13.3%, foreign accent syndrome in 3.3%, and acquired stuttering in 3.3%. Lesions were syndrome-specific.

Conclusion: Rare motor speech syndromes in stroke can be identified at the bedside when comprehension and writing are intact. Lesion mapping supports distinct neuroanatomic substrates for each disorder, in agreement with previous studies.

INTRODUCTION

Motor speech disorders are impairments in the planning, programming, or execution of speech movements without primary language deficits¹.

The major categories include:

- Apraxia of Speech: A disorder of programming of articulation of sequences of phonemes, especially consonants, in the absence of weakness, slowness, or incoordination of speech muscles^{2,3}. Consonants are more often substituted than distorted, errors are inconsistent, and initiation of speech is particularly difficult. The four cardinal features are: (1) effortful, trial-and-error attempts with self-correction; (2)

dysprosody; (3) inconsistent articulation errors; (4) difficulty initiating utterances^{2,3}. Lesions most often involve the left insula or traditional Broca's area^{4,5}.

- Aphemia: A syndrome of near-muteness with preserved comprehension, reading, and writing, representing a motor speech disorder rather than an aphasia⁶. Often associated with lesions of the face area of the primary motor cortex or Broca's area^{7,8}.
- Foreign Accent Syndrome: An acquired motor speech disorder, typically post-stroke, in which altered prosody and articulation create the impression of a foreign accent^{9,10}. Lesions



usually involve the dominant hemisphere motor cortex.

- Acquired Stuttering: A post-lesional speech dysfluency resembling developmental stuttering, characterized by hesitancy in producing initial phonemes and speech dysrhythmia^{11,12}. It may result from cortical or subcortical strokes, including basal ganglia infarcts¹³.
- Opercular Syndrome (Foix–Chavany–Marie): Severe pseudobulbar palsy due to bilateral opercular or perisylvian lesions, with loss of voluntary control over cranial musculature but preserved automatic movements (automatic–voluntary dissociation)^{14,15}.

This report presents three representative cases and summarizes findings from a prospective observational study conducted at a tertiary neurology center.

CASE PRESENTATIONS

Case 1: Apraxia of Speech A 56-year-old man presented with sudden inability to speak fluently. Comprehension, naming, and writing were preserved. Speech output was characterized by inconsistent errors, trial-and-error articulatory attempts, effortful initiation, and dysprosody.

Imaging: DWI MRI revealed a hyperintense lesion in the left frontal gyrus

Case 2: Opercular Syndrome (Foix–Chavany–Marie)

A 25-year-old woman developed an acute inability to perform orofacial movements voluntarily. She could not protrude her tongue or whistle on command but could laugh and cry spontaneously, demonstrating automatic–voluntary dissociation. Comprehension and writing remained intact. Examination showed pseudobulbar features.

Imaging: DWI MRI demonstrated a hyperintense lesion in the left opercular region

Case 3: Foreign Accent Syndrome

A 49-year-old woman developed an altered speech pattern following a left middle cerebral artery infarct. Relatives reported that her speech carried an unfamiliar "foreign" intonation. Examination showed prosodic disturbance and systematic vowel distortions. Comprehension and writing were unaffected.

Imaging: DWI MRI brain showed an acute infarct in the left inferior frontal gyrus.

Design and Setting: Prospective observational study conducted in the Department of Neurology, Madurai

Medical College Hospital, from June 2023 to December 2024.

Ethics: Written informed consent from all participants obtained.

Inclusion Criteria: Adults (≥ 18 years) with acute ischemic or hemorrhagic stroke confirmed by MRI within 7 days of onset; speech-output abnormality with preserved comprehension and writing.

Exclusion Criteria: Pre-existing speech or language disorders; aphasia confirmed by Western Aphasia Battery; cranial nerve palsy affecting speech articulation; severe cognitive impairment (MMSE < 18).

Speech Assessment Protocol

1. Bedside Examination:

- Spontaneous Speech: Narrative description of a picture or daily routine
- Repetition Tasks: Single words, multisyllabic words, and short sentences
- Diadochokinetic Rates: Rapid alternating syllables ("pa-ta-ka") recorded and timed
- Reading Aloud: Standardized passages to observe prosody and articulation
- Writing Task: Sentence dictation to confirm preserved written expression

2. Classification of Motor Speech Disorder:

- Dysarthria vs. Apraxia of Speech: Based on perceptual features (e.g., consistent slurring versus trial-and-error articulatory attempts)
- Rare Syndromes Identification:
 - Aphemia: Near absence of speech with normal writing and comprehension
 - Foreign Accent Syndrome: Systematic shifts in vowel quality or prosodic pattern judged by two independent speech-language pathologists
 - Acquired Stuttering: Emergence of core stuttering behaviors (repetitions, prolongations, blocks) in an adult-onset pattern
 - Opercular Syndrome: Automatic-voluntary dissociation confirmed by inability to perform voluntary orofacial movements despite preserved automatic reflexes

Neuroimaging: MRI (DWI, T1, FLAIR). Lesions were mapped using MRICron and reviewed by a neuroradiologist.



RESULTS

Demographic and Stroke Characteristics

A total of 30 patients were included in the study. The mean age was 58.2 ± 11.7 years (range 34–82 years). Of the cohort, 18 were male and 12 were female. Ischemic stroke was the predominant type, observed in 24 patients (80%), while hemorrhagic stroke occurred in 6 patients (20%).

Distribution of Motor Speech Syndromes

Motor speech syndromes were identified in all patients and showed heterogeneous patterns. Apraxia of speech and dysarthria were the most frequent, each affecting 10 patients (33.3%). Apraxia of speech was associated predominantly with lesions involving the left anterior insula and ventral premotor cortex, occurring in 9 ischemic strokes and one hemorrhagic stroke, with a mean age of 57.1 ± 10.3 years. Dysarthria was linked to lesions of the internal capsule or corona radiata, observed in 7 ischemic and three hemorrhagic strokes, with a mean age of 60.5 ± 9.8 years.

Aphemia was diagnosed in 4 patients (13.3%), all with ischemic strokes involving the left inferior frontal gyrus with or without insular involvement, with a mean age of 55.0 ± 8.9 years. Opercular syndrome was observed in 4 patients (13.3%), equally distributed between ischemic ($n=2$) and hemorrhagic ($n=2$) strokes, and was associated with bilateral frontal opercular lesions (mean age 62.7 ± 12.4 years).

Less common syndromes included foreign accent syndrome in 1 patient (3.3%) following an ischemic stroke involving the left inferior frontal gyrus (age 49 years), and acquired stuttering in 1 patient (3.3%) with ischemic stroke affecting the left putamen and claustrum (age 66 years).

Table 1: Demographic and Stroke Characteristics

Variable	Value	Range
Total patients	30	–
Mean age \pm SD (years)	58.2 ± 11.7	34–82
Sex (M/F)	18 / 12	–
Ischemic stroke	24 (80%)	–
Hemorrhagic stroke	6 (20%)	–

Table 2: Distribution of Motor Speech Syndromes

Syndrome	n (%)	Lesion Site(s)	Stroke Type	Mean Age \pm SD
Apraxia of Speech	10 (33.3)	Left anterior insula + ventral premotor cortex	9 ischemic, 1 hemorrhagic	57.1 ± 10.3
Dysarthria	10 (33.3)	Internal capsule / corona radiata	7 ischemic, 3 hemorrhagic	60.5 ± 9.8
Aphemia	4 (13.3)	Left inferior frontal gyrus \pm insula	4 ischemic	55.0 ± 8.9
Opercular Syndrome	4 (13.3)	Bilateral frontal opercula	2 ischemic, 2 hemorrhagic	62.7 ± 12.4
Foreign Accent Syndrome	1 (3.3)	left inferior frontal gyrus	1 ischemic	49
Acquired Stuttering	1 (3.3)	Left putamen + claustrum	1 ischemic	66

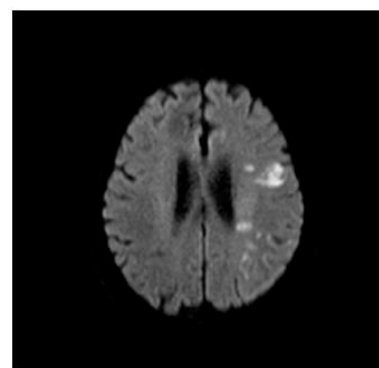


Figure 1 of apraxia patient: DWI MRI brain images showing a hyperintense lesion in the left frontal gyrus, representing an acute infarct

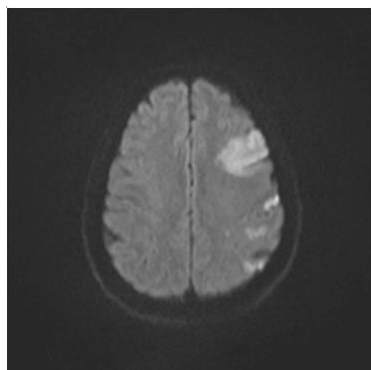


Figure 2: DWI MRI brain images demonstrating a hyperintense infarct in the left opercular region, corresponding to Opercular Syndrome

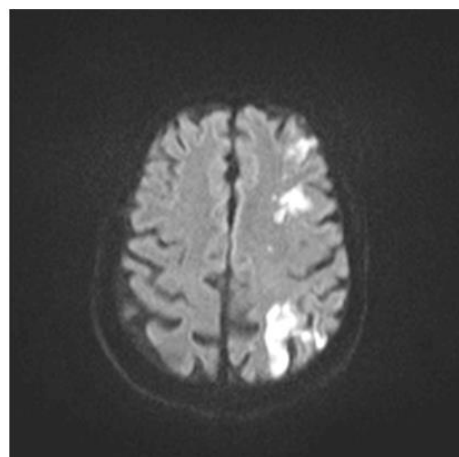


Figure 3 of foreign accent syndrome: DWI MRI brain showing an acute infarct in the left inferior frontal gyrus.

DISCUSSION

This study demonstrates that rare motor speech disorders can be identified in acute stroke when comprehension and writing remain intact. Apraxia of speech and dysarthria were most frequent, while aphemia, opercular syndrome, foreign accent syndrome, and acquired stuttering were less common. Each showed consistent lesion patterns, reinforcing their distinct neuroanatomical substrates.

Our results align with prior literature: apraxia localized to the left insula and premotor cortex, dysarthria to the internal capsule, aphemia to the inferior frontal gyrus, opercular syndrome to bilateral opercular regions, and acquired stuttering to basal ganglia circuits. The single case of foreign accent syndrome involved the left inferior frontal gyrus region, supporting its association with prosodic control. Targeted screening likely explains the

higher frequency of these syndromes compared with unselected stroke cohorts.

Recognition of these disorders is important for accurate diagnosis, lesion localization, and rehabilitation planning. Misclassification as aphasia may delay appropriate therapy, whereas identifying the correct syndrome allows for focused interventions. Limitations include a small sample size, a single-center design, and reliance on bedside assessments. Larger multicenter studies using advanced neuroimaging and objective speech analysis are needed to better understand recovery and refine management strategies.

Apraxia of speech cases involved the left anterior insula and ventral premotor cortex, consistent with Dronkers⁴ and Hillis *et al.*⁵. Dysarthria was linked to internal capsule lesions, matching Ackermann and Hertrich¹⁶ and Richardson *et al.*¹⁷. Aphemia cases localized to the inferior frontal gyrus, aligning with Alexander *et al.*⁶. Foreign accent syndrome involved the left inferior frontal gyrus region, as in Kurowski *et al.*⁹ and Mariën *et al.*¹⁰. Acquired stuttering was associated with basal ganglia lesions, consistent with Ciabarra *et al.*¹³. Opercular syndrome cases showed bilateral opercular involvement, as described by Bogousslavsky *et al.*¹⁵. Our targeted screening likely explains the higher incidence of these syndromes compared to unselected stroke cohorts.

CONCLUSION

This study demonstrates that rare motor speech disorders such as apraxia of speech, aphemia, opercular syndrome, foreign accent syndrome, and acquired stuttering can be reliably recognized in acute stroke when comprehension and writing remain intact. Each syndrome shows a distinct lesion pattern, reaffirming its neuroanatomical basis. Early identification enables accurate diagnosis and targeted rehabilitation, improving communication outcomes. Incorporating structured speech assessment into stroke evaluation can prevent misclassification as aphasia and facilitate timely therapy.

LIMITATIONS

A small sample size, a single-center design, and reliance on bedside clinical assessment limit the study.

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