European Journal of Clinical and Experimental Medicine

ONLINE FIRST

Authors: Isha Wosti

Article type: Case Report

Received: 4 June 2025

Accepted: 19 August 2025

Published online: 25 November 2025

eISSN: 2544-1361

Eur J Clin Exp Med

doi:10.15584/ejcem.2026.1.3

From diagnosis to therapy – mixed hyperkinetic-hypokinetic dysarthria – a comprehensive case study

Isha Wosti

Audiology and Speech Language Pathology, BASLP Audiology Officer, Pokhara Academy of Health Sciences, Pokhara, Nepal

Corresponding author: Isha Wosti, e-mail: ishawosti@gmail.com, isha.764402@mmc.tu.edu.np

ORCID

IW: https://orcid.org/0009-0003-2814-1163

ABSTRACT

Introduction and aim. Progressive dysarthria and dysphagia pose substantial diagnostic and therapeutic challenges. This case report aims to describe the assessment and intensive structured management of a patient with chronic, functionally limiting dysarthria and dysphagia.

Description of the case. The patient was a 38-year-old male with neuroacanthocytosis syndrome. Dysarthria diagnosis was established through auditory-perceptual profiling and acoustic analysis, confirming a mixed hyperkinetic-hypokinetic pattern. Clinical bedside evaluation of swallowing was done, which revealed severe oral dysphagia. Speech therapy was conducted using the hierarchy of motor speech treatment, targeting various motor speech bases. Additionally, severe oral phase dysphagia was managed using rehabilitative, compensatory, and modified diet approaches.

Results. Improvements were noted across all motor speech bases, supported by subjective reports and objective data. The patient's self-reported measures, as well as the improvement in voice quality (AVQI score decreased from 4 to 2.95), improved intelligibility (from 30 to 75%), and decreased speech rate (4.36 to 2.53 syllables/second) showed substantial improvement in dysarthria. Similarly, safe swallowing was achieved at IDDSI Levels 4–6 with compensatory strategies.

Conclusion. This case illustrates that even rare and chronic forms of dysarthria can respond positively to structured, intensive speech-language therapy, underscoring the importance of individualized, comprehensive intervention approaches.

Keywords. dysphagia, mixed dysarthria, movement disorder, neuroacanthocytosis, progressive dysarthria, speech therapy

Introduction

Dysarthria and dysphagia frequently occur in progressive neurological disorders, including amyotrophic lateral sclerosis, multiple sclerosis, myasthenia gravis, and Parkinson's disease (PD).[1,2] Dysarthria is a collective name for a group of neurologic speech disorders that reflect abnormalities in the strength, speed, range, steadiness, tone, or accuracy of movements required for the breathing, phonatory, resonatory, articulatory, or prosodic aspects of speech production.[3] On the other hand, dysphagia is difficulty in swallowing, characterized by an abnormal delay in the transit of liquid or solid bolus from the oral cavity to the stomach.[4] Since dysarthria is marked by impaired voluntary oromotor control, it frequently co-occurs with dysphagia.[5] While the incidence of dysarthria varies in different neurological conditions, some degenerative conditions have an incidence of up to 90%.[6]

This case report aims to describe the comprehensive assessment and speech therapy intervention for a patient with chronic progressive dysarthria and dysphagia secondary to neuroacanthocytosis (NA) syndrome, a rare neurological disorder.. NA syndromes represent a group of rare, genetically distinct disorders marked by the presence of red blood cell acanthocytosis and progressive basal ganglia degeneration.[7] NA presents with a diverse range of symptoms, including both hyperkinetic movement disorders such as chorea, dystonia, and tics, and hypokinetic features like Parkinsonism. NA syndromes are categorized into core forms and other related disorders.[8] Each subtype has an estimated prevalence of fewer than 1 to 5 cases per million individuals.[9] Speech and swallowing impairments are consistently observed in these disorders and result from the progressive deterioration of motor control.[10] The patient in this study has a diagnosis of NA syndrome, and not a subtype, given the clinical phenotype and MRI findings, in the absence of conclusive genetic results of the particular subtype at this stage.

The unpredictable and relentlessly progressive nature of the underlying movement disorder leads to a gradual decline in communication and swallowing abilities and increased social isolation. This experience is unique for each individual and family. A multidimensional clinical protocol that integrates both clinician-reported measures and patient-reported outcomes is essential in comprehensive dysarthria assessment and management.[11] Such a protocol helps select the diagnostic tools and determine the timing of interventions, including the implementation of augmentative and alternative communication.[12]

In regards to management, clinical decision-making in the progressive conditions warrants the sequencing or staging of interventions so that current problems can be addressed and future problems anticipated.[2] However, evidence-based management practices for dysarthria are still limited[13], and Speech-Language Pathologists (SLPs) are found to employ inconsistent and varied treatment techniques.[14,15] Furthermore, the efficacy of speech therapy in progressive dysarthria remains debated, as some studies report limited or inconsistent evidence for long-term speech improvements in neurodegenerative conditions[16–18], citing disease progression as a limiting factor. However, there are reports of contrasting evidence in the study of

PD and related syndromes, which show that intensive behavioral interventions can mitigate motor speech decline.[19]

Aim

This case contributes to this discourse by examining the outcomes of intensive behavioral speech therapy in a case with progressive dysarthria and dysphagia.

Description of the case

This case report adheres to the ethical principles of the Declaration of Helsinki.[20] Ethical approval was not required due to the descriptive nature of the report; however, informed written consent for publication of anonymized clinical information was obtained from the patient and his family. The patient is a 38-year-old male. He presented to the Speech-Language Pathology Unit of Tribhuvan University Teaching hospital (TUTH) with clinical indications of imbalanced walking, and gross involuntary choreiform movement of the hand and leg, unclear speech, muscle atrophy, difficulty swallowing and chewing, drooling, weight loss, for 5 years. The problem had an episodic onset and was aggravated by anxiety. There was no significant family history of neurological or psychiatric disorders, head injury, or exposure to neurotoxins. He reported no issues with memory and language, and no family history of the disorder.

We utilized the International Classification of Functioning, Disability, and Health (ICF)[21] framework to understand the holistic impact of the condition. The involuntary movements of the trunk made it difficult to engage in activities of daily living. He lost his job at the bank, which was his sole source of income. He had been separated from his parents at a young age and was no longer on good terms with them. His pregnant wife was his sole caretaker. He had difficulty masticating, could no longer enjoy mealtimes, and had significant weight loss throughout the symptom progression. His disorder had isolated him from his friend circle, as he was no longer able to travel alone (Table 1).

Timeline

Table 1.Timeline of events

2015–2016	Onset of symptoms: episodic involuntary mouth movements, drooling, and sleep disturbances.
11/03/2019	First neurological consultation at a tertiary care hospital in Nepal; differential diagnoses included Tourette's syndrome and NA syndrome.
Mid-2019	Referred to an international referral center in Delhi, India, for further evaluation.

Late 2019	Peripheral smear showed normocytic normochromic red blood cells with acanthocytosis
2023	Magnetic resonance imaging of the brain showed bilateral caudate atrophy, enlarged frontal horns of lateral ventricles, and T2 hyperintensities in the putamina. Nerve conduction velocity test indicated bilateral peroneal pure motor axonal loss. Electromyography revealed a neurogenic pattern. Huntington's disease was ruled out via genetic testing. Whole Exome Sequencing one genetic variant of uncertain significance in the optineurin gene. Uncertain diagnosis of amyotrophic lateral sclerosis 12.
Current	Patient is under pharmacological management with Revocon 25 mg, Bexol 2 mg, and Serenace 0.5 mg. The patient was relieved of duties from his previous position at a bank.

Diagnostic Assessment

Colorado Motor Speech Framework (CMSF)

CMSF was used for structured, subsystem-based assessment of the patient's motor speech profile.[22] Recorded speech samples of sustained vowel, reading, and conversational speech were used for perceptual analysis. 16 characteristics that correspond to hypokinetic dysarthria and 8 characteristics that correspond to hyperkinetic dysarthria were observed; thus, he was diagnosed to have hypokinetic-hyperkinetic mixed dysarthria. Subsequent therapy planning was conducted based on CMSF findings.

Articulation assessment

Done using Photo Articulation Test-3.[23] Findings revealed hypernasality in stop sounds, and deaffrication of affricates.

Voice assessment

Voice assessment was conducted using a voice proforma involving a detailed history, aerodynamic, and acoustic analysis. The perceptual voice analysis was done using the grade, roughness, breathiness, asthenia, strain (G1 R1 B0 A0 S1) rating scale.[24] Rapid fluttering tremor was intermittently present on vowel prolongation, and Maximum Phonation Duration (MPD) was reduced – 5 seconds. Acoustic analysis was done using PRAAT software version 6.4.34. Acoustic Voice Quality Index (AVQI) v.03.01[25] was used to objectively quantify the voice quality, which incorporates multiple parameters including shimmer, jitter, harmonic-to-noise ratio (HNR), cepstral peak prominence (CPP), and formant-based measures. The speech samples used were a vowel prolongation /a/ and a reading sample of a 100-syllable passage. Recording was done using a smartphone microphone (Infinix Hot 10s) placed at 10 cm distance from the patient's mouth. The recording was done in a sound-treated room. An AVQI score of 4 was obtained (Table 2, Fig. 1).

Table 2. Dysarthria assessment findings (AVQI – acoustic voice quality index, DDK – diadochokinetic rate)

Speech characteristics	Fast rate of speech
	Variable rate of speech
	Stutter-like dysfluencies
	Monoloudness
	Loudness decay
	Maximum phonation time: 5 seconds
	Telescoping
	Hypernasality
	Irregular rhythm in DDK
	Rapid vocal flutter
	Reduced stress
	Atypical silences
	Imprecise consonants
	Fast rate of speech
	Variable rate of speech
AVQI	4.00
Speech Rate	4.36 syllable/second
GRBAS	G1R1B0A0S1

Speech intelligibility	30%

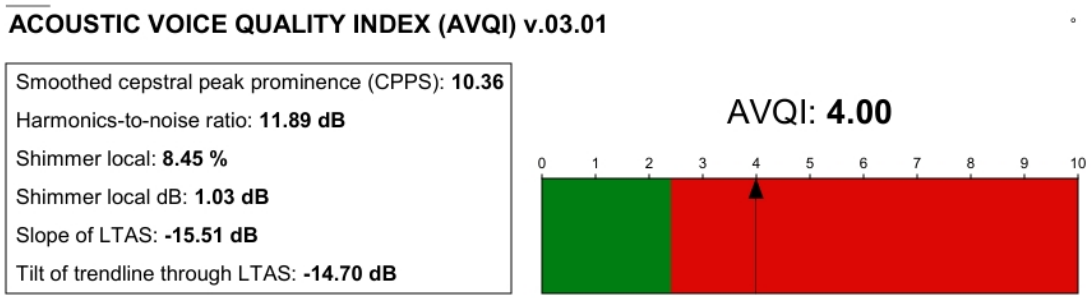

Fig. 1. Pre-Therapy AVQI analysis report

Speech intelligibility assessment

The patient was asked to read a passage in his native language to elicit the speech sample. The reading was audio-recorded in a quiet environment. To assess intelligibility, a blinded transcription task was carried out by an SLP who was unfamiliar with both the patient and the reading passage. Percentage intelligibility was calculated based on the number of intelligible words. Intelligibility was found to be 30%.

Speech rate

The rate of speech was calculated from the recorded speech sample. Speech rate was determined by dividing the total number of syllables spoken by the overall duration of the sample, including all pauses, and was expressed in syllables per second. The rate was 4.36 syllables/ second (81.6 words per minute).

Language assessment

Language assessment was done using the Frenchay Aphasia Screening test (FAST) to screen for aphasia, and the findings were normal.[26]

Cognitive-Communication assessment

The Montreal Cognitive Assessment (MoCA) test was administered for cognitive assessment, and the findings were normal with a score of 26.[27] The test was completed in 15 minutes.

Evaluation of swallowing function

A clinical non-instrumental evaluation of swallowing was performed. We followed the Comprehensive Assessment Protocol for Swallowing (CAPS) protocol.[28] Swallowing evaluation was done under the supervision of an SLT trained in dysphagia.

The patient was diagnosed with severe oral phase dysphagia. While hyolaryngeal elevation and airway protection were intact, the primary difficulties stemmed from impaired oral bolus control due to jaw dystonia, poor labial seal, and reduced tongue movement for bolus transit, limiting the safe and efficient oral intake to the International Dysphagia Diet Standardization Initiative (IDDSI) levels 4–6 (Table 3).[29]

Table 3. Swallowing evaluation findings using CAPS

Phase	**Tasks**	**Clinical observations**
Pre-testing	IDDSI levels trialed: 0 (water), 1 (thin milkshake), 2 (biscuit with water), 5 (pudding), 6 (banana), 8 (rice)	Determined safest bolus amounts for various IDDSI Levels: Level 0, 1, 2–5 ml (1 tsp) Level 3, 4–10 ml Level 5–≤5 mL or ½ tsp bite size Level 6–<15 mm^3 piece Levels 7 and 8 contraindicated due to poor chewing ability.
Dry swallowing	Asked to swallow saliva	Poor secretion management. Excessive drooling and compensatory lip smacking. proper, timely hyolaryngeal excursion.
Non-swallowing	Patient asked to clear throat, yawn, sniff, cough, hum, and pronounce vowels	A good, strong cough and throat clearing indicate an intact airway protection mechanism.
Wet swallowing	IDDSI levels trialed: 0 (water), 1 (thin milkshake), 2 (biscuit with water), 5 (pudding), 6 (banana),	Oral phase: Anterior spillage noted in levels 0-3 due to inadequate lip seal. The patient smacked his lips several times to prevent liquid from spilling. Level 4 – difficulty in oral transit of food to the back of the mouth due to reduced tongue Levels 5, 6 – inefficient chewing was noted. Jaw dystonia was present with extreme difficulty in closing the jaw once opened. He could not manage lateral jaw

	movement during chewing and used a munching pattern. Pharyngeal phase – normal hyolaryngeal excursion and timing. No signs of aspiration were noted. Thus, the patient was diagnosed with severe oral phase dysphagia. He had choking risks due to oral inefficiency

Therapeutic intervention

In terms of management, speech therapy was done to establish intelligible communication skills across various communicative contexts relevant to the patient. Based on the findings from the initial assessment, therapeutic objectives were established for the rehabilitation of the five motor bases for speech, following the hierarchy of speech-motor treatment. This hierarchy includes prioritizing the recovery of breathing, resonance, prosody, phonation, and articulation, respectively.

One-hour therapy sessions were conducted daily over a four-week period. Each session comprised 45 minutes focused on the targeted motor speech base, followed by 15 minutes of swallowing exercises. In addition, the patient was tasked with daily articulation exercises to be done at least 30 minutes at home each day. The exercises included intelligibility drills with a list of difficult-to-pronounce words and daily conversation in a controlled situation with a family member to generalize the articulatory gains to conversations (Table 4).

Table 4. Management of dysarthria

Target	**Therapy goals**	**Techniques**	**Frequency and duration**	**Therapist involvement**	**Home practice**
Respiration	To increase respiratory support and relax laryngeal muscles	1) Abdominal Diaphragmatic breathing 2) Correct posture 3) Cueing for complete inhalation	45 minutes per session, 6 sessions	Direct instruction, Modeling, Feedback	Abdominal breathing + counting aloud 30 minutes per day.

		and speaking immediately on exhalation			
Resonance	To reduce nasal air emission on non-nasal stop sounds.	1) Decreasing the rate of speech 2) Open mouth posture during speech 3) Increasing loudness	45 minutes per session, 6 sessions	Feedback, Self-monitoring	Self-monitoring hypernasality while reading.
Phonation and Prosody	1) To reduce vocal tremor and promote easy phonation. 2) To vary pitch, loudness, and duration of speech to convey emotion, emphasis, and linguistic information.	3) Yawn-sigh 4) Easy onset phonation 5) Forward focus 6) Pitch range exercises 7) Contrastive stress drills	45 minutes per session, 6 sessions	Direct instruction, Modeling, Feedback, self-monitoring	Reading different sentence types and controlled conversations with wife.

Articulation	To improve articulatory precision and intelligibility of speech.	1) Intelligibility drills 2) Hand-tapping, rhythmic cueing 3) Minimal contrast drills	45 minutes per session, 6 sessions	Direct instruction, Modeling, Feedback	Intelligibility drills with difficult-to-pronounce words.

Dysphagia was managed side-by-side with speech therapy. A combination of rehabilitative and compensatory approaches was used for the management of dysphagia. SLP discussed tube feeding options with the patient, providing insight into the disease prognosis. Patient and family denied tube feeding, so a careful hand-feeding plan ensuring good nutrition intake was made. After consulting with the dietician, a feeding protocol was prepared that included a fully nutritional, pureed mixture for the patient. The mixture was to be orally fed to the patient every 2 hours to maintain bodily intake (Table 5).

Table 5. Management of dysphagia

Approach for therapy	**Techniques and exercises**
Rehabilitative approach	Exercises for oral structures: labial exercise- labial press, which entails holding a tongue depressor between the lips to improve the anterior seal. - Rapid labial opening and closing using the consonants /p, b/ Lingual exercises- with resistance which entails pushing the tongue out, up, and to each side against a tongue depressor. - Use the phonemes /t, d/ for rapid contact and release of the tongue tip to the alveolar ridge. Base-of-tongue exercises – yawning, simulating gargling, and pulling the tongue straight back in the mouth. Jaw opening against resistance – to increase the strength of the jaw Range of motion exercise for the jaw against resistance – chewing exercise using chewy tubes.
Compensatory approach	Postural techniques: Head extension – for more efficient oral transit.

Modified diet texture	A diet consisting of IDDSI levels – 4, 5, and 6 [29] was recommended for the patient considering the limited range of motion and strength of jaw for chewing.

Follow-up and outcomes

Re-evaluation of the objective as well as the subjective measures done after 4 weeks showed improvements across all motor speech bases. While there are no normative values for AVQI in the Nepali population, the decrease in AVQI score from 4 to 2.95 suggests significant improvement in voice quality. The decreased speech rate suggest increased control of articulatory movements and better coordination of the respiratory and phonatory systems. This improved the overall intelligibility. The patient had improved safety and efficacy of swallowing and better nutritional intake (Tables 6–8, Fig. 2 and 3).

Table 6. Patient self-reported outcome using the Colorado Motor Speech Framework after 4 weeks of therapy

Measure	**Task**	**Score**	
Self-Report	Ask the patient: "On a scale of 1-7, 1 being the worst and 7 being the best, how would you rate your speech right now?"	Pre-therapy	Post-therapy
		2/7	5/7
Intelligibility	Judge during running speech tasks. Estimate of the percentage of words correctly understood.	58%	80%
Naturalness	Judge during running speech how well speech matches normal stands of rate, pitch, and loudness.	Severe	Moderate
Efficiency	Judge during running speech tasks for how efficient message is conveyed (e.g., is it effortful? Slow?)	Severe	Mild

Table 7. Speech characteristics and objective outcomes of dysarthria management after 4 weeks of therapy. (AVQI – acoustic voice quality index, DDK – diadochokinetic rate)

	Pre-therapy	**Post-therapy**
Speech characteristics	Fast rate of speech	Slowed speech rate
	Variable rate of speech	uniform rate
	Stutter-like dysfluencies	Absent
	Monoloudness	Improved prosody
	Loudness decay	Absent
	Maximum phonation time: 5 seconds	Maximum Phonation time: 10 seconds
	Telescoping	Absent, Open mouth, over-articulation present
	Hypernasality	Reduced
	Irregular rhythm in DDK	Reduced rate, but uniform
	Rapid vocal flutter	Reduced
	Reduced stress	Better stress on stressed syllables
	Atypical silences	Natural speech phrasing
	Imprecise consonants	Improved articulatory precision
	Fast rate of speech	Slowed speech rate
	Variable rate of speech	Uniform rate
AVQI	4.00	2.95
Speech Rate	4.36 syllable/ second	2.53 syllable/second
GRBAS	G1R1B0A0S1	G0R0B0A0S0
Speech intelligibility	30%	75%

Table 8. Outcomes of dysphagia management

	Pre therapy	**Post therapy**
Nutrition intake	inadequate, severe weight loss	well-balanced nutrition
Diet consistency	tried all consistencies, risk of choking due to impaired chewing. limited success in oral transit	IDDSI levels 4, 5, 6 are recommended to be used with head extension posture to support oral transit
Lip seal	impaired, excessive drooling	better lip seal, decreased drooling
Chewing	jaw dystonia, extreme difficulty in chewing	no significant improvement

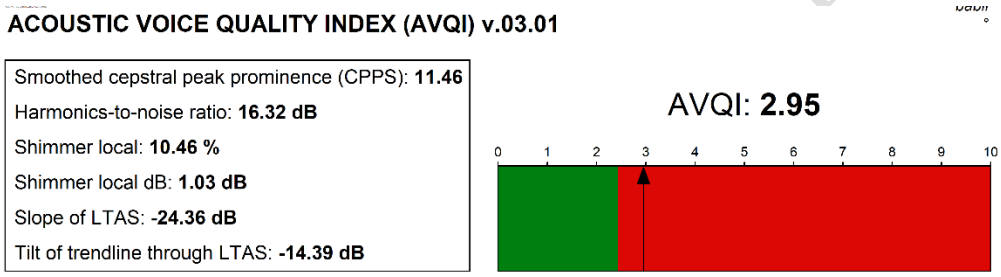

Fig. 2. Post-therapy AVQI analysis report – note the improvement in AVQI score, Smoothed Cepstral Peak Prominence, and Harmonics to Noise ratio compared to Fig. 1

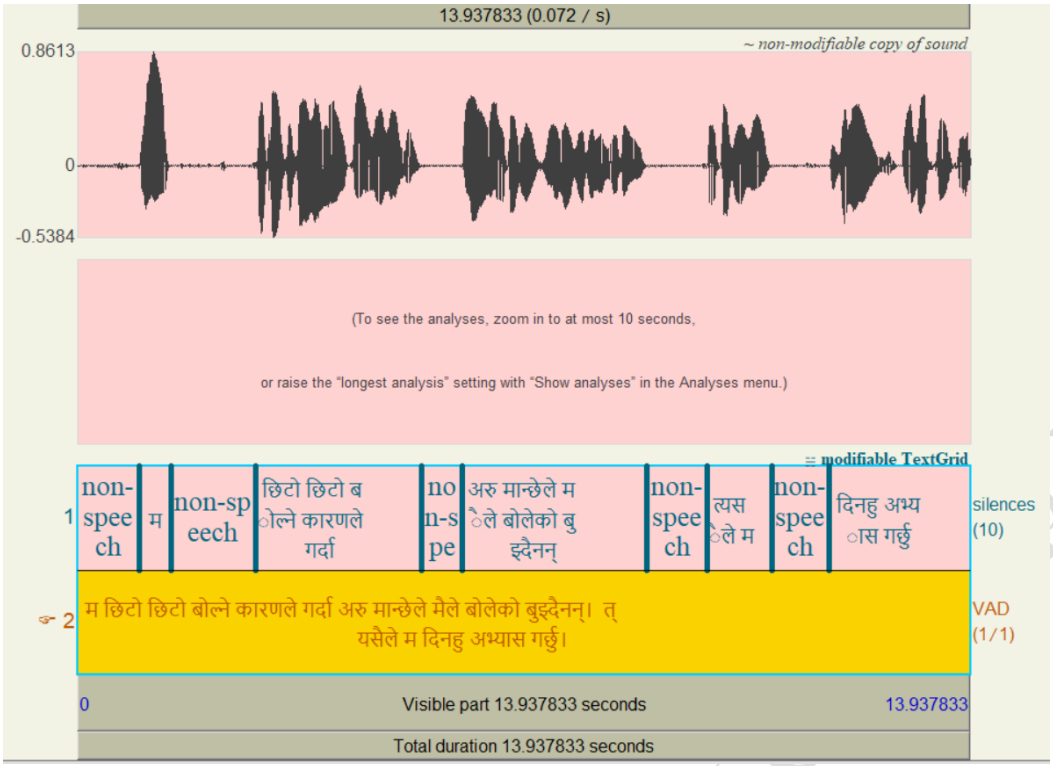

Fig. 3. Praat waveform with Textgrid annotation showing speech and non-speech segments in connected speech. This illustrates natural speech phrasing and prosody post-therapy (English translation: "People don't understand what I say because I speak very fast. So, I practice every day")

Discussion

There are a few case reports published on hyper-hypokinetic mixed dysarthria and no study on dysarthria and dysphagia management in NA syndrome to the best of our knowledge.[30] The findings in this study suggest that effective behavioral intervention can moderate the pace of functional and neurophysiological decline, even in progressive conditions.[31] We conducted a comprehensive set of objective and subjective evaluations, which included both descriptive and quantitative tests, that played a crucial role in reaching a diagnostic conclusion.[32] Specifically, characteristics such as rapid rushes of speech, inappropriate silences, variable speech rate, intermittent hypernasality, inaccuracies in consonants, and reduced speech intelligibility collectively delineate a perceptual and physiological profile consistent with mixed hyperkinetic-hypokinetic dysarthria.[33] Furthermore, we gained insight into the impact of the disorder on his daily functioning and participation using the ICF framework, and planned treatment best suited for the patient, and also approved by the patient.[2] The goal of any intervention is to change how the condition progresses over time.[34] In our case, where there was an ongoing decline in motor and potentially future cognitive functions, the aim was not restoration of function but to slow the rate of functional deterioration, preserve the remaining abilities, and support communication through adaptive strategies.[10] We designed the

therapy around specific, realistic, and functional goals, with a focus on maintaining the patient's communicative abilities through consistent and targeted activities.

Motor-based treatment, which aligns with the principle of neural plasticity, was selected for the patient. Initially, rehabilitation focused on enhancing breathing to establish strength, control, and respiratory support for speech. The coordination of respiratory function with speech production is crucial for achieving adequate loudness and speech phrasing. Therefore, treatment approaches that effectively target impaired or weakened respiratory drive and its coordination with speech production were employed.[35,36]

Progressing from breathing adjustments, attention was then directed toward addressing other motor bases of speech like resonance, phonation, articulation, and prosody. The phonatory and respiratory coordination improvement is shown by the reduced AVQI score. While there are no AVQI norms for the Nepali language, we used the same reading material to compare pre- and post-therapy measures.

One of the goals in therapy was to make speech more natural to compensate for intelligibility.[37]. Speech therapy targeting a decrease in speech rate has been shown to improve speech intelligibility significantly in patients with hypokinetic dysarthria.[38] The patient's speech rate before therapy was 81.6 wpm, which is well below the normal speech rate, but it is perceived to be too fast because it is beyond the patient's neuromuscular control.[39] To reduce speech rate, we introduced a rigid rate reduction technique- hand tapping. However, hand tapping was difficult for the patient due to chorea. The metronome was used, set to a target speech rate of 46 wpm. After 3 sessions of metronome-induced slowed rate in reading and structured conversations, rhythmic cueing was used where the clinician guided natural speech pauses and phrasing in reading, followed by structured conversations. This allowed for more natural prosody, which again contributes to speech intelligibility.[40] The speech rate at the end of therapy was 64.61 words per minute, with appropriate speech phrasing.

All the therapy sessions were structured based on motor learning principles.[41] Each motor target was introduced with increasing complexity over time. During the initial three sessions, blocked and constant practice was used to support the learning of new skills. In later sessions, the approach shifted to random and variable practice to promote retention and generalization.[42] Similarly, feedback strategies evolved throughout the program. Early sessions involved frequent, knowledge of performance feedback, while later sessions incorporated less frequent, knowledge of results feedback to encourage independent monitoring. The clinician gradually reduced cueing to foster the patient's ability to engage in self-evaluation and internal feedback. A range of feedback methods was used, including auditory and visual modeling as well as phonetic placement cues.

For the swallowing assessment, we followed the CAPS protocol as it provides a structured, non-instrumental method to evaluate swallowing safety and efficiency. Instrumental evaluation could not be done due to a lack of services in the hospital. While it has limitations, clinical bedside evaluation remains a key component in assessing patients with dysphagia.[43,44] It is commonly used to identify the presence and

severity of swallowing difficulties and to guide the development of appropriate rehabilitation strategies.[45] Our findings revealed the patient had severe oral dysphagia, with a normal pharyngeal phase of swallow. He had extreme difficulty in chewing secondary to jaw dystonia. Jaw dystonia, specifically precipitated by eating, is a characteristic feature of neuroacanthocytosis.[46] Our goals in dysphagia were to promote safe swallowing and improve nutritional status. It has been suggested that alternative means of nutrition, such as a feeding tube, should be considered early in NA, in light of the significant risk of aspiration and the characteristic marked weight loss.[10] The patient and family denied alternative feeding options, so we used a combination of rehabilitative and compensatory approaches.[47] Labial, lingual, and jaw-strengthening exercises were used to create changes in the patient's swallowing over time by improving the underlying physiological function. Lingual exercises have been shown to increase lingual strength and improve their role in swallowing function.[48] Studies report aspiration as a major risk in NA, as patients adopt dramatic maneuvers to swallow food, such as extending the head and throwing food into the back of the throat.[10] So, we worked on safe feeding strategies and consistencies. The patient and his wife were also given extensive information on monitoring the symptoms of aspiration and regular follow-up visits.

The head extension compensatory technique was used for efficient oral transit, but it reportedly does not create lasting functional change.[49] This chin-up posture may enhance oral bolus transport, as suggested by prior studies.[49] Additionally, this posture could potentially have a rehabilitative effect on pharyngeal swallow.[50] While there was a significant improvement in nutritional status post-therapy, the patient's swallowing difficulties persisted even after intervention, and there was no significant improvement in the patient's chewing ability.

Outcomes are influenced by both the timing and appropriateness of the therapeutic strategies employed. As Yorkston[51] said, "Instead of asking questions like, 'Does dysarthria treatment work?', it is more important to set intervention as a series of targeted steps and explore which specific treatments are effective at different stages of the condition. It is important to identify the signs that indicate a speaker is ready to transition from one stage to the next. SLPs are invaluable team members in the rehabilitation of patients with extrapyramidal movement disorders, and speech therapy has the potential to diminish the impact of dysarthria on functional communication and alleviate the effort associated with speaking.[52]

Study limitations

As an individual case study, the findings of this study lack generalizability and do not allow for causal conclusions regarding treatment efficacy. Furthermore, the use of informal, non-standardized tools to assess activity and participation was necessitated by the lack of validated instruments in the local context, in the patient's native language. In addition, instrumental assessments for swallowing were not available, which restricted diagnostic precision in evaluating pharyngeal phase function.

Patient perspective

For a long time, I was confused, depressed, and angry about my situation, but I'm glad I'm getting treatment now, and I'm hoping for answers. What I want most is to be able to work again. I feel like my speech has improved a lot, and people understand me now. But it's still very difficult for me to chew.

Conclusion

This case study demonstrates that individualized, structured speech therapy can lead to measurable improvements in the functional communication of individuals with chronic, progressive dysarthria. Success of therapy depends on careful monitoring of the patient's current functioning, anticipating future changes, and managing symptoms accordingly. Realistic counseling, compensatory strategies, coupled with rehabilitative interventions, can significantly boost the patient's motivation and improve quality of life.

Declarations

Funding

The author received no funding for this study.

Author contributions

Conceptualization, I.W.; Methodology, I.W.; Software, I.W.; Formal Analysis, I.W.; Investigation, I.W.; Resources, I.W.; Data Curation, I.W.; Writing – Original Draft Preparation, I.W.; Writing – Review & Editing, I.W.

Conflicts of interest

The author declares no conflict of interest.

Data availability

The dataset generated and analyzed in this study consists of patient speech recordings and is not publicly available to protect patient confidentiality.

Ethics approval

Ethical approval was not required for this single case study from the Institutional Review Board of the Institute of Medicine, TUTH. Written informed consent was obtained from the patient for participation and publication of anonymized data.

Use of AI and AI-assisted technologies in the writing process

AI-assisted technology (ChatGPT, OpenAI) was used to paraphrase a few sentences to improve readability. The content was reviewed and verified by the author for accuracy.

References

1. Nishio M, Niimi S. Relationship between speech and swallowing disorders in patients with neuromuscular disease. *Folia Phoniatr Logop*. 2004;56(5):291-304. doi:10.1159/000080066
2. Yorkston KM, Beukelman DR. Dysarthria: Tools for Clinical Decision-Making. *ASHA Lead*. 2004;9(9):4-21. doi:10.1044/LEADER.FTR2.09092004.4
3. Duffy JR. *Motor Speech Disorders: Substrates, Differential Diagnosis, and Management*. 3rd ed. Elsevier Health Sciences; 2012.
4. Ovsiowitz M. Dysphagia. In: *Gut Instincts: A Clinician's Handbook of Digestive and Liver Diseases*. CRC Press; 2024:17-21. doi:10.1201/9781003524489-4
5. Wang BJ, Carter FL, Altman KW. Relationship between dysarthria and oral-oropharyngeal dysphagia: the present evidence. *Ear Nose Throat J.* Published online 2020. doi:10.1177/0145561320951647
6. Tjaden K. Speech and swallowing in Parkinson's disease. *Top Geriatr Rehabil*. 2008;24(2):115-126. doi:10.1097/01.TGR.0000318899.87690.44
7. Jung HH, Danek A, Walker RH. Neuroacanthocytosis syndromes. *Orphanet J rare Dis.* 2011;6(68). doi:10.1186/1750-1172-6-68
8. Walterfang M, Evans A, Looi JCL, et al. The neuropsychiatry of neuroacanthocytosis syndromes. *Neurosci Biobehav Rev*. 2011;35(5):1275-1283. doi:10.1016/j.neubiorev.2011.01.001
9. Walker RH, Jung HH, Dobson-Stone C, et al. Neurologic phenotypes associated with acanthocytosis. Neurology. 2007;68(2):92-98. doi:10.1212/01.WNL.0000250356.78092.CC
10. Walker RH. Management of neuroacanthocytosis syndromes. *Tremor Other Hyperkinet Mov (N Y).* 2015;5:346. doi:10.7916/D8W66K48
11. Atkinson-Clement C, Letanneux A, Baille G, et al. Psychosocial Impact of Dysarthria: The Patient-Reported Outcome as Part of the Clinical Management. *Neurodegener Dis*. 2019;19(1):12-21. doi:10.1159/000499627
12. Chiaramonte R, Di Luciano C, Chiaramonte I, Serra A, Bonfiglio M. Multi-disciplinary clinical protocol for the diagnosis of bulbar amyotrophic lateral sclerosis. *Acta Otorrinolaringol Esp*. 2019;70(1):25-31. doi:10.1016/j.otorri.2017.12.002
13. Mitchell C, Bowen A, Tyson S, Butterfint Z, Conroy P. Interventions for dysarthria due to stroke and other adult-acquired, non-progressive brain injury. *Cochrane Database Syst Rev.* 2017;2017(1):CD002088. doi:10.1002/14651858.CD002088.pub3

14. Conway A, Walshe M. Management of non-progressive dysarthria: Practice patterns of speech and language therapists in the Republic of Ireland. *Int J Lang Commun Disord*. 2015;50(3):374-388. doi:10.1111/1460-6984.12143
15. MacKenzie C, Muir M, Allen C. Non-speech oro-motor exercise use in acquired dysarthria management: Regimes and rationales. *Int J Lang Commun Disord*. 2010;45(6):617-629. doi:10.3109/13682820903470577
16. Fox CM, Ramig LO. Vocal sound pressure level and self-perception of speech and voice in men and women with idiopathic Parkinson disease. *Am J Speech-Language Pathol*. 1997;6(2):85-94. doi:10.1044/1058-0360.0602.85
17. Connor N, Abbs J, Cole K, Gracco V. Parkinsonian deficits in serial multiarticulate movements for speech. *Brain.* 1989;112(4):997-1009. doi:10.1093/brain/112.4.997
18. Helm-Estabrooks N, Yorkston KM, Spencer KA, Duffy JR. Behavioral management of respiratory/phonatory dysfunction from dysarthria: a systematic review of the evidence. *J Med Speech Lang Pathol.* 2003;11(2):xiii.
19. Robertson SJ, Thomson F. Speech therapy in Parkinson's Disease: A study of the efficacy and long term effects of intensive treatment. *Int J Lang Commun Disord*. 1984;19(3):213-224. doi:10.3109/13682828409029837
20. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA.* 2013;310(20):2191-2194. doi:10.1001/jama.2013.281053
21. World Health Organization. *Framework for Action on Interprofessional Education & Collaborative Practice.* World Health Organization website. https://www.who.int/publications/i/item/framework-for-action-on-interprofessional-education-collaborative-practice. Published 2010. Accessed January 26, 2024.
22. Dunne-Platero K, Cloud C, Hilger A. Colorado Motor Speech Framework. Published online 2023. doi:10.17605/OSF.IO/PM936
23. Lippke BA, Dickey SE, Selmar JW, Soder AL. *PAT-3: Photo Articulation Test—Third Edition.* PRO-ED; 1997. https://www.proedinc.com/Products/8370/pat3-photo-articulation-testthird-edition. Accessed April 21, 2024.
24. Hirano M. Psycho-acoustic evaluation of voice. *Clin Exam Voice Disord Hum Commun.* Published online 1981:81-84. Accessed April 21, 2024.
25. Maryn Y, Weenink D. Objective dysphonia measures in the program praat: Smoothed cepstral peak prominence and acoustic voice quality index. *J Voice*. 2015;29(1):35-43. doi:10.1016/j.jvoice.2014.06.015
26. Enderby PM, Wood VA, Wade DT, Hewer RL. The Frenchay Aphasia Screening Test: A short,

simple test for aphasia appropriate for non-specialists. *Disabil Rehabil*. 1986;8(4):166-170. doi:10.3109/03790798709166209

27. Nasreddine ZS, Phillips NA, Bédirian V, et al. The Montreal Cognitive Assessment, MoCA: A Brief Screening Tool For Mild Cognitive Impairment. *J Am Geriatr Soc*. 2005;53(4):695-699. doi:10.1111/J.1532-5415.2005.53221.X
28. Lim HJ, Lai DKH, So BPH, et al. A Comprehensive Assessment Protocol for Swallowing (CAPS): Paving the Way towards Computer-Aided Dysphagia Screening. *Int J Environ Res Public Health*. 2023;20(4). doi:10.3390/IJERPH20042998
29. Cichero JAY, Lam P, Steele CM, et al. Development of International Terminology and Definitions for Texture-Modified Foods and Thickened Fluids Used in Dysphagia Management: The IDDSI Framework. *Dysphagia*. 2017;32(2):293-314. doi:10.1007/S00455-016-9758-y
30. Rusz J, Megrelishvili M, Bonnet C, et al. A distinct variant of mixed dysarthria reflects parkinsonism and dystonia due to ephedrone abuse. *J Neural Transm*. 2014;121(6):655-664. doi:10.1007/S00702-014-1158-6
31. De Angelis EC, Mourão LF, Ferraz HB, Behlau MS, Pontes PAL, Andrade LAF. Effect of voice rehabilitation on oral communication of Parkinson's disease patients. *Acta Neurol Scand*. 1997;96(4):199-205. doi:10.1111/J.1600-0404.1997.tb00269.x
32. Chiaramonte R, Vecchio M. A Systematic Review of Measures of Dysarthria Severity in Stroke Patients. *PM R*. 2021;13(3):314-324. doi:10.1002/pmrj.12469
33. Darley FL, Aronson AE, Brown JR. Differential diagnostic patterns of Dysarthria. *J Speech Hear Res*. 1969;12(2):246-269. doi:10.1044/JSHR.1202.246
34. Ludlow CL, Hoit J, Kent R, et al. Translating principles of neural plasticity into research on speech motor control recovery and rehabilitation. *J Speech, Lang Hear Res*. 2008;51(1). doi:10.1044/1092-4388(2008/019)
35. Spencer KA, Yorkston KM. Evidence for the treatment of respiratory/phonatory dysfunction from dysarthria. *Perspect Neurophysiol Neurogenic Speech Lang Disord.* 2002;12(4):4-16. doi:10.1044/nnsld12.4.4
36. Lester-Smith RA, Miller CH, Cherney LR. Behavioral therapy for tremor or dystonia affecting voice in speakers with hyperkinetic dysarthria: a systematic review. *J Voice.* 2023;37(4):561-573. doi:10.1016/j.jvoice.2021.03.026
37. Yorkston KM, Beukelman DR. Ataxic dysarthria: treatment sequences based on intelligibility and prosodic considerations. *J Speech Hear Disord*. 1981;46(4):398-404. doi:10.1044/JSHD.4604.398
38. Martens H, Van Nuffelen G, Dekens T, et al. The effect of intensive speech rate and intonation therapy on intelligibility in Parkinson's disease. *J Commun Disord*. 2015;58:91-105. doi:10.1016/J.JCOMDIS.2015.10.004

39. Yorkston KM, Miller RM, Strand EA, Britton D. *Management of Speech and Swallowing in Degenerative Diseases.* Pro-Ed Inc.; 2013.
40. Patel R. Prosodic Control in Severe Dysarthria. *J Speech, Lang Hear Res*. 2002;45(5):858-870. doi:10.1044/1092-4388(2002/069)
41. Schmidt RA, Lee TD, Winstein C, Wulf G, Zelaznik HN. *Motor Control and Learning: A Behavioral Emphasis.* 6th ed. Champaign, IL: Human Kinetics; 2018.
42. Maas E, Robin DA, Hula SNA, et al. Principles of motor learning in treatment of motor speech disorders. *Am J Speech-Language Pathol*. 2008;17(3):277-298. doi:10.1044/1058-0360(2008/025).
43. O'Horo JC, Rogus-Pulia N, Garcia-Arguello L, Robbins J, Safdar N. Bedside Diagnosis of Dysphagia: A Systematic Review. *J Hosp Med*. 2015;10(4):256. doi:10.1002/jhm.2313
44. Ricci Maccarini A, Filippini A, Padovani D, Limarzi M, Loffredo M, Casolino D. Clinical non-instrumental evaluation of dysphagia. *Acta Otorhinolaryngol Ital*. 2007;27(6):299.
45. Lim SHB, Lieu PK, Phua SY, et al. Accuracy of bedside clinical methods compared with fiberoptic endoscopic examination of swallowing (FEES) in determining the risk of aspiration in acute stroke patients. *Dysphagia*. 2001;16(1):1-6. doi:10.1007/s004550000038
46. Peikert K, Dobson-Stone C, Rampoldi L, et al. VPS13A Disease. *Encycl Mov Disord Three-Volume Set*. Published online March 30, 2023:V1-217-V1-219. doi:10.1016/b978-0-12-374105-9.00396-8
47. Adult Dysphagia. American Speech-Language-Hearing Association website. https://www.asha.org/Practice-Portal/Clinical-Topics/Adult-Dysphagia. Accessed April 25, 2024.
48. Robbins JA, Kays SA, Gangnon RE, et al. The Effects of Lingual Exercise in Stroke Patients With Dysphagia. *Arch Phys Med Rehabil*. 2007;88(2):150-158. doi:10.1016/j.apmr.2006.11.002
49. Sollazo A, Monaco L, Vecchio L Del, et al. Investigation of compensatory postures with videofluoromanometry in dysphagia patients. *World J Gastroenterol*. 2012;18(23):2973-2978. doi:10.3748/wjg.v18.i23.2973
50. Calvo I, Sunday KL, Macrae P, Humbert IA. Effects of chin-up posture on the sequence of swallowing events. *Head Neck*. 2017;39(5):947-959. doi:10.1002/hed.24713
51. Yorkston KM. The degenerative dysarthrias: A window into critical clinical and research issues. *Folia Phoniatr Logop*. 2007;59(3):107-117. doi:10.1159/000101769
52. Ford CN, Roy N, Bless DM. Muscle tension dysphonia and spasmodic dysphonia: The role of manual laryngeal tension reduction in diagnosis and management. *Ann Otol Rhinol Laryngol*. 1996;105(11):851-856. doi:10.1177/000348949610501102