

REHABILITATION OUTCOME IN A PATIENT WITH LATERAL MEDULLARY SYNDROME



ISHOD REHABILITACIJE BOLESNIKA S LATERALNIM MEDULARNIM SINDROMOM

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SUMMARY

Medullary infarction, a type of brainstem stroke affecting the medulla oblongata, often results in bulbar symptoms such as dysphagia, dysphonia, and dysarthria, significantly impacting a patient's quality of life. Lateral medullary syndrome (Wallenberg's syndrome) is a common manifestation, typically caused by vertebral or posterior inferior cerebellar artery occlusion. This case report presents a 52-year-old female with dorsomedial medullary infarction, exhibiting left-sided hemiparesis, balance impairment, and severe bulbar symptoms. Early multidisciplinary rehabilitation, including physical therapy and speech therapy, was initiated during hospitalisation. Despite improvements in motor function, the patient experienced persistent dysphonia, dysarthria, and swallowing difficulties post-discharge, necessitating continued rehabilitation. Functional assessments, including fiberoptic endoscopic evaluation of swallowing and acoustic voice analysis, identified vocal cord paralysis and dysphagia. Speech therapy was focused on voice rehabilitation, swallowing safety and efficacy, and speech intelligibility, leading to notable functional gains. However, gait instability and balance deficits persisted, requiring long-term physiotherapy interventions. This report underscores the importance of a comprehensive, multidisciplinary approach in managing medullary infarction sequelae. It highlights the role of speech-language pathologists in addressing bulbar dysfunction and emphasises the necessity of ongoing rehabilitation and long-term follow-up for optimising patient outcomes.

Keywords: Medullary infarction, Lateral medullary syndrome, Dysphagia, Dysphonia, Dysarthria, Brainstem stroke, Speech therapy, Rehabilitation, Neurological recovery.

SAŽETAK

Medularni infarkt je vrsta moždanog udara, koji zahvaća produženu moždinu te često rezultira bulbnim simptomima poput disfagije, disfonije i dizartrije koji značajno utječu na kvalitetu života bolesnika. Lateralni medularni sindrom (Wallenbergov sindrom) je najčešće uzrokovan okluzijom vertebralne ili posteriorne inferiorne cerebelarne arterije. Ovaj prikaz slučaja prikazuje 52-godišnju pacijenticu s dorzomedijalnim medularnim infarktom koji se prezentirao ljevostranom hemiparezom, poremećajem ravnoteže i bulbnim simptomima. Rana multidisciplinarna rehabilitacija je započela tijekom hospitalizacije te je uključivala fizikalnu terapiju i govornu terapiju. Unatoč poboljšanju motoričkih funkcija, pacijentica je imala zaostalu disfoniju, dizartriju i disfagiju nakon otpusta, zbog čega je bio potrebn nastavak rehabilitacije. Funkcionalna procjena, koja je uključivala fibero-endoskopsku procjenu gutanja te akustičku analizu glasa, je potvrdila paralizu glasnica i disfagiju. Govorna terapija je bila usmjerena na rehabilitaciju glasa, sigurnost i učinkovitost gutanja i razumljivost govora te je rezultirala značajnim funkcionalnim poboljšanjem. Ipak, nestabilnost hoda i poremećaji ravnoteže su perzistirali, zbog čega je bila potrebna daljnja fizikalna terapija. Ovaj prikaz slučaja naglašava važnost sveobuhvatnog, multidisciplinarnog pristupa u rehabilitaciji medularnog infarkta, ulogu logopeda u rehabilitaciji bulbarne disfunkcije te nužnost kontinuirane rehabilitacije i dugoročnog praćenja bolesnika.

Ključne riječi: medularni infarkt, lateralni medularni sindrom, disfagija, disfonija, dizartrija, moždani udar u moždanom deblu, terapija govora, rehabilitacija, neurološki oporavak

INTRODUCTION

Medullary infarction, a type of stroke affecting the medulla oblongata in the brainstem, can lead to a diverse array of neurological deficits, including the triad of dysphagia, dysphonia, and dysarthria. These bulbar symptoms, which affect swallowing, voice production, and speech articulation, respectively, can significantly impact a patient's quality of life and require comprehensive management. Lateral medullary syndrome, also known as Wallenberg's syndrome, is a well-documented manifestation of medullary infarction. It typically results from occlusion of the posterior inferior cerebellar artery (PICA) or the vertebral artery, leading to infarction of the lateral part of the medulla oblongata. Patients with this syndrome often present with a constellation of symptoms including dysphagia, vertigo, ataxia, and sensory deficits [1].

Dysphagia, in particular, is a common and potentially severe complication in medullary infarction, reported in 51% to 94% of patients with Wallenberg's syndrome [2]. The swallowing impairment in these cases is often characterised by a predominantly affected pharyngeal phase, which can be bilateral despite the unilateral nature of the lesion. This bilateral effect is thought to result from the disruption of the premotor neurons in the nucleus ambiguus and their connections to swallowing-related cranial motor neuron pools on both sides of the brainstem [3].

The management of patients with medullary infarction and associated bulbar symptoms requires a multidisciplinary approach. Early identification, comprehensive assessment, and individually tailored rehabilitation strategies are crucial for optimising recovery and enhancing quality of life [4]. Speech-language pathologists play an integral role in this process, focusing on the rehabilitation of swallowing, voice quality, and articulation. Recent research has explored the cortical compensation mechanisms involved in swallowing recovery after medullary infarction. Functional MRI studies have revealed increased activation in various brain regions during effortful swallowing tasks, suggesting potential targets for rehabilitation strategies [5]. Additionally, innovative treatment approaches, such as transcranial magnetic stimulation, have shown promise in assisting with dysphagia rehabilitation in these patients [6].

Assessing the patient's functional and cognitive abilities in the first few days after a stroke is crucial for an individualised rehabilitation plan. The initial examination of the patient should take place within 48 hours of admission and within the first five to seven days after an acute stroke. Orientation, mental functions, communication, cranial nerve status, muscle tone, muscle strength, coordination, balance, gait and sensations are examined. Acute rehabilitation after a stroke begins while the patient is still in the hospital on the ward. Early mobilization is recommended between 24 and 48 hours after the stroke, as it reduces the risk of deep vein thrombosis and orthostatic hypotension. Early rehabilitation prevents the development of contractures, spasms, pressure ulcers, deep vein thrombosis and other complications caused by prolonged bed rest. Post-acute rehabilitation can be carried out in specialized hospitals for medical rehabilitation, on an outpatient basis, or in the patient's home. The choice depends on the patient's level of independence in the activities of daily living and the degree of functional impairment, which is determined using the Functional Impairment Measurement (FIM). The FIM consists of 6 parts (personal hygiene, sphincter control, mobility, movement, communication, and social cognition). Higher score means greater independence and less functional impairment. Patients with a score of 80 or more have a mild disability. Outpatient rehabilitation is intended for patients who are mobile

and have minor functional limitations. Patients with less than 40 points are recommended to receive extended care and a basic rehabilitation program due to their severe disability in the patient's home or medical and nursing facilities. Inpatient rehabilitation is recommended for patients with a FIM score between 40 and 80. Inpatient rehabilitation is carried out in specialized hospitals and is intended for patients who are expected to significantly improve their functions within a short period and return to daily life in the community after discharge from the hospital. Inpatient rehabilitation reduces mortality rates, long-term disability and the likelihood of institutionalization and increases independence in activities of daily living. The fastest functional recovery after a stroke can be expected in the first three months, with the emphasis on the first month. Six months after the stroke, the chronic phase of recovery begins, the aim of which is to maintain the progress made and improve quality of life. The duration of rehabilitation is individual for each patient until they reach a recovery plateau [7-9].

As our understanding of the pathophysiology and recovery mechanisms in medullary infarction continues to evolve, so does our approach to patient care. This introduction sets the stage for a deeper exploration of the clinical presentation, diagnostic approaches, and management strategies for patients with medullary infarction and associated bulbar symptoms.

CASE REPORT

A 52-year-old female suffered an ischemic stroke localised in the medulla oblongata dorsomedially (Figure 1; Figure 2). The patient presented with moderate left-sided hemiparesis of the extremities, dysmetria of the left extremities, mild peripheral paresis of the facial nerve, and impaired balance. During hospitalisation, a speech-language pathologist (SLP) was consulted because of severe dysphagia, dysphonia and dysarthria. An otolaryngologist performed a fiberoendoscopy and visualised left-sided unilateral vocal cord paralysis.

Following discharge, the patient underwent regular follow-up evaluations to monitor neurological recovery and address persistent symptoms. At one-month post-discharge, improvements in walking were observed, although ataxia, dysphonia, dysarthria, and left-sided hemiparesis remained prominent, limiting independent mobility. Vertigo persisted, particularly with head movements, accompanied by nausea and occasional vomiting, necessitating ongoing symptomatic management. At the neurology visit, we emphasized the importance of continued speech therapy and recommended additional inpatient rehabilitation to support functional recovery and improve quality of life.



Figure 1. MR image of the lesion localised in the medulla oblongata dorsomedially – axial view; the lesion is marked with an arrow.

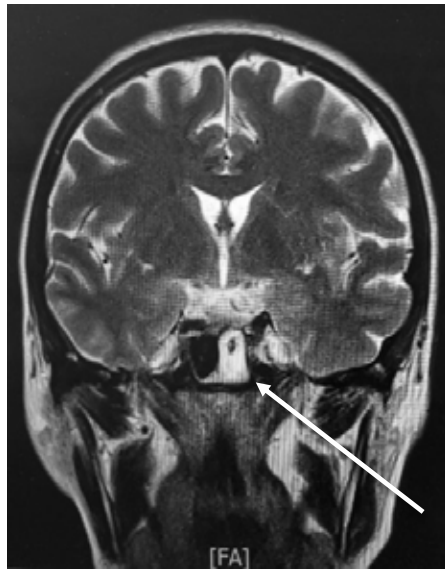


Figure 2. MR image of the lesion localised in the medulla oblongata dorsomedially – coronal view; the lesion is marked with an arrow.

Early physical therapy began 24 hours after the stroke. The examination revealed left-sided hemiparesis, dysmetria of the left extremities, a mild lesion of the left peripheral facial nerve and the inability to sit and stand upright. The motor function was assessed using the Motor Assessment Scale

(MAS). The Motor Assessment Scale (MAS) evaluates the performance of functional tasks in patients with stroke. The items are rated on a scale from 0 to 6, and a score of 6 indicates normal motor function. The total score is 48 points. The general tone item is removed from the scale because there are no strict guidelines for testing the tone [10, 11]. At the first examination, 24 hours after the stroke, the patient had a MAS score of 5. Early physical rehabilitation consisted of transfer exercises followed by verticalization exercises, active assisted range of motion exercises, facial muscle exercises, and neuromuscular rehabilitation for the left extremities. One month after the stroke, the patient was referred to a rehabilitation centre, where rehabilitation continued for three weeks. At the beginning of inpatient rehabilitation, the MAS score was 13 points.

The patient had decreased strength in her left extremities and could only lift and hold her left arm and leg in an antigravity position for a few seconds, strength of her left hand was 3/5 according to the manual muscle testing (MMT), strength of the left foot was 2/5 according to the MMT and she could not perform fine movements with her left hand. The patient could walk short distances with the help of another person. After three weeks, she achieved a significant improvement (MAS total score: 26 points). The strength of her left extremities increased (4/5 according to the MMT), she was able to perform certain more complicated movements with her left hand, and with the help of a walker and another person she was able to walk up to 50 meters. However, she still suffered from ataxia and balance problems. Due to limited mobility, home physical therapy was recommended. The patient continued to visit the physical medicine and rehabilitation specialist for follow-up examinations. Six months after the stroke, she still had balance impairments that resulted in her being able to walk short distances of up to 15 meters independently, while she required assistance from another person for longer distances. At this point, the patient scored 37 points on the MAS. After one year, strength, and coordination of the left extremities had improved significantly. According to the MAS, the patient had 43 out of a total of 48 points. However, gait instability and balance problems persisted, which impaired the patient's overall mobility and functional independence. A comprehensive rehabilitation plan was recommended to address these remaining deficits.

Balance training focused on exercises to improve postural control and stability. Strength training targeted the lower limbs and trunk muscles. Proprioceptive training included exercises to improve sensory feedback and movement control. Gait training consisted of structured walking exercises with and without aids to improve walking ability. Robot-assisted therapy included exercises on a balance platform to improve balance and neuromuscular

re-education. In addition, occupational therapy was provided to improve functional independence in daily activities.

The patient complained of difficulty swallowing solid food, and an otolaryngologist and an SLP performed the fiberoptic endoscopic evaluation of swallowing (FEES) to diagnose dysphagia. FEES revealed residues in the pyriform sinuses and valleculae after swallowing all food and liquid consistencies and multiple swallows, but no signs of aspiration or penetration (Figure 3). To prevent malnutrition, the nutritionist was consulted to give diet recommendations.



Figure 3. The image shows a paralysed left vocal cord in a paramedian position during the fiberoptic endoscopic evaluation of swallowing (FEES). Solid food residues are visible in the pyriform sinuses and valleculae. There are no signs of aspiration or penetration.

The voice was evaluated objectively using the computer program Praat, and perceptually (Table 1) [12]. Voice intensity was reduced and variable, and the mean pitch was high 6- and 12-months post-stroke. The perturbation measure of jitter and the harmonics-to-noise ratio were normal. The GR-BAS scale was used for the perceptual evaluation of voice [13]. The grade, roughness and strain categories remained the same, while breathiness and asthenia decreased, probably due to better breath control. Results on the Voice Handicap Index indicated the severe impact of dysphonia on quality of life [14]. Hypernasality, poor breath control, imprecise articulation, slow and effortful speech, and fatigue characterised the patient's dysarthric speech. SLP treatment aimed at the rehabilitation of swallowing and enhancing voice quality and articulation. The patient demonstrated improvement in speech intelligibility, voice quality, and swallowing safety and efficacy throughout rehabilitation.

Table 1. Results of objective and perceptual voice evaluation

VOICE PARAMETERS	6 months post-stroke	12 months post-stroke
Maximum phonation time (MPT)	16 sec	18 sec
Maximum friction time (MFT)	12 sec	14 sec
Intensity (I0)	56.55 dB	56.58 dB
Mean pitch (F)	317.218 Hz	294.654 Hz
Number of voice breaks (NVB)	0	0
Jitter	0.410%	0.415%
Shimmer	0.375 dB	0.358 dB
Mean harmonics-to-noise ratio (HNR)	21.755 dB	21.340 dB
GRBAS scale	G3, R0, B2, A3, S2	G3, R0, B1, A2, S2
Voice Handicap Index (VHI)	VHI-F 23, VHI-P 22, VHI-E 10, total: 65	VHI-F 21, VHI-P 29, VHI-E 20, total: 70

CONCLUSION

This case report underscores the importance of early identification, comprehensive assessment, and individually tailored rehabilitation strategies in optimising recovery and enhancing the quality of life for patients affected by medullary infarction. The multifaceted presentation of bulbar symptoms, including dysphagia, dysphonia, and dysarthria, necessitates a multidisciplinary approach to patient care. This collaborative effort, involving neurologists, physiatrists, SLPs, and otolaryngologists, is essential in addressing the complex needs of patients with medullary infarction sequelae.

The patient was continuously involved in the physical rehabilitation program from her stay in the neurology department to outpatient rehabilitation. The greatest progress was made in the first three months after the stroke. Although progress slowed after 6 months post-stroke, function continued to gradually improve over the first year, as expected. Ongoing rehabilitation is important to improve mobility, reduce the risk of falls and maximize the patient's overall quality of life.

The management of swallowing, speech, and voice disorders falls within the purview of SLPs and constitutes an integral component of comprehensive neurological rehabilitation. This case highlights the potential for significant improvement in speech intelligibility, voice quality, and swallowing safety

and efficacy through targeted interventions and persistent therapeutic efforts.

Furthermore, this report emphasises the need for ongoing assessment and long-term follow-up in patients with medullary infarction, as recovery may continue well beyond the acute phase. The persistent nature of some deficits, such as gait instability and balance disorders, underscores the importance of continued rehabilitation efforts and the potential need for adaptive strategies to maximise functional outcomes.

In conclusion, this case heightens awareness among healthcare professionals regarding the diverse manifestations of medullary infarction and the critical role of a coordinated, multidisciplinary approach in managing these complex patients. Bulbar symptoms mustn't be overlooked in the broader context of neurological deficits, as their effective management can significantly impact a patient's overall recovery and quality of life.

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DECLARATION OF INTEREST

The authors declare that they have no conflict of interest.

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