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Pure Motor Monoparesis of the Upper Extremity Due to Medial Medullary Infarction: A Case Report and Literature Review

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1. Abstract

Medial medullary infarction (MMI) is an uncommon form of brainstem stroke typically associated with contralateral hemiparesis, cranial nerve involvement, and sensory deficits. Pure motor monoparesis (PMM) confined to a single upper limb is extremely rare and has not been previously described in association with MMI. We report a case of isolated upper limb weakness caused by a small infarct in the right medial medulla oblongata. Neuroimaging confirmed the lesion, and the patient recovered fully following antithrombotic therapy and rehabilitation. This case provides additional insight into the functional organization of the corticospinal tract at the level of the medulla.

2. Introduction

The corticospinal tract plays a central role in voluntary motor control and follows a complex pathway through the brainstem before decussating in the lower medulla. While its general somatotopic organization in the cerebral cortex and internal capsule is well established, its arrangement within the medulla oblongata remains incompletely understood.

Medial medullary infarction is a rare subtype of ischemic stroke involving the pyramidal tract, medial lemniscus, and hypoglossal nerve fibers. It typically presents with contralateral hemiparesis, ipsilateral tongue weakness, and sensory disturbances, forming the classical Dejerine syndrome.

Pure motor monoparesis (PMM), defined as isolated weakness of one limb without sensory, cerebellar, or cranial nerve involvement, is usually associated with lesions in the cortex, corona radiata, internal capsule, or pons. Brainstem involvement, particularly at the medullary level, is exceptionally uncommon.

3. Case Presentation

A 69-year-old right-handed man with a history of essential hypertension presented with sudden onset difficulty in lifting his left arm. The symptom developed abruptly without preceding trauma, pain, or systemic illness.

Neurological examination revealed moderate weakness in the left upper limb, predominantly affecting proximal muscles. Strength in the right upper limb and both lower limbs was normal. There were no cranial nerve abnormalities, sensory deficits, cerebellar dysfunction, or pathological reflexes. Muscle tone and deep tendon reflexes were within normal limits.

Coordination testing, including finger-to-nose and rapid alternating movements, was intact. Gait was normal except for mildly reduced arm swing on the affected side. Laboratory investigations, including complete blood count and biochemical profile, were unremarkable. Cardiac evaluation and chest radiography showed no abnormalities.

Brain magnetic resonance imaging revealed a small infarct in the right medial medulla oblongata. Magnetic resonance angiography did not demonstrate any significant vascular stenosis or occlusion. The patient was treated with intravenous antithrombotic therapy (argatroban) for seven days, followed by oral antiplatelet therapy (clopidogrel 75 mg daily). Early rehabilitation was initiated. The patient showed progressive improvement and achieved complete neurological recovery within 14 days.

4. Discussion

This case is noteworthy as it represents a rare presentation of medial medullary infarction manifesting as isolated pure motor monoparesis of the upper extremity.

The corticospinal tract undergoes somatotopic organization along its course, but its precise arrangement in the medulla remains controversial. Diffusion tensor tractography studies have suggested that fibers controlling the hand are located medially within the medullary pyramid, while lower limb fibers are positioned more laterally.

However, the clinical presentation in this case does not fully align with this model. Despite isolated upper limb weakness, the infarct was located in the lateral portion of the medial medulla. This discrepancy suggests that corticospinal fibers may not be strictly segregated in a linear medial-to-lateral arrangement at the medullary level.

Previous reports of lateral medullary infarction have described rare cases of isolated lower limb weakness. These findings support the hypothesis that corticospinal fibers destined for different limbs may decussate at slightly different rostrocaudal levels within the medulla. Specifically, lower limb fibers may cross more rostrally than upper limb fibers,

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or there may be intermingling of fiber tracts prior to decussation.

The present case expands the clinical spectrum of medial medullary infarction. Instead of the classical triad of hemiparesis, hypoglossal palsy, and sensory loss, the patient exhibited a highly focal motor deficit restricted to a single limb. This highlights that brainstem strokes can occasionally present with very subtle and localized neurological signs.

Clinically, this has important diagnostic implications. Patients presenting with isolated limb weakness are often initially evaluated for cortical or peripheral causes. However, this case emphasizes that brainstem infarction should also be considered, even in the absence of cranial nerve or sensory abnormalities.

5. Conclusion

Medial medullary infarction can rarely present as isolated pure motor monoparesis of the upper extremity. This case challenges the conventional understanding of corticospinal tract somatotopy at the level of the medulla and suggests a more complex fiber organization than previously described.

Clinicians should maintain a high index of suspicion for brainstem stroke in patients with isolated limb weakness. Early MRI evaluation is essential for accurate diagnosis and timely management.

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