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Isolated axial lateropulsion caused by an acute lateral medullary infarction involving the dorsal spinocerebellar tract: A case report

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Abstract:

Lateral medullary syndrome encompasses a broad spectrum of symptoms and signs depending on the bulbar localization of the lesion. Body lateropulsion (BL) can occur without vestibular and cerebellar symptoms, as a unique manifestation of a lateral medullary infarction. However, it is relatively rare and challenging to diagnose. We report a case of a 72-year-old woman who presented with a tendency to fall to the right. She denied having vertigo, cerebellar signs, sensory loss, or motor weakness. No signs of vestibular dysfunction were found on the ENT examination. Neurological evaluation was unremarkable, except for mild ataxia of the right limbs along with BL to the right side when standing and walking. Brain magnetic resonance (MR) imaging showed an acute small infarct in the right lateral aspect of the medulla extending from the rostral to the caudal level. MR angiography found no stenosis or vascular occlusions. We believe that ipsilateral axial lateropulsion shown by our patient may be related to a selective ischemic lesion of the dorsal spinocerebellar tract in its medullary course. A lateral medullary infarction should be seriously considered in patients who present with isolated BL without further signs of bulbar involvement.

Keywords:

Isolated body lateropulsion, medulla oblongata, posterior spinocerebellar tract

Introduction

Lateral medullary syndrome (LMS) is a neurological condition caused by an acute ischemic infarction in the lateral segment of the medulla, posterior to the inferior olivary nucleus.^[1] Body lateropulsion (BL), i.e., the phenomenon of tilting the body to one side when standing, may rarely be the initial or unique symptom of LMS, a syndrome that includes a variety of symptoms depending on the extent of the lesion.^[2-7] In this study, we report a case of isolated BL (IBL) associated with an acute ischemic infarction in the lateral aspect of

the medulla extending from the rostral to the caudal level.

Case Report

A 72-year-old woman presented with a tendency to fall to the right while standing and walking, 4 days after onset. She had a history of hypertension, diverticulosis of the colon, chronic cholecystitis, and renal lithiasis. She did not complain of vertigo, diplopia, hiccups, dysphagia, speech disturbances, tinnitus, hearing loss, numbness, or muscle weakness. No signs of vestibular dysfunction were found on the ENT examination: the patient was able to sit on the side of the bed without support, the head was not tilted, had no lateral eye

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deviations with short lid closure or lateral saccade, and had no skew deviation during the cross-cover test when fixing, and subjective visual vertical test^[8] was normal (angle of deviation from vertical = 1.0°). Except for a standing and walking right BL along with a slight right dysmetria in the finger–nose and heel–knee–shin test, neurological evaluation was unremarkable. Laboratory tests at admission found a hyposideremia (31 µg/dl) and an increase in C-reactive protein (4.9 mg/dl) and erythrocyte sedimentation rate (113 mm/h). Hgb was 10.6 g/dl and Hct – 31.0%. Brain magnetic resonance (MR) with diffusion-weighted imaging (DWI) showed an acute small infarct in the right lateral aspect of the medulla, extending from the rostral to the caudal level of the medulla [Figure 1]. T2 axial image analysis revealed a conjugate ocular deviation to the right of 14°, calculated by a method previously reported.^[9] MR angiography (MRA) found no stenosis or vascular occlusions [Figure 1]. The echocardiogram (ECG) was normal while the transthoracic ECG found only a parietal hypertrophy of the left ventricle. Carotid ultrasound revealed a plaque in the left and right internal carotid artery, causing lumen stenosis of 25% and 10% according to the NASCET^[10] method, respectively. No occlusions or atherosclerotic plaques were found in the extracranial vertebral arteries. The patient was started with antiplatelet therapy (aspirin at 100 mg/day) and discharged with a diagnosis of acute lacunar cerebral infarction. Complete remission of the BL was observed over the subsequent few weeks.

Discussion

In the present work, we described a rare case of a small infarction in the lateral aspect of the medulla causing an ipsiversive IBL. BL may be a transient feature of LMS, a syndrome that includes a broad spectrum of clinical symptoms and signs based on the rostro-caudal and horizontal location of the lesion.^[2,11,12] IBL, i.e., BL without other signs of cerebellar or bulbar involvement, has been described in limited case reports where it has been associated with lesions involving the cerebellum,^[13,14] cerebellar peduncles,^[15] red nucleus,^[16] and medulla.^[5-7,17] In a few other cases caused by a bulbar lesion, IBL has been reported as an initial symptom of LMS [Table 1].^[3-7,18-20] However, in all cases of BL of bulbar origin, the lesion was found in the ipsilateral part of the medulla [Table 1].^[3-7,17-20]

The laterality of BL in brain stem strokes has been shown to depend on the pathways involved and the location of the lesions.^[3] Ipsiversive BL has been related to medullary lesions involving either the descending lateral vestibulospinal tract (LVST) or the ascending dorsal spinocerebellar tract (DSCT).^[21] Recently, Thömke, using a three-dimensional brainstem mapping, found

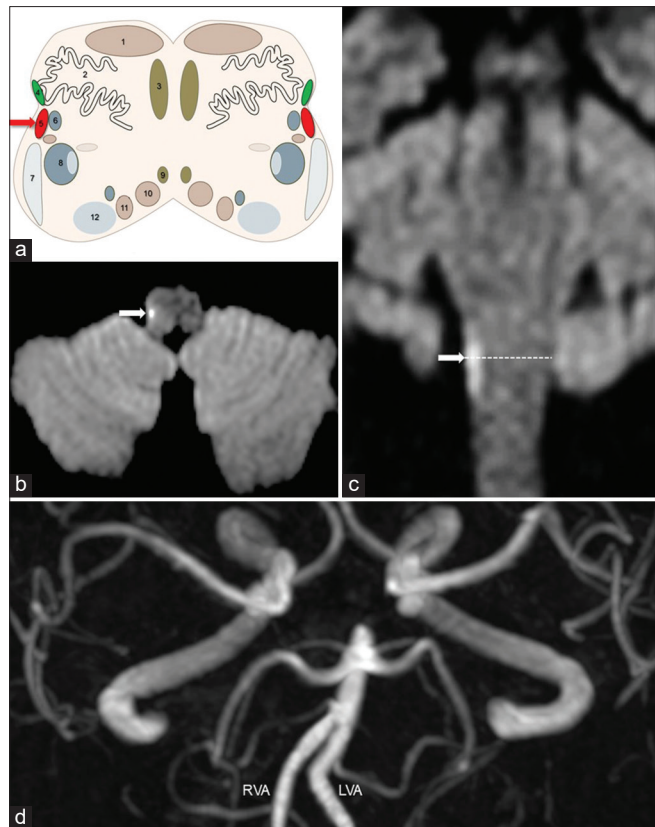


Figure 1: A diagram (a) indicates the location of the main anatomical structures and of the DSCT (red arrow) in the medulla oblongata. Diffusion-weighted magnetic resonance axial (b) and coronal (c) images show a lesion (white arrow) consistent with an acute infarction in the right lateral aspect of the medulla. MRA found no stenosis or vascular occlusions (d). DSCT: Dorsal spinocerebellar tract, MRA: Magnetic resonance angiography. 1: Pyramid, 2: Inferior olivary nucleus, 3: Medial lemniscus, 4: Anterior spinocerebellar tract, 5: DSCT, 6: Nucleus ambiguus, 7: Inferior cerebellar peduncle, 8: Spinal nucleus of trigeminal nerve, 9: Hypoglossal nucleus, 10: Dorsal motor nucleus of vagus, 11: Solitary nucleus, 12: Vestibular nucleus. RVA = Right vertebral artery, LVA = Left vertebral artery

that BL without limb ataxia may be attributed to an impaired vestibulospinal posture control caused by a lesion of the LVST, whereas BL with limb ataxia is probably related to a lesion of the DSCT, which carries unconscious proprioceptive stimuli from the ipsilateral lower trunk and leg.^[21] Contraversive BL, on the other hand, occurs with infarcts involving the medial longitudinal fasciculus in the upper pons or the red nucleus in the midbrain.^[22,23] MRI lesions involving the medulla and associated with LMS have been classified rostrocaudally as rostral, middle and caudal.^[2] It is worth pointing out that in most bulbar-related BLs the MRI lesion was detected in the caudal bulb.^[3,5-7,19] Since the ascending DCST is localized on the lateral surface of the lower medulla, it is believed that the lesion of this spinal tract is the cause of the ipsiversive BL in all these cases.

DWI is a commonly performed MRI sequence for the evaluation of acute ischemic stroke and is very

Table 1: List of previous cases of body lateropulsion associated with other symptoms body lateropulsion or isolated body lateropulsion, caused by a medullary infarction

Article	BL cases	Associated symptoms	IBL cases	Site of the lesion on brain MRI
Lee and Sohn, 2002 ^[4]	1	Nystagmus	-	Lateral aspect of rostral medulla
Kim <i>et al.</i> , 2004 ^[5]	2	Decreased pain sensation on the contralateral body	4	Lateral aspect of lower medulla
Maeda <i>et al.</i> , 2005 ^[6]	2	Ipsilateral Horner syndrome; decreased pain and temperature sensation on the contralateral body	1	Lateral aspect of caudal medulla (case 1 and 2) Dorsolateral medulla (case 3)
Kim <i>et al.</i> , 2007 ^[19]	1	Decreased pain and temperature sensation on the contralateral body	-	Lateral aspect of lowest medulla
Akdal <i>et al.</i> , 2007 ^[18]	1	Strabismus	-	Lateral aspect of medulla
Nakazato <i>et al.</i> , 2017 ^[7]	1	Decreased contralateral sensitivity to pain and heat	1	Lateral aspect of lower medulla
Yamaoka <i>et al.</i> , 2018 ^[20]	1	Ipsilateral numbness of the fingers	-	Dorsal part of middle medulla
Li <i>et al.</i> , 2020 ^[17]	-	No	1	Lateral aspect of medulla
Ramaswamy <i>et al.</i> , 2021 ^[8]	1	Ipsilateral Horner syndrome; hoarseness	-	Lateral aspect of lower medulla

BL: Body lateropulsion, IBL: Isolated BL, MRI: Magnetic resonance imaging

sensitive in the detection of small and early infarcts. In our case, DWI showed an acute small infarct in the right lateral aspect of the medulla extending from the rostral to the caudal level [Figure 1]. In addition, T2 axial image analysis revealed an ipsilesional conjugate eye deviation, commonly associated with acute lateral medullary infarction.^[24] Therefore, the slight degree of ocular deviation (14°) found probably depends on the small size of the infarct lesion which did not allow to damage the olivary projections to the contralateral vestibulocerebellar structures.^[24]

Because DSCT carries major proprioceptive information ipsilaterally in the medulla^[5] and may be affected at any level during its course to the cerebellum, we believe that a lesion of this descending tract in its entire path through the medulla, as not previously demonstrated, could be responsible of the ipsiversive IBL of our patient. Furthermore, the absence of vestibular symptoms, the ipsiversive type of IBL, as well as the mild ipsilesional limb ataxia, confirm in our case the exclusive involvement of the DCST. In fact the absence of signs of vestibular dysfunction excludes the damage of the LVST, while the presence of a mild limb ataxia ipsilateral to the BL makes the involvement of the ventral spinocerebellar tract very unlikely, as this tract carries the proprioceptive sensitivity of the contralateral lower limb.^[6]

In summary, lateral medullary infarction should be seriously considered in patients who present with IBL. The absence of vestibular symptoms together with the neuroradiological finding of a small lesion in the lateral aspect of the medulla, homolaterally to the IBL, is indicative of a DSCT lesion.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in

the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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