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CASE REPORT

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Benedikt syndrome in a 74-year-old hypertensive woman: A case report

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Abstract

Benedikt syndrome is a rare neurological disorder of the midbrain. Herein, we present a case of Benedikt syndrome, who presented with left-sided body weakness, right oculomotor nerve palsy, cerebellar ataxia, and Holmes tremor in the left upper limb following midbrain infarction. She was treated with aspirin, clopidogrel, and amiodarone.

KEYWORDS

case report, cerebellar ataxia, mesencephalon, oculomotor nerve palsy, tremor

1 | INTRODUCTION

Benedikt syndrome, also known as red nucleus syndrome or paramedian midbrain syndrome, is a rare neurological condition resulting from injury to the midbrain. It is characterized by a cluster of symptoms associated with anatomically specific injury to areas of the midbrain caused by a variety of causes.[1] Ipsilateral oculomotor nerve palsy, contralateral hemiparesis, contralateral cerebellar ataxia, and/or Holmes tremor and/or choreoathetosis are the most prevalent symptoms.[1,2] It is hardly seen during clinical practice due to the rarity of the disorder; hence, the disorder can be missed clinically. Thus, the key clinical message of the study is that Benedikt syndrome should be suspected if a patient presents with ipsilateral oculomotor nerve palsy, contralateral hemiparesis, contralateral ataxia, and/or Holmes tremor, and/or choreoathetosis.

This study presents a rare case of Benedikt syndrome in a 74-year-old hypertensive woman, who presented with left-sided body weakness, right oculomotor nerve palsy, cerebellar ataxia, and Holmes tremor in the left upper extremity, secondary to midbrain infarction.

2 | CASE PRESENTATION

A 74-year-old woman with an incidental diagnosis of hypertension presented to the emergency department at Shree Birendra Hospital (SBH) with complaints of left-sided body weakness and dizziness for a day. She felt dizzy but was conscious. There was a history of right-sided facial deviation, which was absent when the patient presented to the emergency department. However, there was no history of slurring of speech, abnormal body movement, and urinary and fecal incontinence.

She had smoked 10 cigarettes per day for 50 years (25 pack years) and consumed 3.75 units (200 ml of locally made alcohol) every day. The patient was not under any medication.

On examination, her blood pressure was 150/100 mm Hg. Hypertension was undiagnosed and untreated previously.

Her right eye had deviated outward and downward with ptosis, vertical nystagmus, and anisocoria (mid-dilated) in a nonreactive pupil (Figure 1). However, her visual acuity was normal. The left eye was normal. Facial asymmetry was absent during the examination, but the patient party stated that she had facial deviation initially which resolved.

On central nervous system examination, there was extensor plantar reflex and reduced power on the left limb along with gait instability during initial observation. On a subsequent day, the finger-to-nose test was impaired (left-sided ataxia), but rapid alternating hand movement evaluation was normal. On the third day of admission, a jerky movement of the left hand resembling a tremor was observed. When the abnormal movement was further evaluated, it was a resting tremor (Holmes tremor or rubral tremor), which exacerbated with posture and additionally intensified with action. This tremor was fairly coarse. It was particularly prevalent in the left upper extremity. The tone, bulk, higher mental function, and sensory functions were normal.

On baseline examination, the electrocardiogram (ECG) was normal with a regular, rhythmic heart rate of 74 beats per minute. Chest X-ray and blood tests were normal but hemoglobin level was elevated (17.2 g/dl).

Radiological investigations were ordered to rule out posterior cerebral artery stroke and midbrain lesions. The computed tomography (CT) scan was normal. However, magnetic resonance imaging (MRI) of the brain showed restriction of diffusion in the paramedian area of the midbrain, hyperintense on diffusion-weighted imaging, and hypointense on apparent diffusion coefficient, consistent with an acute infarct (Figure 2). There was an approximately 10×7 mm sized focus, hypointense on the T1-weighted image and hyperintense on T2, and fluid-attenuated inversion recovery in the right paramedian area of the midbrain involving the red nucleus extending to the cerebral peduncle (suggesting an acute infarction in the right posterior cerebral artery territory) and posteroinferior–medial aspect of the right temporal lobe (representing late subacute infarction) (Figure 3). Bilateral cerebellar white matter ischemic changes were also seen.

After these findings in MRI, echocardiography and carotid Doppler were performed for further review. On carotid Doppler, age-related intimal thickening and atheromatous plaques were seen in the bilateral common carotid artery, most prominently in the right common carotid artery. However, the echocardiographic findings were normal. Therefore, with these findings, neurologists diagnosed the case as Benedikt syndrome.

During the patient's emergency presentation, aspirin (150 mg orally once a day), clopidogrel (75 mg orally once a day), and amiodarone (5 mg orally once a day) were given. Since the patient was a chronic alcoholic, thiamine hydrochloride (100 mg per oral thrice per day) was also given. After the diagnosis, the patient was recommended for physiotherapy and follow-up.

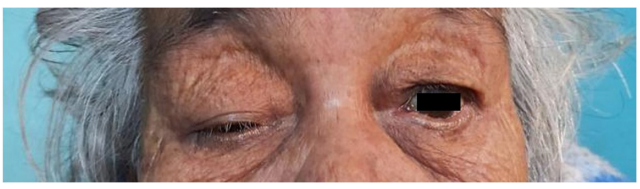

FIGURE 1 Ptosis in the right eye with the normal left eye

3 | DISCUSSION

Moritz Benedikt initially described Benedikt syndrome in three patients with ipsilateral ocular palsy, contralateral hemiparesis, tremor, and involuntary movements due to a lesion in the cerebral peduncle, a lesion within the inferior medial part of the cerebral peduncle. Charcot attributed it to a lesion within the inferior medial part of the cerebral peduncle in another case. Following that, Souques, Crouzon, and Bertrand revised the work based on an autopsy of a patient with similar symptoms, which indicated an infarction at the level of the red nucleus.[1] In these cases and later reported cases, the red nucleus, substantia, and oculomotor nerve were all involved but the cerebral peduncle was spared.[1–4]

Benedikt syndrome can occur with any etiology that causes injury to the structures of the midbrain. The main and usual cause is vascular in origin, including infarction and hemorrhage in the basilar artery or posterior cerebral artery in the midbrain.[2,5,6] Other causes include tuberculosis,[1] trauma,[2] surgical complications,[7] infections, multilobulated cyst formation,[8] and cancer metastasizing to the midbrain.[4] There was no history of trauma, tuberculosis, surgery, or malignancy in our case. She had an acute infarction in the right posterior cerebral artery with ischemia of the midbrain territory, which could be attributed to her elderly age, hypertension, smoking, and alcohol consumption history.

Benedikt syndrome is caused by the injury of the midbrain tegmentum and manifests as a constellation of symptoms. The tegmentum encompasses the nuclei of the oculomotor (III) and trochlear (IV) cranial nerves, white matter tracts, including the decussation of superior cerebellar peduncles[9] and gray matter comprising the substantia nigra and red nucleus.[3] The oculomotor nucleus projects the third nerve, which travels near the red nucleus. The substantia nigra plays a role in motor control and reward pathways. The red nucleus functions in motor coordination.[3] Therefore, the patient typically

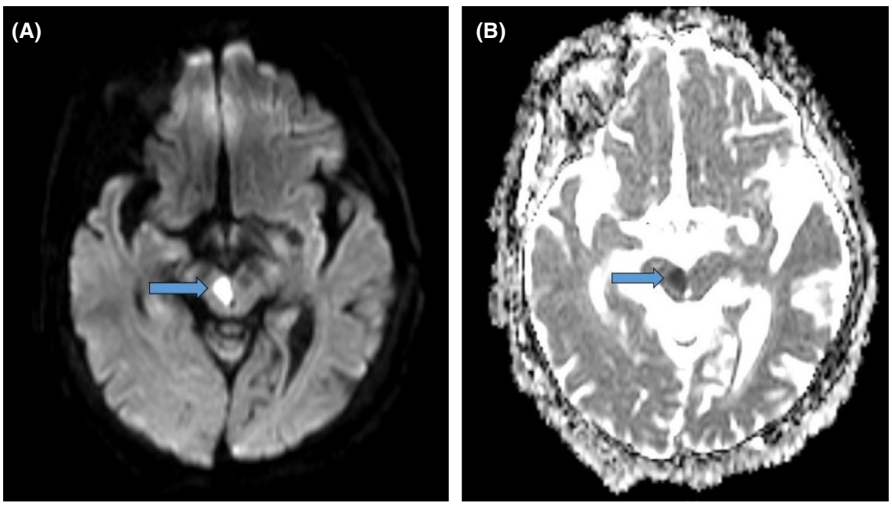

FIGURE 2 MRI head showing DWI (A) and ADC (B)-weighted images showing a diffusion-restricted lesion (arrows) in the right paramedian midbrain, consistent with an acute infarct. ADC, apparent diffusion coefficient; DWI, diffusion-weighted imaging

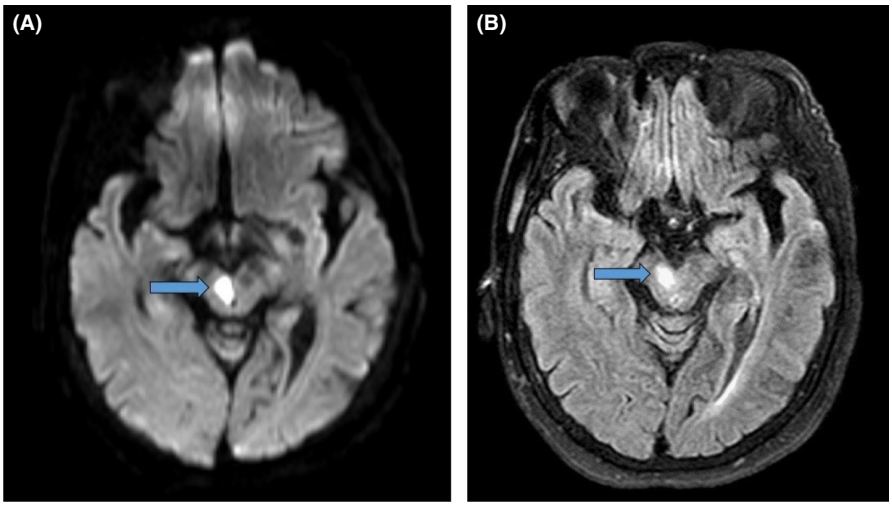

FIGURE 3 MRI head showing hyperintense lesion on FLAIR weighted image in the right paramedian midbrain (arrows) involving the tegmentum, including the red nucleus. FLAIR, fluid-attenuated inversion recovery

presents with ipsilateral internal and external ophthalmoplegia (lesions of the oculomotor nerve), contralateral hemiparesis, hyperreflexia (injury of the cerebral peduncle), contralateral ataxia, and tremor (lesion of the red nucleus), and dystonic movement (lesion of the substantia nigra).[1–7] The clinical presentation of our patient was similar to previously reported cases.[1,2,4,6,8] She had the classic symptoms of Benedikt syndrome. In contrast to those cases, our patient had normal reflexes, except for the plantar reflex, which was extensor on the contralateral side, as reported in prior studies.[2,6] However, in an article by Duncan et al., pupils were reactive and size was equal in both eyes, and tendon reflexes were hyperactive on the contralateral side, in contrast to our case.[6] Our patient had gait instability like the other reported cases.[1,7,8] The structures of the midbrain involved in the pathophysiology of Benedikt syndrome and their corresponding signs of dysfunction[10,11] are tabulated below (Table 1).

TABLE 1 Signs of midbrain dysfunction in Benedikt syndrome

Structures in midbrain	Signs of dysfunction
Edinger–Westphal nucleus	Mydriasis, problems with visual accommodation
Oculomotor nucleus	Ptosis, down and out pupil
Medial longitudinal fasciculus	Internuclear ophthalmoplegia
Red nucleus	Contralateral coarse tremor or choreoathetosis
Substantia nigra	Resting tremor, postural instability, difficulty initiating movement
Cerebral peduncle	Contralateral ataxia, hyperreflexia

Ocular symptoms appeared earlier while the tremor occurred after some days in our case. A delay between midbrain injury and the onset of tremor has often been observed.[7,12] Reza Samie et al.[13] indicated that it might be linked to axonal sprouting, trans-synaptic neuronal degeneration, or alterations in receptor sensitivity.

After polycythemia had been ruled out, there were three differential diagnoses for midbrain lesions, namely Weber syndrome, Benedikt syndrome, and Claude syndrome. The common presentation of these three syndromes is the ipsilateral oculomotor nerve palsy (inferolateral eye deviation, diplopia, ptosis, and afferent pupillary defect) on the affected contralateral side. Since MRI showed acute infarction in the paramedian aspect of the midbrain and subacute infarction in the posteroinferior aspect of the right temporal lobe, in our case, Claude syndrome was ruled out where the lesion is on the ventromedian aspect of the midbrain.[1] And on the subsequent days of presentation, left-sided ataxia and tremors occurred; then, the case was diagnosed as Benedikt syndrome. The tremor matched the earlier description made by Benedikt, where he described the tremor as secondary to a mesencephalic infarction. The tremor presents as a combination of resting, postural, and kinetic tremor, which is also known as rubral, mesencephalic, or thalamic tremor.[14] Charcot emphasized that tremor distinguished the syndrome from Weber's syndrome.[1]

Different management approaches have been reported in different cases, including pharmacotherapy (levodopa),[14,15] surgery (surgical resection of the midbrain mass),[16] deep brain stimulation,[17] and physical therapy. Follet et al. have mentioned that there are limited benefits of pharmacotherapy with intolerable side effects.[18] Deep brain stimulation has emerged as a new approach for Benedikt syndrome with successful results and replacing ablative therapy.[17] Since our patient is old and has hypertension with a significant history of alcohol and smoking, physiotherapy with timely follow-up was recommended.

4 | CONCLUSION

We report a case of Benedikt syndrome secondary to midbrain infarction in an elderly hypertensive female, who presented with left-sided body weakness, right oculomotor nerve palsy, cerebellar ataxia, and Holmes tremor in the left upper extremity. Benedikt syndrome should be kept in mind when a patient presents with the characteristic symptoms of ipsilateral oculomotor nerve palsy, contralateral hemiparesis, contralateral ataxia, and dystonic movements.

AUTHOR CONTRIBUTIONS

AA, AMB, and AP contributed to the conceptualization, writing—original draft, and review and editing. PR, MK, MST, and SB contributed to the literature review, writing—original draft, and review and editing. RP contributed to the supervision and writing—review and editing. All authors accepted the final version of the manuscript.

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None.

CONFLICT OF INTEREST

None.

DATA AVAILABILITY STATEMENT

All the required information is in the manuscript.

ETHICS STATEMENT

This study did not involve experiments on humans or animals.

CONSENT

Written informed consent was obtained from the patient for the publication of this case report and accompanying images.

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