CASE REPORT

Floccular Syndrome-An Atypical Presentation of Paraneoplastic Cerebellar Degeneration (PCD)

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Abstract

The flocculus, a small and distinct region of the cerebellum, plays a crucial role in coordinating eye movements, especially in stabilizing visual images on the retina during head movements. Damage or lesions in the flocculus can lead to a specific neurological syndrome called floccular syndrome. This syndrome is characterized by abnormalities in the vestibulo-ocular reflex (VOR), which helps coordinate eye movements with head movements to maintain clear vision. Progressive ataxia, particularly affecting the flocculus, combined with vestibulo-ocular reflex abnormalities, strongly suggests the presence of paraneoplastic cerebellar degeneration. In our case study, we described the clinical presentation of a middle-aged woman who experienced gradually worsening dizziness and ocular issues. Due to the subacute onset of cerebellar symptoms and normal neuroimaging evidence of cerebellar atrophy, we initiated a paraneoplastic workup, revealing positive anti-Yo antibodies. This prompted consideration of the diagnosis of PCD (paraneoplastic cerebellar degeneration) with floccular syndrome. The patient underwent steroid therapy, resulting in partial symptom improvement. Despite thorough investigations for hidden malignancies, no occult tumor was found. Our case report aims to underscore the rare and distinct features of PCD, as observed in this particular patient.

Keywords: *Middle-aged, female, cerebellum, steroids.*

INTRODUCTION

The cerebellum is a highly complex structure that is involved in the coordination and regulation of movement, as well as other cognitive functions. The anterior lobe, the posterior lobe, and the flocculonodular lobe are its three primary lobes. The anterior lobe is involved in the regulation of muscle tone, while the posterior lobe controls balance and fine motor coordination. The flocculonodular lobe, further known as the vestibulocerebellum, is involved in the processing of information from the vestibular system, which is responsible for maintaining balance and spatial orientation. The flocculus, on the other hand, is a small, rounded structure located on the undersurface of the cerebellum, near the junction of the flocculonodular lobe and the posterior lobe. It is primarily involved during the processing of visual and vestibular information related to eye movements, including the coordination of smooth pursuit and saccadic eye movements, and the vestibulo-ocular reflex. In summary, while the lobes of the cerebellum have a more general role in motor control and balance, the flocculus has a more specialized role in the processing of visual and vestibular information associated with balance and spatial orientation as well as the coordination of eye movements.

Floccular syndrome is a neurological condition that manifests as a specific type of nystagmus known as direction-changing positional nystagmus (DCPN). DCPN is a type of eye movement that occurs when the patient's head is moved into certain positions. In floccular syndrome, DCPN occurs due to damage to the flocculus. This damage can be caused by various factors, including autoimmune disorders like PCD, tumors, infections, and trauma. Paraneoplastic cerebellar degeneration (PCD) is clinically represented by a progressive ataxia that eventually becomes incapacitating, and pathologically by the destruction of cerebellar Purkinje cells along with varying losses of other cell types. PCD can be a warning indication for an occult tumor because it can occur before malignancy is detected [1-3]. PCD is a type of autoimmune disorder in which the immune system mistakenly attacks the Purkinje cells. This attack results in the loss of Purkinje cells, leading to cerebellar dysfunction and the clinical symptoms of ataxia, dysarthria, and other neurological deficits [4]. We reported a case of Paraneoplastic cerebellar degeneration with floccular syndrome.

CASE PRESENTATION

A 58-year-old, woman presented with three months history of dizziness and one-month history of double vision. She described her dizziness as a sensation of spinning or unsteadiness, which worsened with head movements. These symptoms were gradual in onset and worsened progressively. On further history-taking, the patient denied any recent infections or exposure to toxins. She also reported no history of trauma or head injury that could have triggered her symptoms. The patient mentioned experiencing difficulties in maintaining balance while walking. She was emaciated in appearance but denied any other constitutional symptoms like fever or night sweats. The patient had no significant family history of similar illnesses, and there were no relevant drugs in her medication history that could be considered in the differential diagnosis of

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Received: January 26, 2024; Revised: May 12, 2024; Accepted: July 04, 2024
DOI: https://doi.org/10.37184/lnjcc.2789-0112.5.15

her condition. Inquiring about her medical history, she reported no known chronic medical conditions, and her past medical records showed no significant neurological issues. Additionally, she had not undergone any recent surgeries or procedures that could be relevant to her current symptoms. She was a non-smoker and there was no history of alcohol intake.

General physical examination was unremarkable and she was vitally stable at the time of admission. On neurological evaluation, the higher mental function and speech were normal. Cranial nerve examination showed severe abnormality of horizontal gaze-holding system manifested as primary position spontaneous nystagmus, horizontal, bilateral gaze-evoked nystagmus with a downbeat component when gazed to the right, saccadic pursuits horizontally and vertically, and definite bilateral esotropia with abduction deficits. Her gag reflex was weak, and there was significant truncal ataxia. Motor examination showed normal bulk with reduced tone, power was 5/5 in all four limbs, and DTRs were normal. Sensory examination including pin-prick and joint position was intact. She was approached as a case of truncal ataxia that was steadily progressing and had substantial nystagmus. She was subjected to relevant investigations to rule out possible etiologies of acquired ataxias. The laboratory investigations which were performed at baseline, are shown in detail below (**Table 1**). It revealed mild hyponatremia, hypokalemia and slightly raised CRP (C-reactive protein).

Table 1: Laboratory investigations.

Laboratory Parameters	Laboratory Results	Reference Range
Urea	**20 mg/dl**	**7-20 mg/dl**
Creatinine	0.5 mg/dl	0.6-1.1 mg/dl
Sodium	132 mmol/liter	136-145 mmol/liter
Potassium	3.3 mmol/liter	3.5-5 mmol/liter
Calcium	10 mg/dl	8.6-10.3 mg/dl
Magnesium	2 mg/dl	1.7-2.2 mg/dl
Hemoglobin	11 gm/dl	12-15 gm/dl
Platelets	233	150-400*109/L
White cells	10 /cu mm	4-11 /cu mm
ESR	10 mm/hr	0-20 mm/hr
CRP	2 mg/dl	0.3-1 mg/dl
TSH	3.5 milliunits/liter	0.4-4 milliunits/liter
Vitamin B12	455 pg/ml	160-950 pg/ml
Vitamin E	10 micrograms/ml	5.5 -17 microgram/ml
ANA PROFILE	Negative	
SGPT	15 units/liter	7-40 units/liter
Albumin	3.8 g/dl	3.5-5.4 g/dl
ACE levels	20 nanomole/ml/min	>40 nanomole/ml/ min
CSF D/R		
Glucose	76 mg/dl	
Protein	29 mg/dl	45 mg/dl
WBC	Nil	Upto 5 cells/cu mm
RBC	Nil	
Oligoclonal bands	Matching serum and CSF	
Onconeural antibodies		
AMPHIPHYSIN	Negative	Breast, SCLC
CV2	Negative	SCLC, Thymoma
Ma2/Ta	Negative	SCLC, testicular tumor
Ri/ANNA2	Negative	Breast, ovarian, SCLC
YO/PCA1	Positive	Breast, ovarian
RECOVERIN	Negative	
HU/ANNA	Negative	SCLC, breast, seminoma testes
SOX	Negative	SCLC
TITIN	Negative	Thymoma
IgA TTG	Negative	Celiac disease

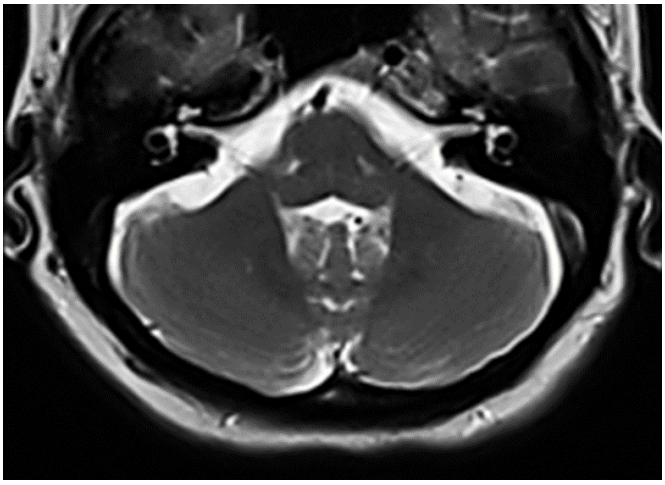

Fig. (1a): Patient's MRI brain T2 sequence showing mild cerebellar atrophy.

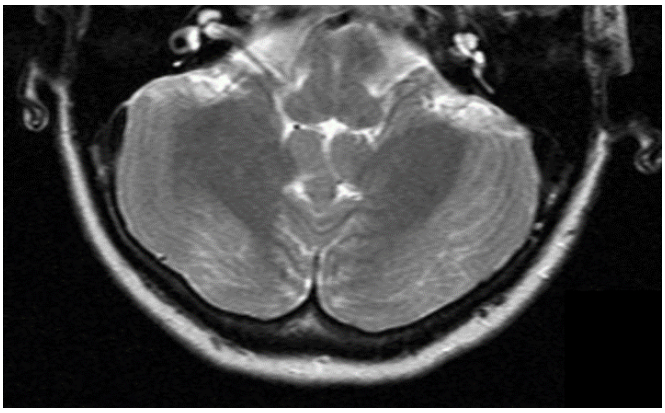

Fig. (1b): Normal MRI Brain T2 sequence at the same level, for reference from radiology assistant.

Her MRI brain showed mild cerebellar atrophy (**Fig. 1a, 1b**).

Anti-Yo antibodies were found in serum, which is associated with breast and ovarian cancer. Based on PNS diagnostic standards, the patient was identified as a case of paraneoplastic cerebellar degeneration. Her mammogram, CT chest, abdomen and pelvis were all normal. She received a pulse of methylprednisolone for five days and was later discharged on tapering doses. Her symptoms improved partially. On the subsequent

visit, we advised her to get plasma exchange, which she deferred because of financial constraints.

DISCUSSION

Our patient presented with a history of unsteady gait, dizziness, bulbar symptoms and significant ocular abnormalities. She had horizontal gaze holding which manifested as primary position spontaneous nystagmus. These findings are suggestive of involvement in the flocculus of the cerebellum. The cerebellar flocculus is an essential element in the regulation of eye movements. Damage to the flocculus/para flocculus complex causes static and dynamic abnormalities of the vestibulo-ocular reflex (VOR). Acutely, it can manifest as ipsilateral-beating spontaneous nystagmus, bilateral gaze-evoked nystagmus, borderline decreased smooth pursuit, and a fully contraversive ocular tilt reaction.

PCD is the most prevalent CNS paraneoplastic syndrome and typically presents with ataxia of gait, trunk, limbs, and impaired speech and eye movements. The criteria suggested by Graus *et al.* serve as the foundation for the diagnosis of paraneoplastic cerebellar degeneration [1]. Upon conducting a literature search we found limited studies reporting cases of paraneoplastic syndrome presenting as a floccular syndrome. One case report described a patient with breast cancer who presented with dizziness, oscillopsia and cerebellar symptoms caused by anti-Yo paraneoplastic cerebellar degeneration [5, 6]. In a separate case study, a patient diagnosed with non-small cell lung cancer, along with anti-Hu paraneoplastic cerebellar degeneration, exhibited symptoms characterized by ataxia and floccular syndrome [7]. Furthermore, a review article published in 2021 reported that floccular syndrome is a rare but recognized presentation of paraneoplastic cerebellar degeneration [8]. The authors noted that floccular syndrome is often associated with anti-Yo antibodies, similar to our case. Based on the available literature, it appears that paraneoplastic syndrome presenting as floccular syndrome is a rare but recognized presentation of paraneoplastic cerebellar degeneration. Clinicians must be aware of this possibility and take it into account when making a differential diagnosis for patients who exhibit nystagmus and dizziness as their primary symptoms. Patients who exhibit cerebellar symptoms and test positive for onconeural antibodies are classified as having definitive paraneoplastic cerebellar degeneration (PCD).

Our patient was then further evaluated after radiological investigations to locate the tumor although the whole workup was negative. As we knew that Paraneoplastic neurological disorders can precede the primary tumor diagnosis so we advised annual surveillance in our case. The prognosis of PCD is poor and the disease symptoms can be controlled with systemic steroids, intravenous immunoglobulins, plasma exchange, tacrolimus, rituximab or cyclophosphamide [9]. The management of paraneoplastic cerebellar degeneration primarily depends on early detection and treatment of the underlying malignancy. Regardless of whether immunotherapy was used, patients who received treatment for their primary malignancy showed improved outcomes [8]. Our patient was given methylprednisolone and her symptoms improved partially. She was further suggested plasma exchange to which she did not comply.

CONCLUSION

Paraneoplastic cerebellar degeneration is widely recognized for its pan-cerebellar symptoms. However, our case uniquely emphasized symptoms localized to the flocculus, a distinct lobe of the cerebellum.

CONSENT FOR PUBLICATION

Informed consent was obtained from the patient.

CONFLICT OF INTEREST

The author declares no conflict of interest.

ACKNOWLEDGEMENTS

Declared none.

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