Movement Disorders
CLINICAL PRACTICE

CASE REPORT

# Sarcoidosis Manifestion Centered on the Thalamic Pulvinar Leading to Persistent Astasia

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Neurosarcoidosis is a rare disease that occurs as a serious complication in about 2–26% of cases with a systemic sarcoidosis. It typically manifests as cranial neuropathy, peripheral neuropathy, or meningitis. It is often accompanied by headache, but also affects cortical, subcortical, and spinal cord structures.[1]

Here, we report on a previously healthy 31 year old male patient without preceding infection or vaccination who was admitted to our hospital after noticing symptoms of walking insecurity, headache, and weight loss. At his neurological examination the patient was unable to stand or walk unsupported (Video S1), with a tendency to fall backwards, and an inconsistent lateropulsion towards either side. Sitting without assistance was possible, although the trunk was unstable and periodically swayed back and forth, irrespective of whether eyes were open or closed. Oculomotor tests were normal except for hypometric saccades towards both hemifields and a transient slight downbeat nystagmus. No tremor, gait, or limb ataxia were seen and heel-to-shin test was normal. No muscle weakness, primary visual, vestibular, somatosensory, or proprioceptive deficits were found. Electrophysiological examinations (EEG, VEPs, SEPs, MEPs, NCVs) and caloric testing were normal. The patient could correctly align the subjective visual vertical (SVV). Neglect symptoms were not detected either (normal visual field test, no exploration bias, or extinction). The CSF analysis showed elevated IgG levels, unspecific oligoclonal bands and lymphocytic pleocytosis (4–7 cells/µl). In MRI, no white matter involvement was noted, but bilateral pulvinar hyperintensities were seen in initial and follow-up scans (Fig. 1). The MR picture thus displayed a so called pulvinar sign, which has been associated with atypical CJD.[2] However, 14-3-3 protein or other neurodegeneration markers in the CSF and neuropsychological testing were normal, except for slight attentional deficits. Other diseases which can also display a pulvinar sign on FLAIR MRI, such as Fabry-disease,[3] autoimmune encephalitis,[4] ADEM,[5] or celiac disease,[6] and other diseases with sometimes atypical CNS manifestations (Tuberculosis, Clamydia or Legionella infection, Whipple's disease, Toxoplasmosis, Mycosis, Helminthic infections, Treponemal infection, Lyme disease, HSV, EBV, CMV, VZV, Enteroviruses, Vasculitis, Behçet's disease, Amyloidosis) were excluded by repeated testing of paraneoplastic antibodies (GAD 65, Zic4, TR, SOX1, Ma1 and 2, Amphiphysin, CV2, Ri, Yo, HuD, NMDAR, AMPAR1,2, CASPAR2, LGI1, DPPX), genetic testing, and further extensive examinations. Pathological serum ACE, pathological CD4/CD8 ratio in the bronchoalveolar-lavage, suspicious lymph nodes in FDG-PET-CT, and follow up thoracic biopsies, together with histopathological documentation of non-caseating epithelioid-cell granulomas in thoracic biopsies, revealed a neurosarcoidosis.[1] High-dose cortisone treatment led to clinical improvement, but later the neurological symptoms of the patient progressed despite aggressive second-line therapy with plasma-exchange, followed by Infliximab, which occurs in up to 30% of patients with neurosarcoidosis.[1] To our best knowledge, neurosarcoidosis manifestations in the thalamic pulvinar have not been reported so far. Importantly, astasia that may occur after cortical (SMA, cingulate) or midbrain lesions so far has not been associated with pulvinar lesions either. Rare descriptions of thalamic astasia affected mainly the primary thalamic nuclei and came with varying degrees of motor, sensory, and vestibular impairments.[7,8] They appeared as acute unilateral syndromes, mostly due to strokes, which involved the more anterior or posterior-

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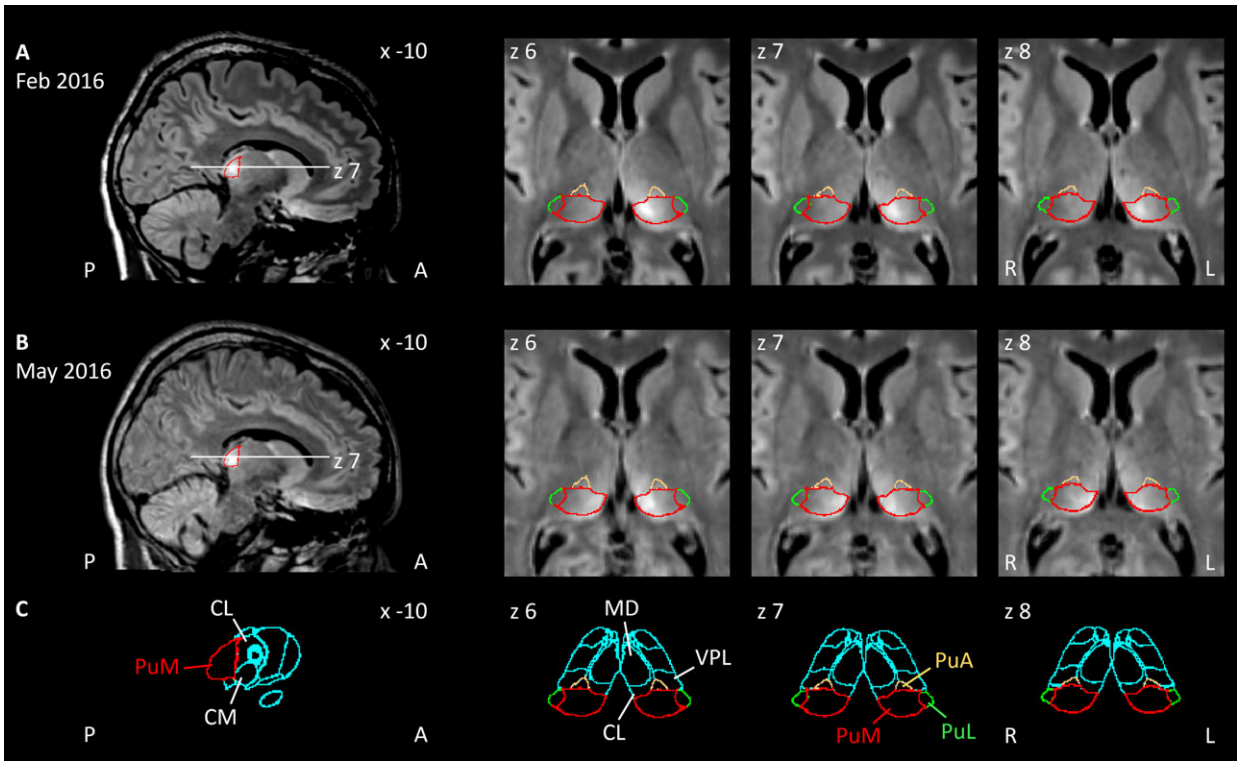


**FIG. 1.** Magnified views of fluid-attenuated inversion recovery (FLAIR) MR images of the patient in MNI-space from (**A**) the first visit in February 2016, (**B**) the second visit in May 2016, and (**C**) co-registered to the digital version of the Morel atlas. The sagittal view on the left indicates the orientation and location of the axial cross-sections shown on the right. **A:** FLAIR images show hyperintensity in the medial pulvinar on both sides, stronger in the left pulvinar (radiological convention). Lesions spared the ventral pulvinar portions, anterior thalamus, brainstem, and surrounding cortices. **B:** On the second visit the bilateral involvement of the pulvinar became more obvious. Cross-sections show the lesioned thalamic regions based on the overlaid pulvinar regions defined by the Morel atlas. **C:** Corresponding sections of the Morel atlas with all regions are shown in the bottom row. The thalamic regions from the Morel atlas are outlined in light blue, except for medial pulvinar (PuM, red), lateral pulvinar (PuL, green), and anterior pulvinar (PuA, orange). Abbreviations: A, anterior; CL, central lateral nucleus; CM, centromedian nucleus; L, left; MD, mediodorsal nucleus; P, posterior; R, right; VPL, ventral posterior lateral nucleus. x, y, z (in mm) denote the level of the cross-sections in MNI-space.

lateral parts of the thalamus, thus also including well known afferent sensory and/or vestibular and oculomotor pathways. This was not the case in our patient, where thorough testing of these modalities did not show abnormalities. Furthermore, the patients recovered their postural deficits within days-to-weeks, either completely or to a large extent.[7–9] Our patient, however, is still unable to stand or walk, which might be explained by the bilateral, persistent pulvinar affection that probably resulted in irreversible neurodegeneration. A unilateral lesion in the centromedian thalamus has been described [CM] where the patient had a (transient) postural instability that also came with a pathological SVV, thus possibly affecting the central otholith pathways.[9] Unfortuantely, no detailed descriptions of the neurological and neurophysiological assessments are given in this report.[9] We cannot completely rule out affection of the left CM in our patient (where the lesion extends slightly more anterior than on the right side), since the border of the CM to the pulvinar is not well defined even histologically, but we think that a major contribution of the CM to the astasia in our patient would have also led to a pathological SVV, which we did not detect. The clinical syndrome, albeit sharing some features with cerebellar dysfunction (hypometric saccades), is also different from direct cerebellar lesions since our patient did not display gait ataxia (e.g., due to rostral vermis lesions which lead to a wide-based stance and gait).[10] Taken together, our results suggest that the pulvinar is critical for upright standing and walking. It likely subserves this role of postural signal integration through its widespread cortical and subcortical (i.e., cerebellar) connectivity.[7]

## Author Roles

1. Research Project: A. Conception, B. Organization, C. Execution; 2. Statistical Analysis: A. Design, B. Execution, C. Review and Critique; 3. Manuscript Preparation: A. Writing the First Draft, B. Review and Critique.

M.W.: 1A, 2A, 2B, 3A, 3B
P.D.: 2B, 2C, 3B
M.B.: 1A, 2A, 2B, 3A, 3B


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## Disclosures

**Ethical Compliance Statement**: We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines.

**Ethical Standards**: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written consent to publish all shown materials was obtained from the patient in German.

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## Supporting Information

**Video S1**: This video clip illustrates the gait abnormalities in our patient with bilateral pulvinar lesions: (1) Astasia, as indicated by an inability to stand and walk without support. (2) Unsecure positioning of the feet. (3) Tendency to fall backwards and to the left > right side. No indication of gait ataxia (i.e., no wide-based stance and gait).



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