International Journal of Radiology Research
www.radiologyjournal.in
E-ISSN: 2663-4562
Received: 09-06-2026, Accepted: 09-07-2026, Published: 24-07-2026
Volume 8, Issue 3, 2026, Page No. 47-50

# The hummingbird and the Morning Glory: Classic MRI signatures of Progressive supranuclear palsy in a patient with atypical parkinsonism — A case report

**Dr. Krushik T R[1], Dr. Naveen D[2]**
[1] Department of Radiodiagnosis, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India
[2] Professor, Department of Radiodiagnosis, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India
**Corresponding Author:** Dr. Krushik T R
**DOI:** https://doi.org/10.66856/ijrr.2026.8.3.8030

**Abstract**
**Background:** Progressive supranuclear palsy (PSP) is the commonest atypical parkinsonian ("Parkinson-plus") syndrome and a 4-repeat tauopathy that is frequently misdiagnosed as idiopathic Parkinson disease early in its course. MRI of the brainstem demonstrates a group of highly specific morphological and planimetric signs that reflect the midbrain-predominant atrophy of PSP.
**Objective:** To illustrate the characteristic MRI features of PSP in a patient carrying a non-specific clinical label of atypical parkinsonism, and to review the systematic imaging approach used to differentiate PSP from multiple system atrophy (MSA) and corticobasal degeneration (CBD).
**Case summary:** A 60-year-old hypertensive man presented with acute dysphagia and dysarthria of two days' duration on a background of an eighteen-month history of progressive gait disturbance and a prior clinical diagnosis of atypical parkinsonism. MRI of the brain demonstrated midbrain tegmental atrophy producing the hummingbird (penguin) sign on midsagittal T1, the morning-glory / Mickey-Mouse configuration of the midbrain on axial images, thinning of the superior cerebellar peduncles and third-ventricular widening, with a preserved pons.
**Conclusion:** The constellation of midbrain-predominant atrophy on MRI, combined with a symmetric, levodopa-unresponsive akinetic-rigid syndrome, allowed confident radiological diagnosis of PSP. Recognition of these signs, reinforced where necessary by simple planimetry and the MR Parkinsonism Index, enables the radiologist to make a clinically meaningful contribution to a diagnosis that is otherwise difficult to establish in life.

**Keywords:** Progressive supranuclear palsy, Hummingbird sign, Morning-glory sign, MR Parkinsonism Index, Atypical parkinsonism, tauopathy

## Introduction

Progressive supranuclear palsy (PSP), first described by Steele, Richardson and Olszewski in 1964, is a sporadic neurodegenerative tauopathy and the commonest of the atypical parkinsonian syndromes [1, 2]. It is characterised pathologically by the deposition of hyperphosphorylated 4-repeat tau as globose neurofibrillary tangles, tufted astrocytes and oligodendroglial coiled bodies, with maximal burden in the subthalamic nucleus, globus pallidus, substantia nigra, midbrain tectum, superior cerebellar peduncle and dentate nucleus [3].

The classical Richardson phenotype is dominated by a vertical supranuclear gaze palsy, early postural instability with unexplained backward falls, axial rigidity and pseudobulbar dysfunction, and characteristically shows a poor or only transient response to levodopa [2, 3]. Because these early features overlap substantially with idiopathic Parkinson disease (PD), multiple system atrophy (MSA) and corticobasal degeneration (CBD), imaging plays a decisive role in narrowing the differential diagnosis [4, 5].

MRI of the brainstem yields a group of highly specific signs — the hummingbird and morning-glory signs — and quantitative indices such as the midbrain-to-pons ratio and the MR Parkinsonism Index (MRPI) that reflect the selective midbrain atrophy of PSP [4, 6, 7]. The present report illustrates these findings in a single patient and reviews the radiological differentiation of the atypical parkinsonian syndromes.

## Description – Case Details & Imaging Technique

- **Design:** Single-patient case report.
- **Patient:** 60-year-old man; known hypertensive of 10 years' duration.
- **Presenting complaints:** Difficulty in swallowing and difficulty in speech of 2 days' duration; difficulty in walking of approximately 1.5 years' duration.
- **Prior diagnosis:** Atypical parkinsonism, diagnosed clinically 3 years earlier at another centre (previous imaging not available).
- **Clinical findings:** Symmetric, axially-predominant rigid–akinetic syndrome with impaired postural reflexes and pseudobulbar dysarthria/dysphagia; poor levodopa response; no prominent early autonomic failure.
- **Imaging:** 1.5-T MRI of the brain – multiplanar T1-weighted, T2-weighted, FLAIR and gradient-echo sequences reviewed on the MEDSYNAPSE system, Department of Radiodiagnosis, SIMS & RC, Bangalore.

## MRI Evaluation Parameters

- Midbrain morphology and anteroposterior diameter; superior midbrain (tegmental) contour.
- Midbrain-to-pons area ratio and MR Parkinsonism Index components (pons, midbrain, middle and superior cerebellar peduncles).
- Superior cerebellar peduncle thickness.

- Third-ventricular width and frontal lobe volume.
- Pons for the hot-cross-bun sign; middle cerebellar peduncles and putamina (to assess for MSA); cortical symmetry (to assess for CBD).

**Characteristic MRI Signs of PSP**

| Sign | Plane / Sequence | Basis |
|---|---|---|
| Hummingbird / penguin sign | Midsagittal T1 | Midbrain tegmental atrophy with preserved pons |
| Morning-glory sign | Axial (midbrain) | Concavity of lateral midbrain tegmental margins |
| Mickey-Mouse sign | Axial (midbrain) | Atrophy accentuating the cerebral peduncles |
| SCP thinning | Coronal / sagittal | Degeneration of superior cerebellar peduncle |
| Midbrain AP < 9.35 mm; M/P ratio < 0.52; MRPI > 13.55 | Midsagittal planimetry | Quantitative midbrain-predominant atrophy |

**Discussion**

The imaging hallmark of PSP is selective atrophy of the midbrain, and in particular of its tegmentum, with relative sparing of the pons. On the midsagittal image this disproportion produces the hummingbird (or penguin) sign, in which the atrophic, beak-like midbrain sits atop the preserved, body-like pons [6, 7]. On axial images the same tegmental volume loss flattens and then concaves the lateral midbrain margins, giving the morning-glory flower sign, while atrophy accentuating the cerebral peduncles yields the Mickey-Mouse appearance. Thinning of the superior cerebellar peduncle and dilatation of the third ventricle are frequent accompaniments [7, 8].

Qualitative signs can be reinforced by simple planimetry. A midbrain anteroposterior diameter below approximately 9.35 mm and a reduced midbrain-to-pons area ratio (below about 0.52) both favour PSP [4, 9]. The MR Parkinsonism Index (MRPI) combines these structures into a single ratio — the pons-to-midbrain area ratio multiplied by the middle-cerebellar-peduncle-to-superior-cerebellar-peduncle width ratio. Because PSP causes atrophy of both the midbrain and the superior cerebellar peduncle while sparing the pons and middle cerebellar peduncle, the MRPI rises in these patients; a value above 13.55 is regarded as abnormal and strongly predictive of PSP [4]. The refined MRPI 2.0, which incorporates third-ventricle width, improves detection of the PSP-parkinsonism variant that lacks early vertical gaze palsy [5].

The principal radiological differential is between PSP, MSA and CBD. MSA is an α-synucleinopathy: MSA-C produces the cruciform pontine "hot-cross-bun" sign, middle cerebellar peduncle atrophy and cerebellar volume loss, whereas MSA-P produces putaminal atrophy with a posterolateral T2-hypointense rim and a hyperintense slit-like lateral margin, with the midbrain relatively preserved [10]. CBD, also a 4-repeat tauopathy, shows markedly asymmetric focal cortical atrophy of the perirolandic region and superior parietal lobule contralateral to the clinically affected side, again sparing the midbrain [11]. In the present case the symmetric, midbrain-predominant atrophy with an intact pons and no focal cortical asymmetry pointed firmly to PSP. The differentiating features are summarised in Table 1.

**Table 1:** Radiological and clinical differentiation of atypical parkinsonian syndromes

| Feature | PSP | MSA | CBD |
|---|---|---|---|
| Core pathology | 4R tauopathy | α-synucleinopathy | 4R tauopathy |
| Symmetry | Symmetric, axial | Symmetric | Asymmetric |
| Hallmark | Vertical gaze palsy; falls | Autonomic failure; stridor | Apraxia; alien limb |
| Levodopa | Poor / transient | Poor | Poor / absent |
| Key MRI sign | Hummingbird; morning-glory | Hot-cross-bun; putaminal rim | Asymmetric cortical atrophy |
| Midbrain | Atrophic | Preserved | Preserved |

Correlating structure with symptom in this patient: the acute dysphagia and dysarthria reflect bilateral corticobulbar degeneration producing a pseudobulbar palsy; the eighteen-month gait disorder with falls corresponds to midbrain and subthalamic degeneration; and degeneration of the rostral interstitial nucleus of the medial longitudinal fasciculus and midbrain oculomotor centres accounts for the supranuclear gaze impairment of the Richardson phenotype. The 2017 Movement Disorder Society criteria formalise the clinical diagnosis around four functional domains — ocular motor dysfunction, postural instability, akinesia and cognitive/lingual dysfunction — with characteristic MRI findings serving as supportive imaging features [2].

**Results – Imaging Findings**

- **Midbrain:** Marked tegmental atrophy with flattening and concavity of the superior contour; reduced anteroposterior diameter.
- **Sagittal sign:** Hummingbird / penguin sign – atrophic midbrain "head and beak" on a preserved pontine "body".
- **Axial signs:** Morning-glory (concave lateral midbrain margins) and Mickey-Mouse configuration of the peduncles.
- **Superior cerebellar peduncle:** Thinned.
- **Ventricles:** Third-ventricular widening; prominence of the interpeduncular/suprasellar cistern.
- **Negative findings:** No hot-cross-bun sign, no middle cerebellar peduncle atrophy, no putaminal rim (against MSA); no focal asymmetric perirolandic/parietal cortical atrophy (against CBD).

**Conclusion**

- The MRI demonstrated the classic midbrain-predominant signatures of progressive supranuclear palsy — the hummingbird sign, morning-glory and

Mickey-Mouse midbrain, superior cerebellar peduncle thinning and third-ventricular widening.

- These signs, with a symmetric levodopa-unresponsive akinetic-rigid syndrome, distinguish PSP from MSA and CBD.
- Simple planimetry and the MR Parkinsonism Index (MRPI > 13.55) provide objective support for the diagnosis.
- MRI is a valuable tool for the early and confident diagnosis of PSP, a condition that is otherwise difficult to establish clinically in life.

**Figures**

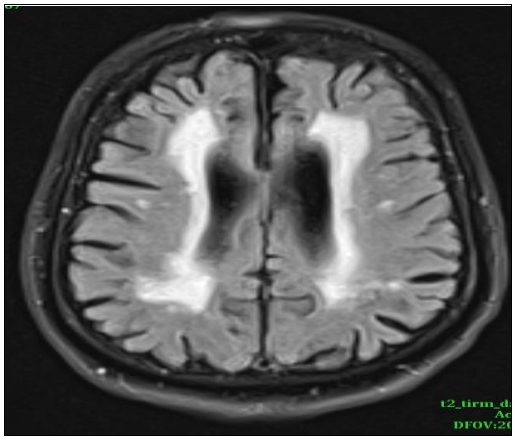
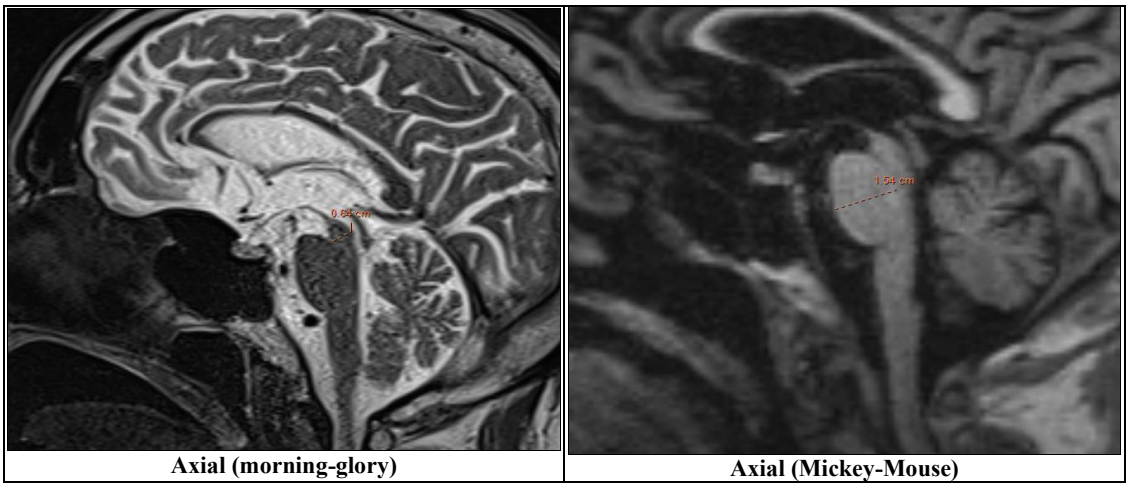
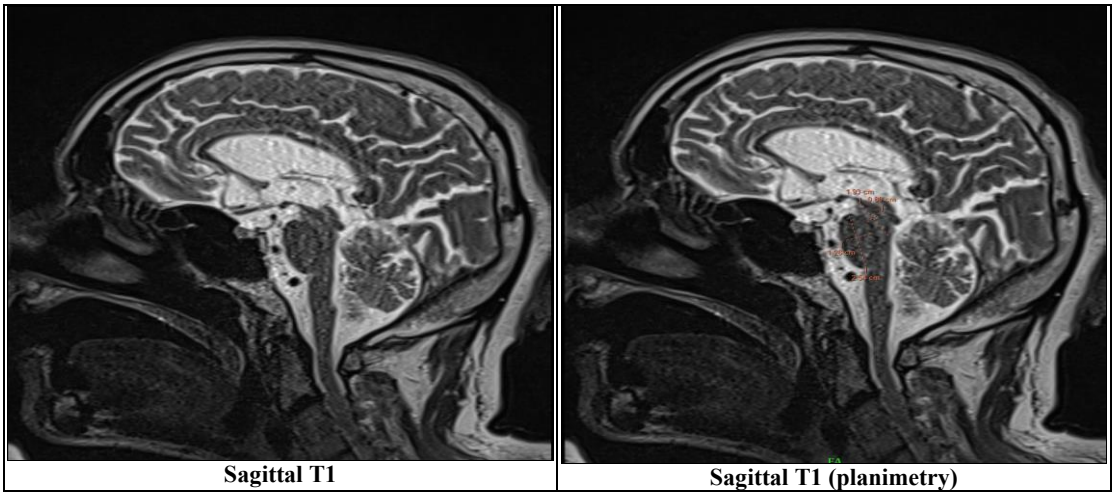


**Fig 1:** Hummingbird / penguin sign. Midsagittal T1-weighted image showing marked atrophy of the midbrain tegmentum with flattening and concavity of its superior contour and a preserved pons, producing the beak-and-body silhouette of the hummingbird sign. Note the associated third-ventricular and cisternal widening



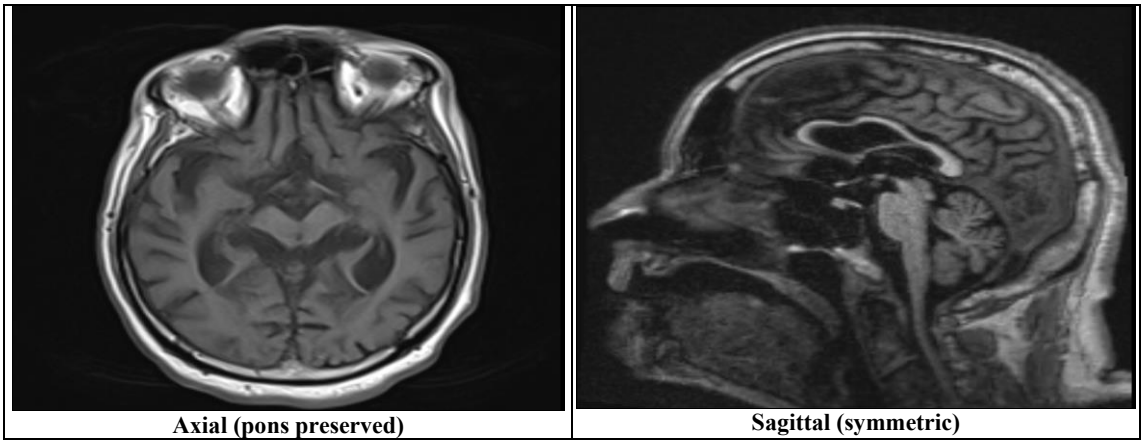

**Axial (morning-glory)** | **Axial (Mickey-Mouse)**

**Fig 2:** Morning-glory and Mickey-Mouse signs. Axial images through the midbrain showing concavity of the lateral tegmental margins (morning-glory sign) and atrophy accentuating the cerebral peduncles (Mickey-Mouse configuration)



**Sagittal T1** | **Sagittal T1 (planimetry)**

**Fig 3:** Midbrain planimetry. Sagittal T1-weighted images reiterating the disproportionate midbrain atrophy relative to the pons, with a concave superior midbrain contour and enlarged third ventricle



Axial (pons preserved) | Sagittal (symmetric)

**Fig 4:** Findings excluding mimics. Preserved pons without cruciform T2 hyperintensity (no hot-cross-bun sign) and symmetric supratentorial appearances without focal asymmetric cortical atrophy, arguing against MSA and CBD respectively

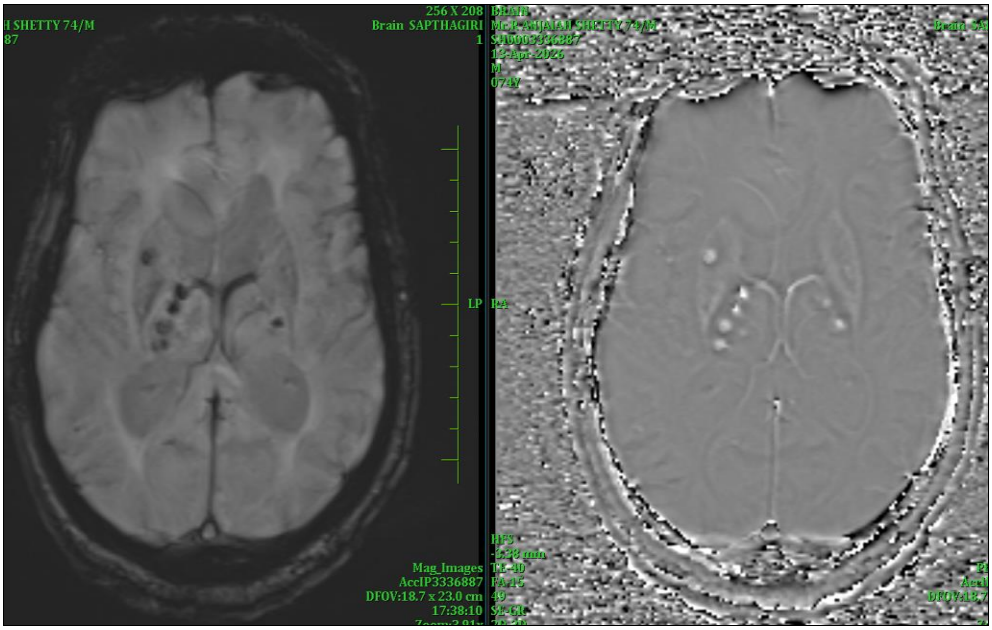


**Fig 5:** Wider-field axial (magnitude and phase). Symmetric supratentorial appearances with third-ventricular prominence and no lobar asymmetry, supporting PSP over corticobasal degeneration

## References


1. Steele JC, Richardson JC, Olszewski J. Progressive supranuclear palsy: a heterogeneous degeneration involving the brainstem, basal ganglia and cerebellum. Archives of Neurology,1964:10:333–359.
2. Höglinger GU, Respondek G, Stamelou M, *et al*. Clinical diagnosis of progressive supranuclear palsy: the Movement Disorder Society criteria. Movement Disorders,2017:32(6):853–864.
3. Williams DR, Lees AJ. Progressive supranuclear palsy: clinicopathological concepts and diagnostic challenges. The Lancet Neurology,2009:8(3):270–279.
4. Quattrone A, Nicoletti G, Messina D, *et al*. MR imaging index for differentiation of progressive supranuclear palsy from Parkinson disease and the Parkinson variant of multiple system atrophy. Radiology,2008:246(1):214–221.
5. Quattrone A, Morelli M, Nigro S, *et al*. A new MR imaging index for differentiation of progressive supranuclear palsy-parkinsonism from Parkinson's disease (MRPI 2.0). Parkinsonism & Related Disorders,2018:54:3–8.
6. Kato N, Arai K, Hattori T. Study of the rostral midbrain atrophy in progressive supranuclear palsy. Journal of the Neurological Sciences,2003:210(1-2):57–60.
7. Massey LA, Micallef C, Paviour DC, *et al*. Conventional magnetic resonance imaging in confirmed progressive supranuclear palsy and multiple system atrophy. Movement Disorders,2012:27(14):1754–1762.
8. Whitwell JL, Höglinger GU, Antonini A, *et al*. Radiological biomarkers for diagnosis in PSP: where are we and where do we need to be? Movement Disorders,2017:32(7):955–971.
9. Kim BC, Choi SM, Choi KH, *et al*. MRI measurements of brainstem structures in patients with progressive supranuclear palsy, multiple system atrophy and Parkinson's disease. Neurological Sciences,2017:38(4):627–633.
10. Gilman S, Wenning GK, Low PA, *et al*. Second consensus statement on the diagnosis of multiple system atrophy. Neurology,2008:71(9):670–676.
11. Armstrong MJ, Litvan I, Lang AE, *et al*. Criteria for the diagnosis of corticobasal degeneration. Neurology,2013:80(5):496–503.