

VISUAL DAT-SPECT OUTPERFORMS SEMI-QUANTITATIVE ANALYSIS IN A ‘PSEUDO-SWEDD’ CASE OF BENIGN TREMULOUS PARKINSONISM



Daniele Birreci¹, Luca Angelini², Martina De Riggi¹, Simone Aloisio¹, Adriana Martini¹, Sofia A. Grandolfo¹, Luca Marsili³, Roberto Cilia⁴, Alberto J. Espay³, Matteo Bologna^{1,2}

¹Department of Human Neurosciences, Sapienza University of Rome, Rome, Italy; ²IRCCS Neuromed, Pozzilli, IS, Italy; ³Department of Neurology, Gardner Family Center for Parkinson's Disease and Movement Disorders, University of Cincinnati, Cincinnati, OH, United States; ⁴Parkinson and Movement Disorders Unit, Department of Clinical Neurosciences, Fondazione IRCCS Istituto Neurologico Carlo Besta, Milan, Italy.



Video

BACKGROUND: A subset of patients with longstanding tremor may eventually develop features suggestive of Parkinson's disease (PD). In such cases, DAT-SPECT imaging can assist in confirming the diagnosis [1]. However, discrepancies between clinical findings and imaging results—commonly referred to as scans without evidence of dopaminergic deficit (SWEDD)—may introduce diagnostic uncertainty [2].

AIMS: To describe a case of benign tremulous parkinsonism (BTP) with clinical and kinematic features suggestive of Parkinson's disease (PD) despite a normal quantitative DAT-SPECT.

METHODS: We evaluated a 73-year-old man with a decade-long history of bilateral action and rest tremor, predominantly affecting the right side, presenting with mild parkinsonian signs and already on levodopa therapy. The evaluation included a clinical assessment with standardized rating scales (Fahn-Tolosa-Marin Tremor Rating Scale, MDS-UPDRS Part III) and a kinematic analysis, both conducted in treated (ON state) and untreated (OFF state) conditions.

RESULTS: Quantitative DAT-SPECT values fell within the lower limits of the normal range, whereas visual inspection revealed a subtle asymmetry in the left posterior putamen (Figure 1). Clinical scales showed no major differences between ON and OFF states, but kinematic analysis documented a subclinical levodopa effect—specifically, a reduction in re-emergent tremor amplitude and improvement in movement velocity and sequence effect (Table 1, Figure 2).

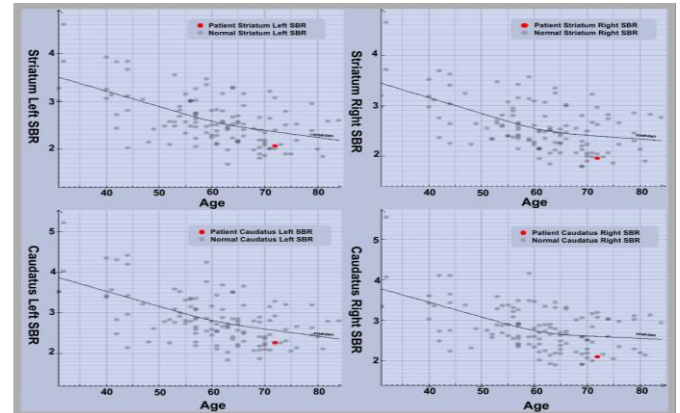
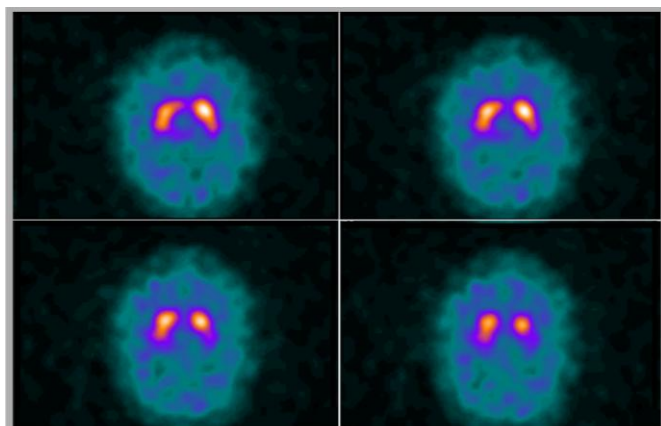


Figure 1: Above: DAT-SPECT images of the radioligand uptake, showing consistent reduction of left posterior putamen uptake. Below: Scatter plots of uptake values of the right and left striatum (top panels) and caudate (bottom panels) as a function of age. The solid black lines represent normative data across different age groups. Each gray dot represents an individual from the reference population, while the red dots correspond to the patient values: right putamen 1.90 (Z-score: -1.04), left putamen 1.96 (Z-score: -0.72), putamen-to-caudate uptake ratio bilaterally (right: 0.90; left: 0.86).

	Right side		Left side	
	ON	OFF	ON	OFF
Tremor				
Rest tremor				
Amplitude	0.53	0.54	0.04	0.03
Frequency	4.50	4.52	4.62	4.59
Re-emergent				
Amplitude	0.15	0.29	0.04	0.08
Frequency	4.89	5.22	5.06	5.03
Kinetic tremor				
CI	1.09	1.06	1.12	1.06
D/A	0.56	0.69	0.59	0.58
Head tremor				
Amplitude	0.35	0.32	0.35	0.32
Frequency	6.03	6.06	6.03	6.06
Finger tapping				
N° mov	36.00	29.67	30.67	25.25
Velocity	1215.91	1012.17	1358.25	1152.77
Amplitude	52.72	52.62	61.60	62.69
CV	0.12	0.07	0.06	0.11
Velocity slope	-23.32	-19.68	-21.67	-20.40
Amplitude slope	-0.11	-0.29	-0.24	-0.57

Table 1: Kinematic measures during levodopa therapy (ON state) and after treatment discontinuation (OFF state). Amplitude for tremor is expressed in $1 \text{ m/s}^2 \text{ RMS}$, while frequency is reported in Hz. For finger tapping, velocity is expressed in degrees/s, amplitude in degrees, velocity slope in (degrees/s)/number of movements, and amplitude slope in degrees/number of movements.

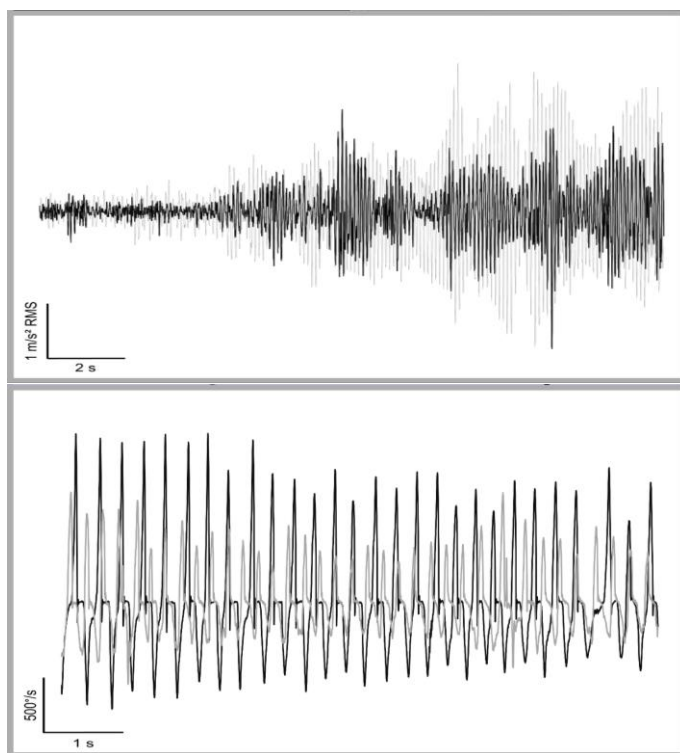


Figure 2: Above: Kinematic trace of re-emergent tremor on the right side (more affected); the black line represents the recording with levodopa, while the light gray line represents the recording off levodopa. Below: Kinematic trace of finger tapping velocity on the right side (more affected); the black line represents the recording with levodopa, while the light gray line represents the recording off levodopa. Notice the progressive velocity reduction consistent with a sequence effect.

CONCLUSION: This case highlights the limitations of relying exclusively on semi-quantitative DAT imaging for diagnosis. Visual inspection of DAT-SPECT and objective movement analysis revealed a mild yet measurable dopaminergic response, supporting the diagnosis of PD [3]. The case exemplifies a ‘pseudo-SWEDD’, where clinical and instrumental evidence outweighs apparently normal imaging, underscoring the importance of a multimodal diagnostic approach in tremor syndromes.

MAJOR REFERENCES:

- [1] W. Deeb et al., ‘Benign tremulous Parkinsonism: a unique entity or another facet of Parkinson's disease?’, *Transl Neurodegener*, vol. 5, p. 10, May 2016, doi: 10.1186/s40035-016-0057-1. [2] R. Erro et al., ‘What do patients with scans without evidence of dopaminergic deficit (SWEDD) have? New evidence and continuing controversies’, *J Neurol Neurosurg Psychiatry*, vol. 87, no. 3, pp. 319–323, Mar. 2016, doi: 10.1136/jnnp-2014-310256. [3] M. Selikhova et al., ‘Neuropathological findings in benign tremulous parkinsonism’, *Mov Disord*, vol. 28, no. 2, pp. 145–152, Feb. 2013, doi: 10.1002/mds.25220.