Original Article

DIFFERENTIATING EARLY PARKINSON'S DISEASE FROM ESSENTIAL TREMOR BY FP- CIT SPECT: A PRELIMINARY STUDY

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Summary

Parkinson's disease (PD) is one of the most frequent neurodegenerative disorders, misdiagnosed in up to 35%. Early and definite differentiation is essential from therapeutic, social and economic points of view. The objective of our study was to differentiate early PD from essential tremor (ET) by FP- CIT SPECT. Fifteen patients (9 males, 6 females) were examined, aged 60.6 years, with complaints dating 2.07 years back. Eight (3 males, 5 females) were diagnosed with Parkinson's disease and the remaining 7 (6 males, 1 female) – with essential tremor. FP- CIT SPECT was performed with dual head ADAC Vertex gamma camera. Visual assessment of scans classified 7 of 8 cases, clinically diagnosed as PD, as abnormal, and all 7 cases of essential tremor as normal. Sensitivity of the method for the clinical diagnosis of PD was 87.5%, and specificity for ET was 100%. The application of FP- CIT SPECT significantly increases the diagnostic accuracy and gives an opportunity for early detection of PD and for differentiation from ET. Exact diagnosis would allow neurologists to obtain better symptom control via early initiation of treatment, as well as to achieve considerable savings from avoiding inappropriate prescription of antiparkinsonian medications to ET patients.
Key words: Parkinson's disease, essential tremor, differentiation, FP- CIT SPECT

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Introduction

Parkinson's disease (PD) is one of the most common neurodegenerative disorders. PD is frequently misdiagnosed in up to 35%, especially in early stages when all symptoms are not yet fully developed. Essential tremor (ET) which is a syndrome, characterized only by postural and kinetic tremor, usually affecting both hands is most commonly misdiagnosed. The prevalence of essential tremor is up to 5.6% of the general population.

The early and definite differential diagnosis is very important from therapeutic, as well as from social and economic points of view [1, 2].

PD diagnosis may be delayed or missed because

its early symptoms are often vague, start slowly, progress gradually and may be assumed as a normal part of aging. The diagnosis of PD is clinical and relies on the presence of characteristic motor symptoms such as bradykinesia, rigidity and resting tremor. Early and exact differentiation is crucial, because of the introduction in clinical practice of many medications with potential neuroprotective and disease progression slowing effect [3, 4].

The diagnostic method of choice is brain FP-CIT SPECT, using radioligands, connecting selectively with the dopamine transporters (DAT). DAT are presynaptic membrane proteins, controlling dopamine level by reuptake from the synaptic cleft. Functional imaging with radiotracers targeting the dopamine system demonstrates abnormalities, thus helping for considerable shortening of the diagnostic process. Brain FP-CIT SPECT images of ET show normal ligand fixation in both basal ganglia with a typical coma shape, while the results in PD patients present with different degrees of asymmetrically reduced accumulation [5, 6]. Objectives: to differentiate early Parkinson's disease patients from essential tremor by brain FP- CIT SPECT.

Patients and Methods

Fifteen patients (9 males, 6 females) with predominant tremor were examined, aged 60.6 ± 8.26 years (age range 44 - 71), with duration of disease 2.07 ± 1.099 (range 1 - 4) years. Eight patients (5 males, 3 females) were diagnosed as clinically possible PD (5 patients, 3 males) or probable (3 patients, 2 males), at Hoehn- Yahr

scale severity stage 1.25± 0.46 (1 - 2), Unified Parkinson`s Disease Rating Scale (UPDRS) total score 15.63± 3.42 points, UPDRS part III 9.25± 2.55 points. The remaining 7 (6 males, 1 female) were clinically diagnosed with ET.

During the first 6 months of 2010, brain FP-CIT SPECT was performed according to a standard protocol with a dual head ADAC Vertex gamma camera [7].

Results were assessed visually by a specialist, blind to the clinical diagnosis.

The striatal uptake of the radiotracer was defined as normal or abnormal, and the abnormal cases were divided into 3 grades of severity:
1. asymmetric uptake: reduced unilaterally, with loss of the typical coma shape;
2. marked bilateral uptake decrease, with loss of the typical coma shape;
3. extremely reduced or absent uptake bilaterally [7].

The sensitivity of FP- CIT SPECT for PD was calculated as the number of true positive results divided by the sum of true positive and false-negative results. The specificity for ET was calculated as the number of true negative results divided by the sum of true negative and false-positive results [8].

Results

Brain FP- CIT SPECT was performed on all 15 patients. The procedure was well tolerated.

The visual assessment of scans obtained scored 7 of 8 cases, clinically diagnosed with PD, abnormal, and the rest of the patient were visually diagnosed with ET, which was clinically diagnosed as possible PD.
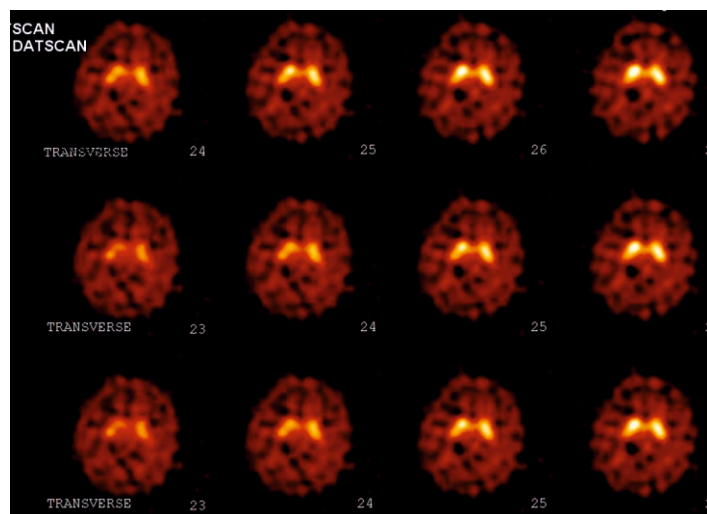

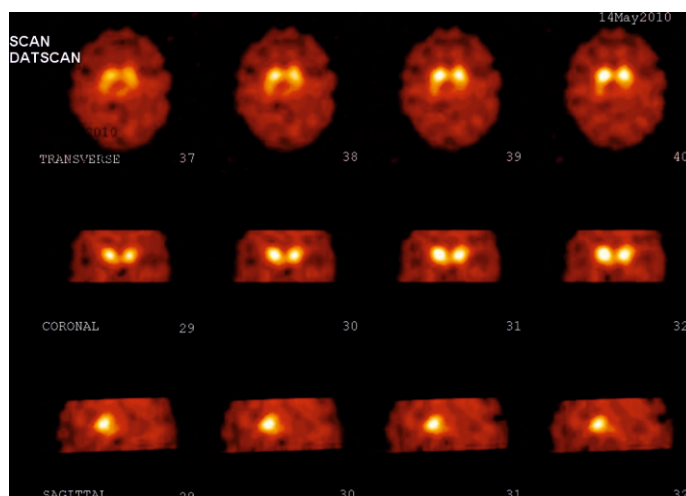
Fig. 1. Patient №2 (normal FP-CIT-SPECT)– ET

Fig. 2. Patient №6 (abnormal unilateral ligand fixation) – PD, Hoehn- Yahr I
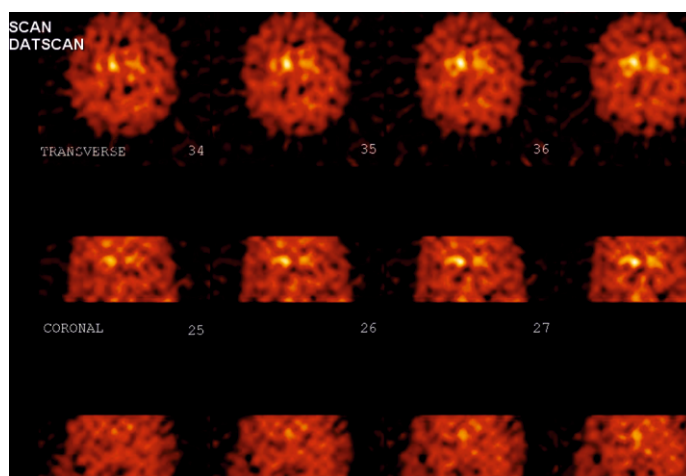

Fig. 3. Patient №13 (abnormal bilateral ligand fixation) – PD, Hoehn- Yahr II- III

Discussion

Our results demonstrated high level of correspondence between clinical and imaging diagnosis. Analysis of our data showed similar specificity and sensitivity values to those published in the literature (93-100% and 89-98%) [1, 9, 10, 11].

Even in a relatively small number of patients, our findings confirm the results from previous studies in different European centers for the effectiveness of visual evaluation of SPECT with 123I- FP- CIT and its high specificity and sensitivity for determination of PD or ET diagnosis [5, 6, 10, 11].

This characteristic of the method together with its relatively low cost and accessibility render it easily applicable and of high diagnostic value [2, 9].

The diagnosis of idiopathic Parkinson's disease (IPD) is based on clinical criteria but when cardinal clinical signs and symptoms as bradykinesia, rigidity, and resting tremor are present, the diagnosis of IPD is straightforward. However, the differentiation between PD and ET can be difficult, especially in the early stages of the disease [1, 4].

Clinico-pathological studies show that up to 25% of the patients with PD are classified incorrectly in the final disease stages, even by experts on motor disorders. Because the prognosis and medical treatment differ between various parkinsonian syndromes, an accurate and early diagnosis is essential for optimal treatment and counseling [11].

Conclusion

Our results confirm previous findings of different European centers about the efficacy of visual

assessment of brain FP- CIT SPECT and its high specificity and sensitivity in the differential diagnosis between PD and ET. Together with its relatively low costs and availability, these make it an easily applicable method of choice. The introduction of this method in routine clinical practice could allow for early and accurate differential diagnosis, adequate treatment and optimal quality of life of patients with tremor disorders.

The application of FP- CIT SPECT significantly increases the diagnostic accuracy and gives opportunity for early detection of PD and for differentiation from ET.

Exact diagnosis would allow neurologists to obtain better symptom control via early initiation of treatment as well as to achieve considerable savings from avoiding the inappropriate prescription of antiparkinsonian medications to ET patients.

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