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DAT-scan in Diagnosis on Idiopatic Parkinson's Disease in Our Hospital*

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Abstract: We evaluated the ability of DAT scan on diagnosis of Idiopathic Parkinson's Disease (IPD) patients in Parkinsonisms. The sensitivity was high level enough to diagnosis of IPD, however, the specificity and accuracy was low. It might be due to some atypical Parkinsonisms and some technology at data aquisition.

Key words: idiopathic parkinson's disease (IPD), Atypical Parkinsonisms

1. Introduction

Idiopathic Parkinson disease (IPD) is neurodegenerative disorder characterized by tremor, rigidity, and bradykinesia [1]. The etiology is unknown, however, progressive loss of dopaminergic cell and presence of Lewy body in substantia nigra of mid brain have been reported [2]. The patients of IPD has a mean prevalence of 11.3 per 100,000 in Asians [3]. Our hospital is a state-of-the-art of neurology, especially, IPD. The diagnosis of IPD is made clinically by expert neurologists in our hospital. In Jan. 2014, DAT-scan was approved for diagnosis of Parkinsonism and Lewy-body dimentia (LBD) in Japan. We evaluated the ability of diagnosis of IPD patients in our hospital.

2. Materials and Methods

We evaluated 125 patients who were suspected IPD consists of 57 males and 68 females, 35~88 year old (mean 72.7 y.o) between 2014 and 2015.

Patients with IPD fulfilled the U.K. Parkinson's Disease Society Brain Bank criteria [2]. For MSA the diagnostic criteria of the Consensus Committee of the American Autonomic Society and American Academy of Neurology were used [4]. For PSP clinical research diagnostic criteria of the National Institute of Neurological Disorders and Stroke and the Society for PSP were applied[5].

The images of single photon emission compute tomography (SPECT) (Figs. 1, 2) were made as follows. Following the intravenous injection of 167 Mbq of ^{123}I-Ioflupan, images were acquired using a two-head gamma camera equipped with low-energy high-resolution collimators. 60 projection images were obtained over 360 °rotating each head 180 °following an elliptical contour, where the radius of rotation was minimized for each subject. The matrix size was 128×128, and a Pixel size was 4 mm. Counts were acquired within a 20% centered around 159 keV. Reconstruction was performed on a ADAC FORTE workstation and soft ware. Raw projections were filtered prior to reconstruction with a Butterworth filter, cut off 0.5 cycle/pixel and order 10. Transaxial slices covering the whole brain were

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reconstructed using a method of successive approximation. The transaxial slices, one pixel thick,

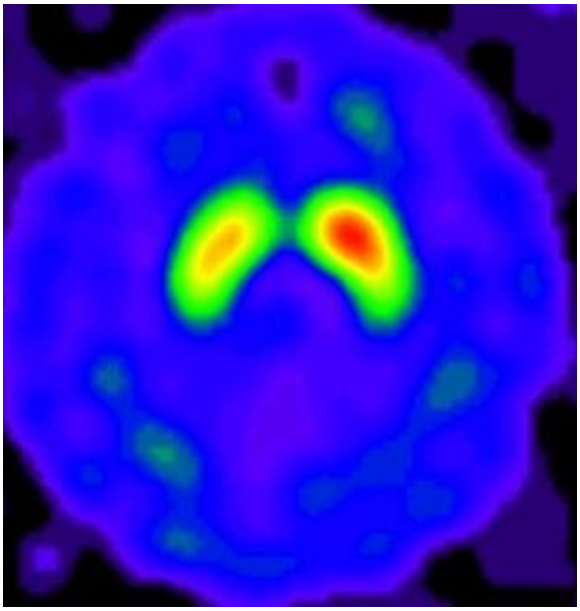

Fig. 1 SPECT image of 77M patient with essential tremor.

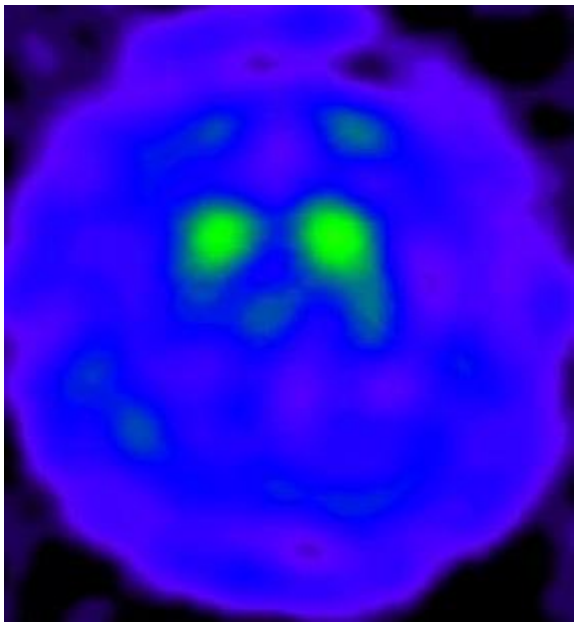

Fig. 2 SPECT image of 72M patient with IPD.

were manually corrected for possible transverse and coronal inclinations and reoriented parallel to standardized orientation of the orbito-meatal (OM) plane. Semiquantitative analysis called specific binding ratio (SBR) was also calculated.

We evaluated the image with visual assessment and classified following: (a) Normal (b) Abnormal grade 1 (c) Abnormal grade 2 (d) Abnormal grade 3, according to Benamer's classification [6]. Benamer's classification includes: (a) Tracer uptake bilaterally in putamen and caudate and largely symmetric. (b) Asymmetric uptake with normal or almost normal putamen activity in one hemisphere, and with a more marked reduction in contralateral putamen. (c) Significant bilateral reduction in putamen uptake with activity confined to the caudate nuclei. (d) Virtually absent uptake bilaterally affecting both putamen and caudate nuclei.

The grade was based on the assumption that in the normal scan there is symmetric uptake in the striatum and that the most anterior part of that uptake represents mainly caudate nucleus and the posterior part mainly the putamen.

3. Result

We found reduced accumulation of the radiopharmaceutical at the level of putamen and caudate nucleus in IPD patients. However, this findings were also partly seen in the patients with atypical Parkinsonisms such as Progressive supranuclear palsy (PSP), Multiple system atrophy (MSA), corticobasal degeneration (CBD). The patints with Normal hydrocephalus (NPH), vascular Parkinsonisms, Dystonia, and drug induced Parkinsonism (DIP) were normal at DAT-scan.

Sensitivity, specificity and accuracy of DAT-scan in diagnosis with PD patients [7] was 93%, 58%, 83%, respectively (Table 1).

4. Discussion

Low specificity and accuracy might be due to some atypical Parkinsonisms. It was reported that DAT-

Table 1 Sensitivity, specificity and accuracy of DAT-scan in diagnosis with PD patients.

	IPD (n)	not-IPD (n) *	total
Grade 1-3**	81	16	97
Normal	6	22	28
total	87	38	125

*: Include Atypical Parkinsonism; **: Benamer's classification

SPECTs are not useful in differentiating between IPD and atypical Parkinsonisms (MSA, PSP, CBD) [8, 9]. Differential diagnosis of PD from these were performed by clinical criteria of motor symptom, signs, and MRI (magnetic resonance imaging). The diagnosis of IPD was mainly made by clinical criteria, however, about 20% of misdiagnosis of PD was reported [2]. Scans without Evidence of Doperminergic Deficits (SWEDDs) was also reported [10]. The difference between normal (Fig. 1) and abnormal grade 1 (Fig. 2) at Benamer's classification was sometimes difficult when the patients was rotated position or moving at the table. The accumulation to striatum decrease 5-7%/10 year are also mentioned [11]. The quantitative assessment was desirable for diagnosis on DAT scan. However, SBR calculated in our institution was unreliable.

5. Conclusion

We evaluated the ability of DAT-scan on diagnosis of IPD patients in Parkinson's syndrome in our hospital. The sensitivity was high level enough for the diagnosis of IPD, however, the specificity and accuracy was low. It might be due to some atypical Parkinsonisms and some technology at data acquisition.

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