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False-Positive Dopamine Transporter Imaging Due to Therapeutic Dextroamphetamine/Amphetamine

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Abstract

Dopamine transporter (DAT) single-photon emission computed tomography (SPECT) is an accurate adjunct to clinical evaluation for Parkinson's disease (PD) in cases where the diagnosis is difficult. Dopaminergic medications may significantly impact DAT availability and thus uptake of DAT tracers. A patient had a false-positive DAT-SPECT while on dextroamphetamine/amphetamine for attention deficit/hyperactivity disorder (ADHD). DAT-SPECT normalized after withholding amphetamine therapy. An accurate medication history combined with the knowledge of drugs that interfere with DAT imaging is critical to ensure accuracy.

Key words: Dopamine transporter, single positron emission tomography, ioflupane, Parkinson's disease, amphetamine

Introduction

DAT localization with 123I ioflupane and SPECT is an accurate and well-established test to differentiate PD from similar clinical entities not associated with presynaptic neuronal dysfunction (*1*). However, DAT-SPECT imaging can be degraded by positioning artifacts and dopaminergic drugs (*1–3*). We present a case of a patient with a DAT-SPECT suspicious for PD while taking dextroamphetamine/amphetamine for ADHD followed by a normal scan after withholding amphetamines. Institutional review board approval was not required for this case report.

Case Presentation

A 60-year-old woman with bipolar disorder treated with valproate and ziprasidone, and ADHD treated with dextroamphetamine/amphetamine presented with 2 months of progressive tremors and instability. The patient's neurologist started her on carbidopa-levodopa and ordered a DAT-SPECT scan, and her psychiatrist decreased her valproate. DAT-SPECT while on dextroamphetamine/amphetamine 15 mg daily was interpreted as reduced activity in the left putamen consistent with PD (Fig. 1).

The patient had improvement of symptoms after one month of carbidopa-levodopa and decreased valproate, but still had significant residual symptoms. Discontinuation of ziprasidone lead to further improvement. As the symptoms were not responding like typical PD and especially since the DAT imaging was only mildly abnormal, the neurologist reviewed the patient's chart with the nuclear medicine physician for potentially interfering medications. The physicians agreed to repeat imaging off amphetamines. Repeat DAT-SPECT after 7 weeks of

withholding dextroamphetamine/amphetamine was normal (Fig. 2). Therefore, drug-induced Parkinsonism was considered most likely.

Discussion

The patient initially had a DAT-SPECT positive for PD while on dextroamphetamine/amphetamine for ADHD, but repeat DAT-SPECT after withholding amphetamines for 7 weeks was negative. This case demonstrates that therapeutic doses of amphetamines can significantly alter DAT imaging. Our findings are consistent with animal models showing methylphenidate, which reduces DAT availability like dextroamphetamine/amphetamine, decreases DAT-SPECT signal (*4*).

A 1-week washout period prior to DAT-SPECT for patients taking amphetamines has been recommended (*1*). However, recreational users of dextroamphetamine have decreased striatal DAT-SPECT signal compared to normal controls even after 2 weeks of abstinence (*5*). While one case is not sufficient to determine an optimal washout period, 7 weeks was utilized here for normalization of DAT imaging.

Conclusion

Accurate medical history and knowledge of medications that interfere with DAT imaging is critical to ensure drugs are properly withheld prior to DAT imaging.

Disclosure

Phillip H. Kuo has consulted for and received grants from GE Healthcare. No other potential conflict of interest relevant to this article was reported.

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Figure Legends

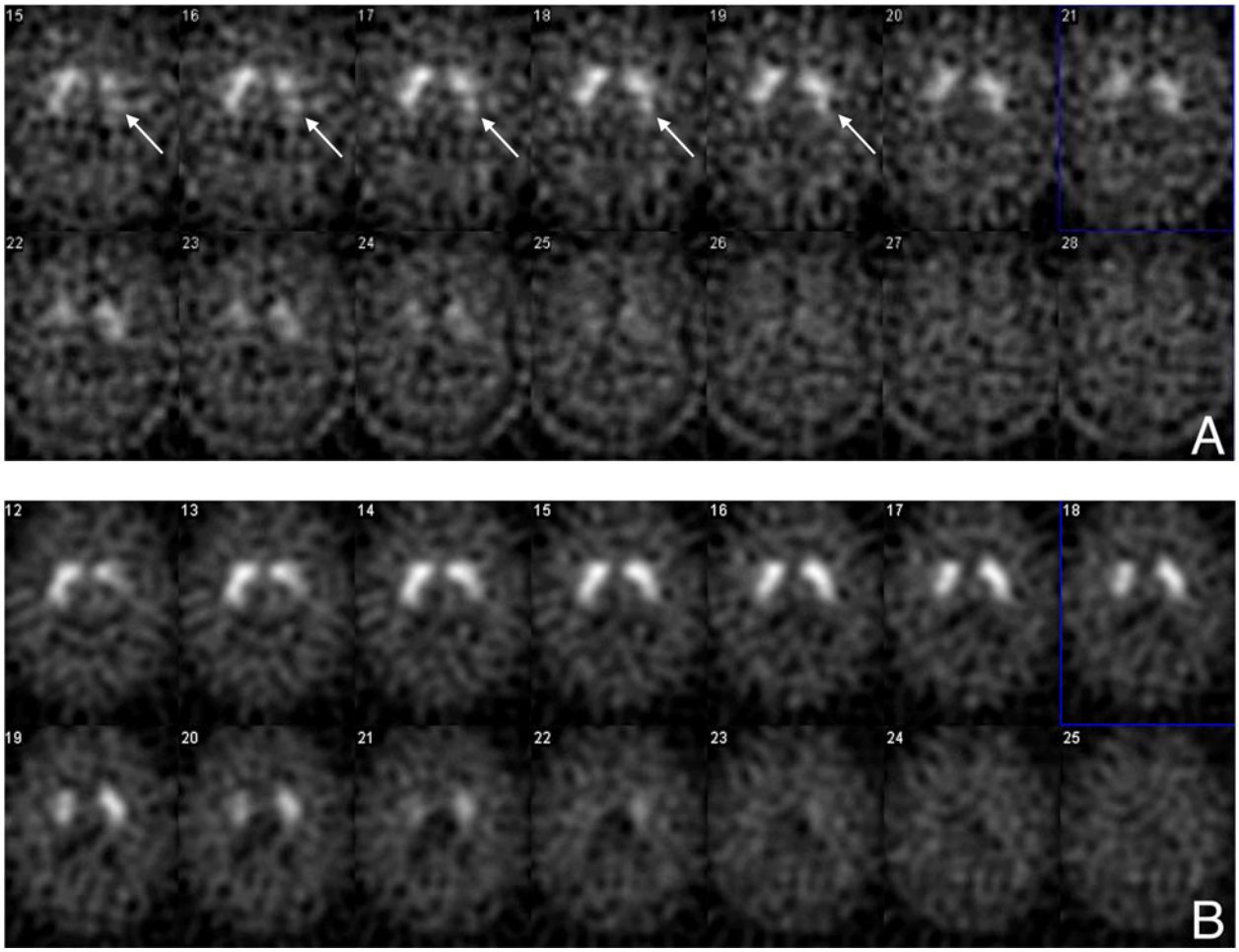

FIGURE 1: A) Decreased activity in the left putamen (arrows) on DAT-SPECT while on dextroamphetamine/amphetamine supports the diagnosis of PD. B) A typical normal DAT-SPECT using the same camera and reconstruction protocol.

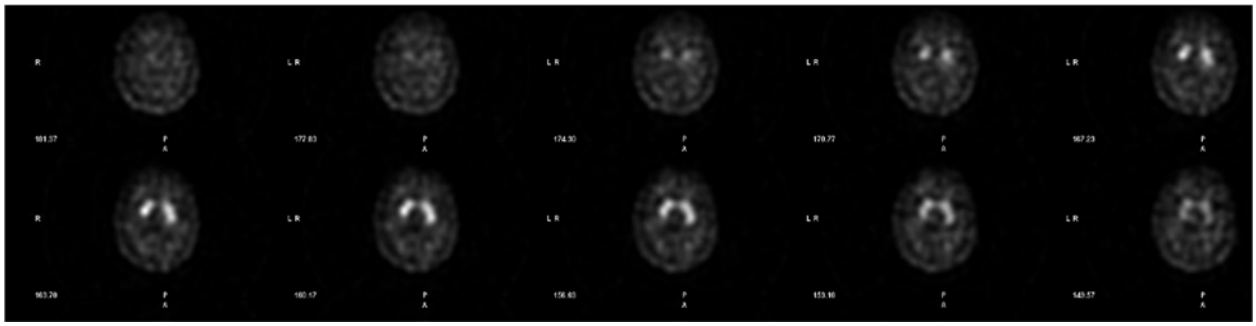

FIGURE 2: DAT-SPECT obtained on a different camera showed normalization after 7 weeks without dextroamphetamine/amphetamine.