

## **Diagnostic Accuracy of Visual Assessment of an Initial DaT-Scan in Comparison to a Fully Automatic Semiquantitative Method**

Rudolf A. Werner<sup>1,2</sup>; Charles Marcus<sup>1</sup>; Sara Sheikhabaei<sup>1</sup>; Takahiro Higuchi<sup>2,3</sup>; Lilja B. Solnes<sup>1</sup>; Steven P. Rowe<sup>1</sup>; Andreas K. Buck<sup>2</sup>; Constantin Lapa<sup>2</sup>; Mehrbod S. Javadi<sup>1</sup>

1. Johns Hopkins University School of Medicine, The Russell H Morgan Department of Radiology and Radiological Science, Division of Nuclear Medicine and Molecular Imaging, Baltimore, MD, United States;
2. Department of Nuclear Medicine, University of Wuerzburg, Wuerzburg, Germany;
3. Department of Bio Medical Imaging, National Cardiovascular and Cerebral Research Center, Suita, Osaka, Japan.

**Objectives:** Visual interpretation of DaT-SPECT is often straightforward, in particular with obvious presynaptic dopamine transporter deficits. However, challenging borderline cases might inherit the risk of erroneously ruling out parkinson's disease and (semi)automatic methods using template regions of interest (ROIs) should improve the reader's confidence. We aimed to elucidate the diagnostic accuracy of visual assessment of an initial DaT-SPECT by both an experienced and unexperienced reader with comparison to results using a fully automatic semiquantitative method. **Material and Methods:** In a mono-centric setting, 382 patients with clinically uncertain parkinsonian syndrome (168 females, median age, 66y) were included. For assisting in diagnosis, an initial DaT-SPECT was performed by IV administration of 3-5 mCi I-Ioflupane. One experienced nuclear medicine physician (>10 years of experience, >1,000 DaT-SPECTs) and one unexperienced resident (<4 years of experience, <200 DAT-SPECTs), blinded to the clinical status and diagnosis, performed a visual evaluation of all scans independently. Binary reporting was performed by qualitative analysis of tracer uptake and morphology within the putamen and caudate in each hemisphere. The findings of the visual assessment were compared with a fully automatic semiquantitative evaluation method (Xeleris, 4.0, GE Healthcare) using ROI to measure uptake ratios in the caudate and putamen. The mean count by separate ROIs fitted to the caudate, putamen and entire striatum, were divided by those mean counts derived by the reference region (occipital region). **Results:** The fully automatic semiquantitative evaluation method revealed the following ratios (median): striatum right, 1.74; striatum left, 1.79; putamen right, 1.47; putamen left 1.47; caudate right, 2.17; caudate left, 2.24. When comparing the fully automatic semiquantitative evaluation method with the visual assessment, a discordance could be found in 19/382 (4.9%) cases for the experienced and in 37/382 (9.7%) for the unexperienced reader. The main reasons were ROI misalignment (experienced, 68.4% vs. unexperienced, 35.1%), increased background activity (21.1% vs. 37.8%) and qualitative asymmetry (10.5% vs. 27.1%). These discordant findings between the qualitative and quantitative assessment triggered a subsequent study: Discordant cases were compared with available neurology follow-up (f/u) serving as a gold standard. Interestingly, the discordance rate with neurology f/u was the same for both readers with 27.3%, respectively. **Conclusions:** Compared with a software-based analysis, an experienced reader might obtain higher concordance rates in DaTscan

interpretation as an unexperienced reader. However, the addition of quantitative analyses may improve the diagnostic accuracy of readers with limited experience. Apart from that, the visual reader's interpretation seems to be superior to a solely software-based quantitative assessment, particularly in borderline cases. Further evaluation with absolute quantitation might provide a benefit beyond semiquantitative uptake ratio analysis. Research Support: This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 701983.

*This research was originally published in JNM. Rudolf A. Werner, Charles Marcus, Sara Sheikhabaei, Takahiro Higuchi, Lilja B. Solnes, Steven P. Rowe, Andreas K. Buck, Constantin Lapa, Mehrbod S. Javadi. Diagnostic Accuracy of Visual Assessment of an Initial DaT-Scan in Comparison to a Fully Automatic Semiquantitative Method. J Nucl Med. May 1, 2018; vol. 59 no. supplement 1:626. © SNMMI.*