

D.Silva¹; M.Elias¹; M.Queiroga¹; J.Serrano²; J.I.Rayo²; E.Carolino¹; E.Sousa¹

¹Escola Superior de Tecnologia da Saúde de Lisboa, Instituto Politécnico de Lisboa, Lisbon, PORTUGAL

²Nuclear Medicine Department, Hospital Infanta Cristina, Badajoz, SPAIN

Introduction

Semi quantification (SQ) in DaTScan[®] studies is broadly used in clinic daily basis, however there is a suspicious about its discriminative capability, and concordance with the diagnostic classification performed by the physician.¹⁻³

Aim: Evaluate the discriminate capability of an adapted database and reference's values of healthy controls for the Dopamine Transporters (DAT) with ¹²³I – FP-CIT named DBRV adapted to Nuclear Medicine Department's protocol and population of Infanta Cristina's Hospital, and its concordance with the physician classification.

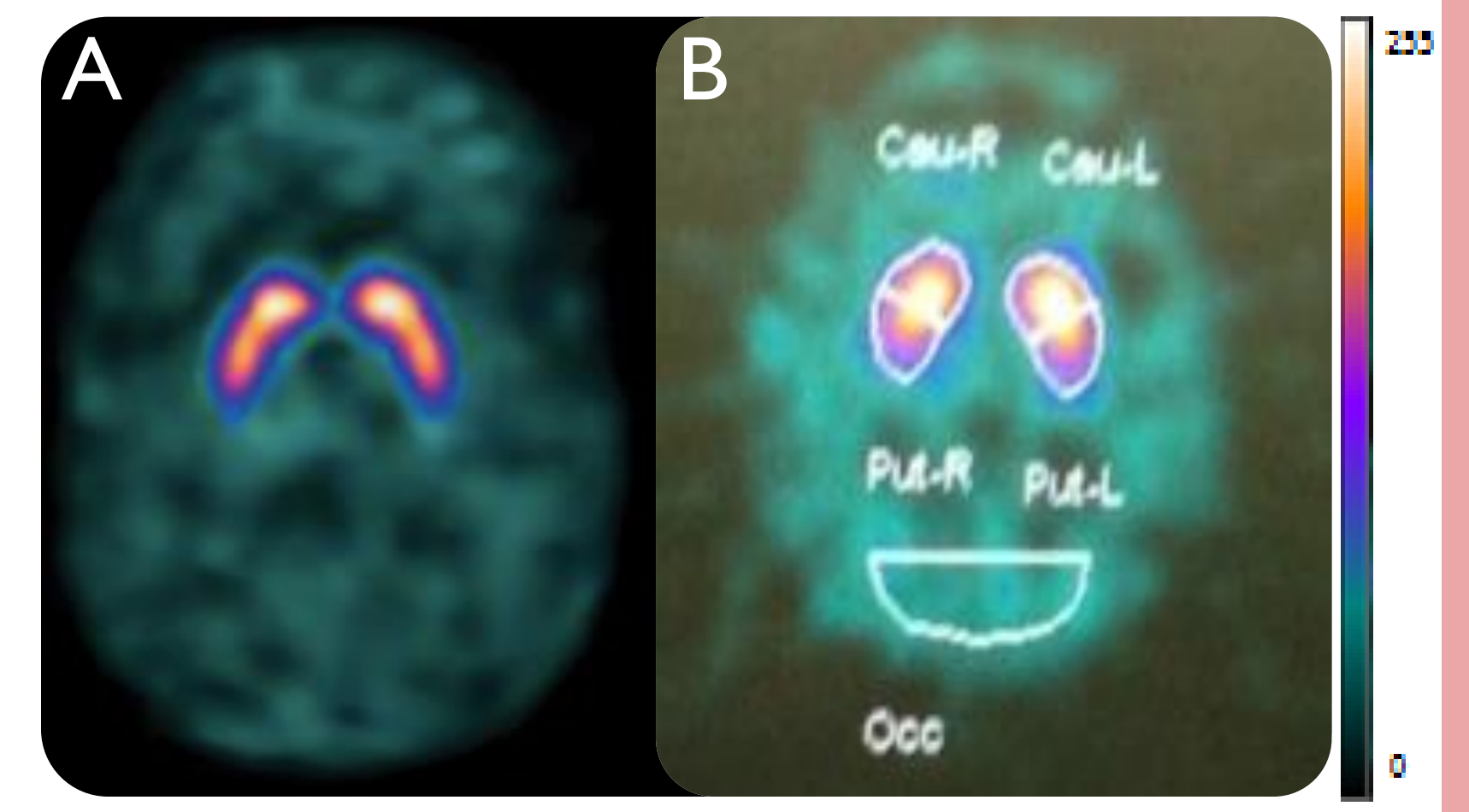


Figure 1: Images obtained by DatScan[™].
 A: Visual Analysis.
 B: Semi quantification Analysis.

Subjects & Methods

It was used a randomized group of 30 Datscan[™] patients to evaluate the ability of SQ classification (Table 1), with pre calculated and validated reference values (RV) of Infanta Cristina's Hospital, and compare with the physician evaluation. The exams were acquired by EANM's Guidelines protocol, and it was used semiautomatic method for segmentation to posterior calculi of binding potential in DAT. Only the Uptake Ratios (UR) C-H were considered for the classification for being the best discrimination meters between pathological and healthy. The patients were classified as pathological if one of the ratios, is less than the limit RV ($\bar{x} - \delta$), and healthy when all the RV were higher than ($\bar{x} - \delta$). Then these diagnostics based only on SQ were compared with the diagnosis made by the physician based only on visual examination and clinical history. Sensibility (S), Specificity (SP), Positive (PPV) and Negative (NPV) predictive values were calculated.

Table 1. Reference Values ($\bar{x} \pm \delta$) specific of this service obtained for the Uptake Ratios C-H

	Ratios	Reference Value
C	Left Putamen/Occipital	2.29 ± 0.36
D	Right Putamen/Occipital	2.31 ± 0.35
E	Striatum/Occipital	2.44 ± 0.35
F	Left Striatum/Occipital	2.44 ± 0.37
G	Right Striatum/Occipital	2.44 ± 0.34
H	Putamen/Caudate Nucleus	0.89 ± 0.07

Results

Table 2 (Table 2) is the concordances between the medical report and the diagnosis made based on SQ. The resulting values of S (1.00), SP (0.652), PPV (0.467) and VPN (1) of DBRV are shown in Table 3 (Table 3). Examine there is a high value of sensitivity (1.00) and consequently a high VPN. On the contrary S is not so high, which corresponds to a low PPV. The value obtained VPN (1.00) indicates that all diagnosed as healthy individuals (15 subjects), based on the RV C-H, correspond to healthy subjects based on the medical reports. On the other hand, the value obtained PPV (0.467) is justified by the fact of the 15 individuals diagnosed as pathological by RV, only 7 were diagnosed as pathological in medical reports.

Table 2. Comparison results of diagnosis based on DBRV with the medical report based on visual analysis

		Clinical Classification		
		Pathologic	Healthy	Total
SQ	Pathologic	7	8	15
	Healthy	0	15	15
Datscan Exam		7	23	30 Total

Table 3. Results Sensitivity, specificity, PPV and NPV for DBRV

Sensitivity	1.00
Specificity	0.652
PPV	0.467
NPV	1.00

Discussion

The SQ has a high ability to detect the pathology among the positives^{4,5}, having a S of 100% agreement between both classification methods used. However the specificity is lower, so the proportion of truly healthy subjects among the not sick is lower. Others studies say the SQ can assess pathological changes earlier, compared with visual analysis^{6,7}, which is one possible justification for these results. Together with the fact that some of the medical reports had dubious conclusions, and still they were considered normal.

Conclusions

The SQ technique, with UR established in DaTScan[™] studies to the Infanta Cristina Hospital in Badajoz, is precise and accurate in the assessment and classification of individuals suspected of SP and can be used as a complement to visual analysis. In the future it would be interesting perform a study to confirm the precocity of this diagnostic technique, through a clinical follow-up over the time.

References

- Darcourt J, Booij J, Tatsch K, et al. EANM procedure guidelines for brain neurotransmission SPECT using ¹²³I-labelled dopamine transporter ligands, version 2. *Eur J Nucl Med Mol Imaging*. 2010;37:443-450
- Bolt L, Hoffmann S, Kemp P, Fleeming J. Quantification of [¹²³I] FP-CIT SPECT brain Images: an accurate technique for measurement of the specific binding ratio. *Eur J Nucl Mol Im*. 2006;(33):1491-1499.
- Olso E, Vander Borgh T, Moreno E. Accuracy of DaTSCAN (¹²³I-IOflupane) SPECT in diagnosis of patients with clinically uncertain parkinsonism: 2-Year follow-up of an open-label study. *Mov Disord*. 2007;22:2346-2351.
- Martinez EZ, Louzada-Neto F, Pereira BDB. A Curva ROC para Testes Diagnósticos. *Cad Saúde Coletiva*. 2003;11:7-31.
- Kumar R, Indrayan a. Receiver operating characteristic (ROC) curve for medical research. *Indian Pediatr*. 2011;48:277-287.
- Darcourt J, Booij J, Tatsch K, et al. EANM procedure guidelines for brain neurotransmission SPECT using ¹²³I-labelled dopamine transporter ligands, version 2. *Eur J Nucl Med Mol Imaging*. 2010;37:443-450.
- Djang DSW, Janssen MJR, Bohnen N, et al. SNM Practice Guideline for Dopamine Transporter Imaging with ¹²³I-IOflupane SPECT 1.0. *J Nucl Med*. 2012;53(1):154-163. doi:10.2967/jnumed.111.100784.