Validation of a New Reference Values´s Database for Semiquantification of 123I-FP-CIT SPECT scans in one Nuclear Medicine Department

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Introduction

The DatScan[TM] and its Semiquantification (SQ) can provide advantages in the diagnosis of Parkinsonian Syndromes (PS). To improve the SQ is recommended the creation of adapted database (DB) with reference values for the Nuclear Medicine Departments. [1-3]

Previously to this work was created a adapted database (DBRV) to Nuclear Medicine Department´s protocol and population of Infanta Cristina´s Hospital located in Badajoz, for patients between the ages of 60 and 75, and reference values of the SQ were calculated (***Table 1***).

Aim: To evaluate the discrimination capacity of a department´s adapted DB reference´s values of healthy controls for DatScan[TM].

Table 1. DBRV

Binding Ratios (BR)		Reference Value
A	Left Caudate Nucleus/ Occipital	2.60 ± 0.40
B	Right Caudate Nucleus/ Occipital	2.57 ± 0.36
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

Subjects & Methods

It was used a semiautomatic method for segmentation and posterior calculi of binding potential in dopamine transporters (DAT) in striatum structures and in a nonspecific binding region (***Figure 1***). All exams were acquired by EANM´s Guidelines protocol and processed 3 times for one operator and average values were used[3]. **For validation purpose** of reference values two different DB with 30 patients each, were considered: DB of healthy controls (DBVGIIH) and DB of subjects with PS (DBVGIIP), both were processed using the same protocol and its results were compared with the ones of DBRV. Receiver Operating Characteristic Curves (ROCC) were calculated.
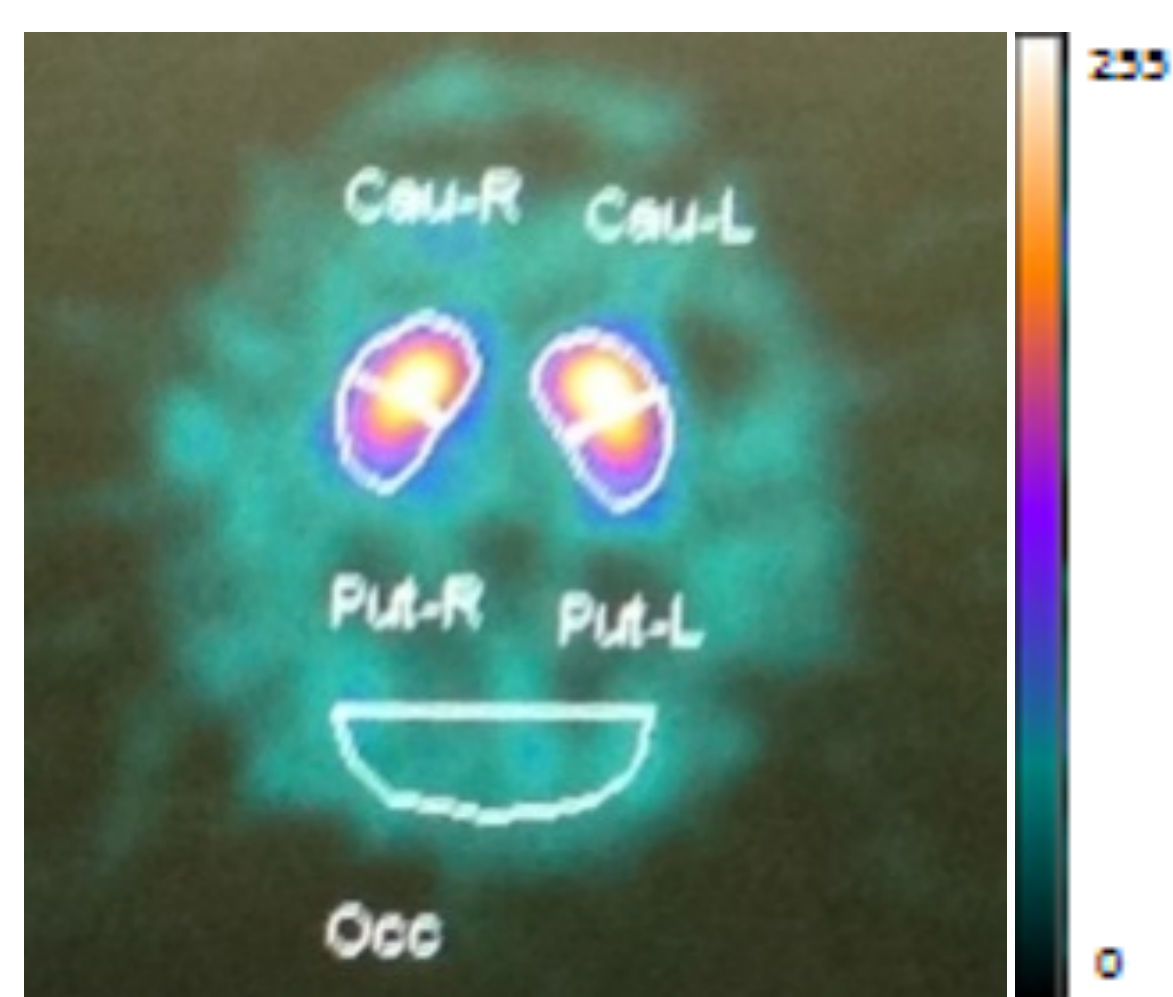

Figure 1. Sum image of three transaxial slices where striatum is visible, with semiautomatic Regions of Interest (ROIs) on Caudate Nucleus (Left and Right), Putamen (Left and Right) and Occipital

Results

The ***Figures 2-9*** represents the ROCC of the Binding Ratios (BR) A-H, used for validation of DBRV.

By the ROCC assessment for each BR the values of Area Under the Curve (AUC) were obtained: A (AUC=0.81), B (AUC=0.79), C (AUC=0.91), D (AUC=0.93), E (AUC=0.88), F (AUC=0.86), G (AUC=0.87), H (AUC=0.87).
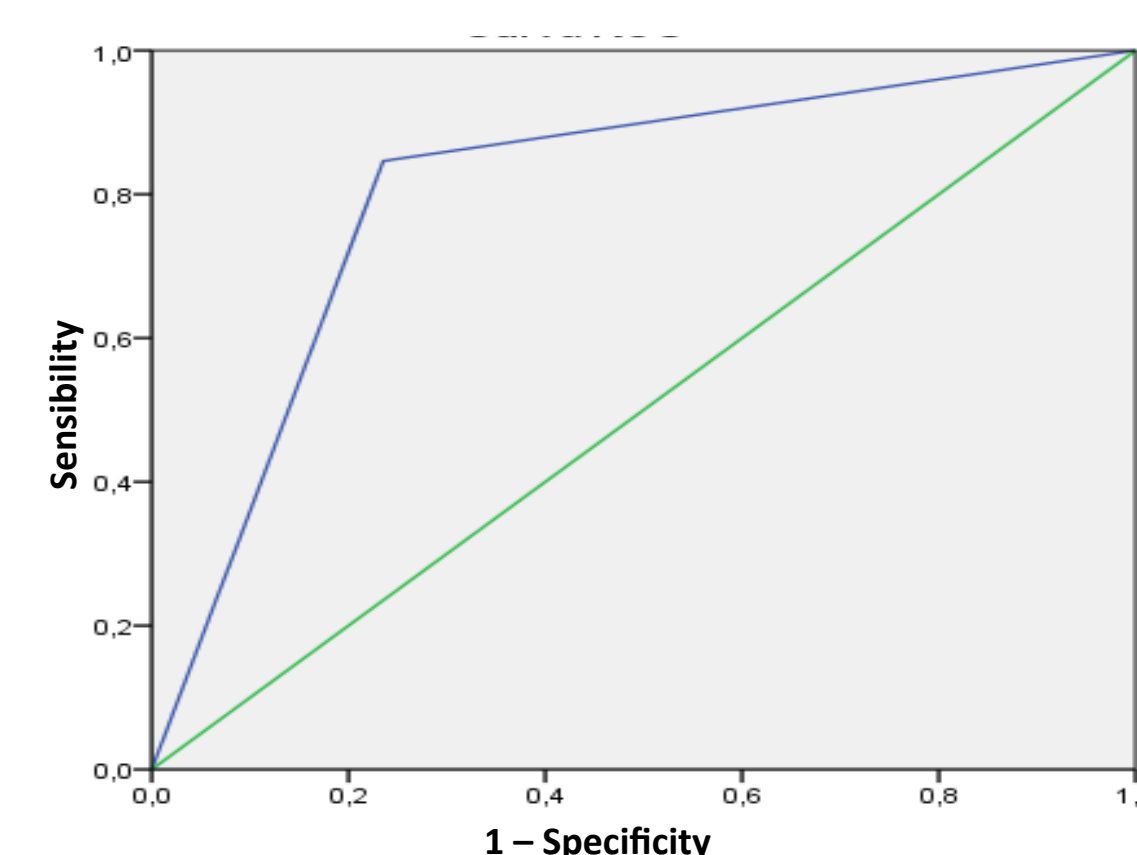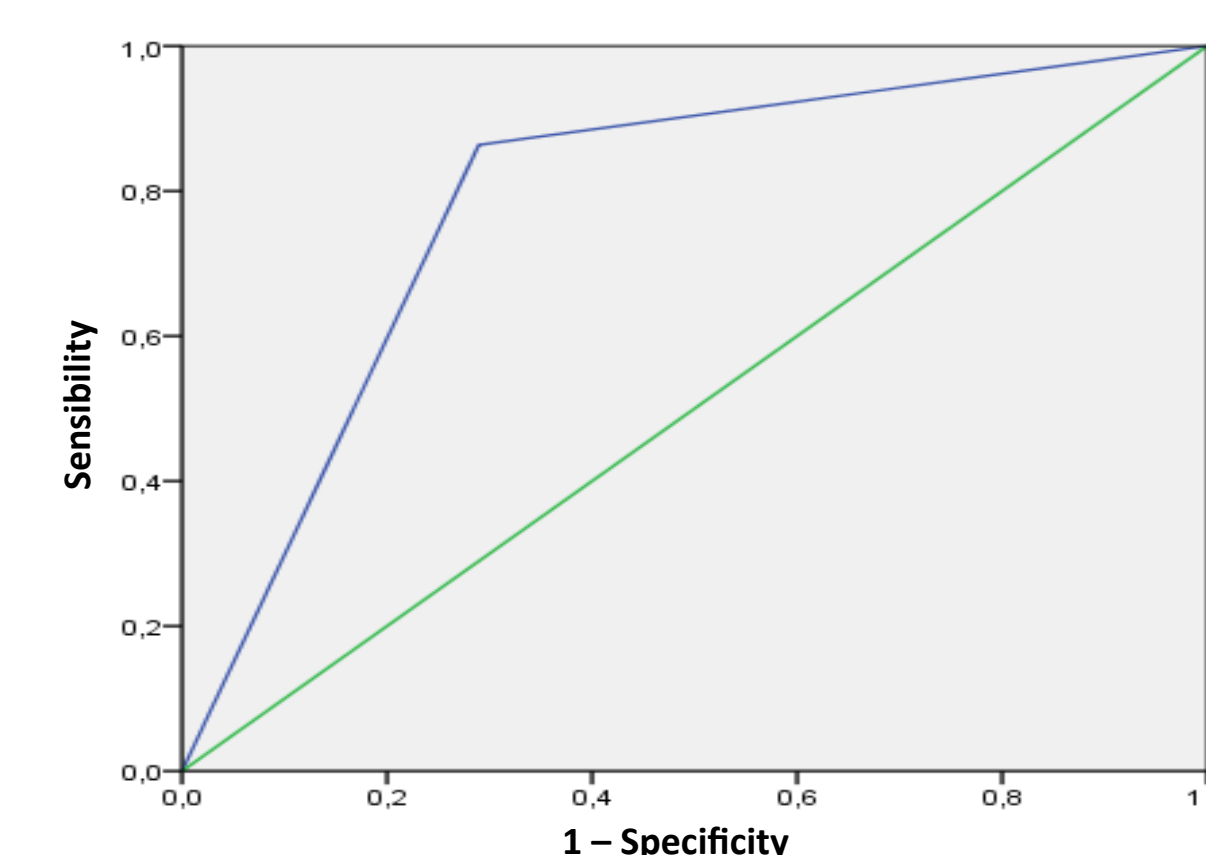

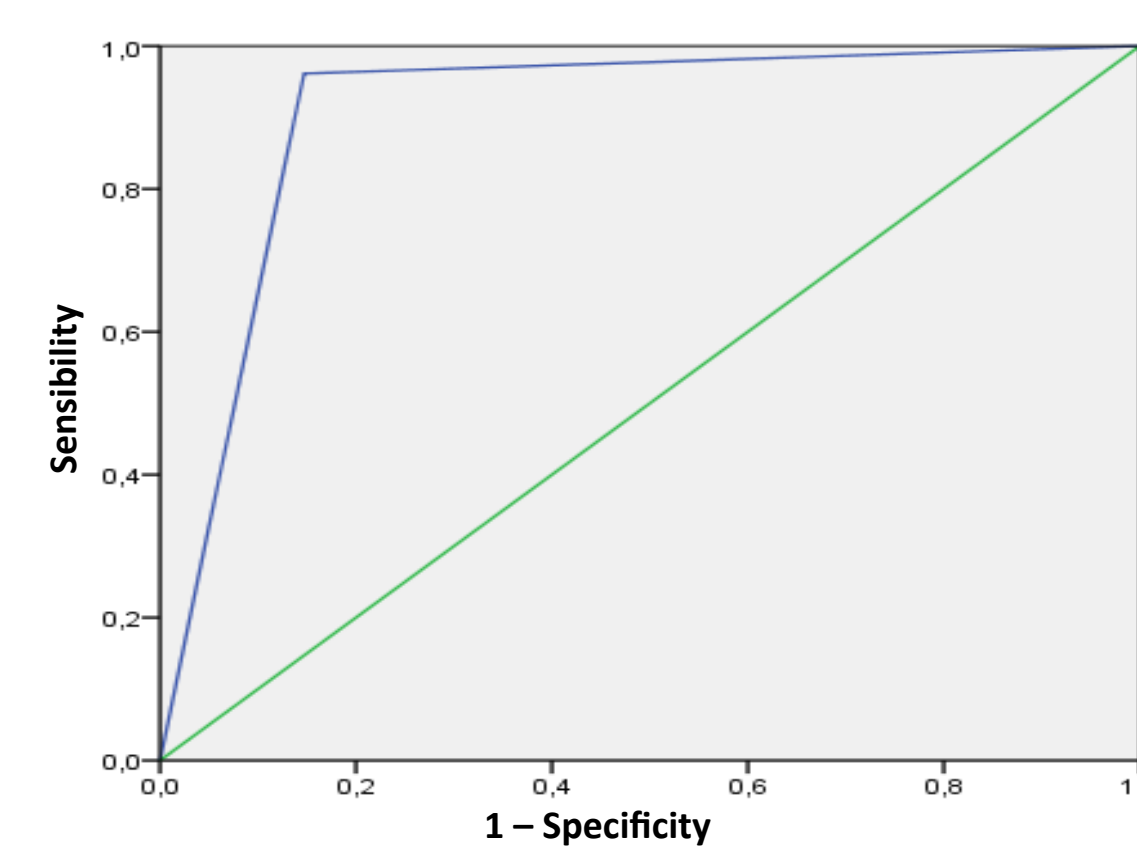**Figure 2.** Curve ROC BR A
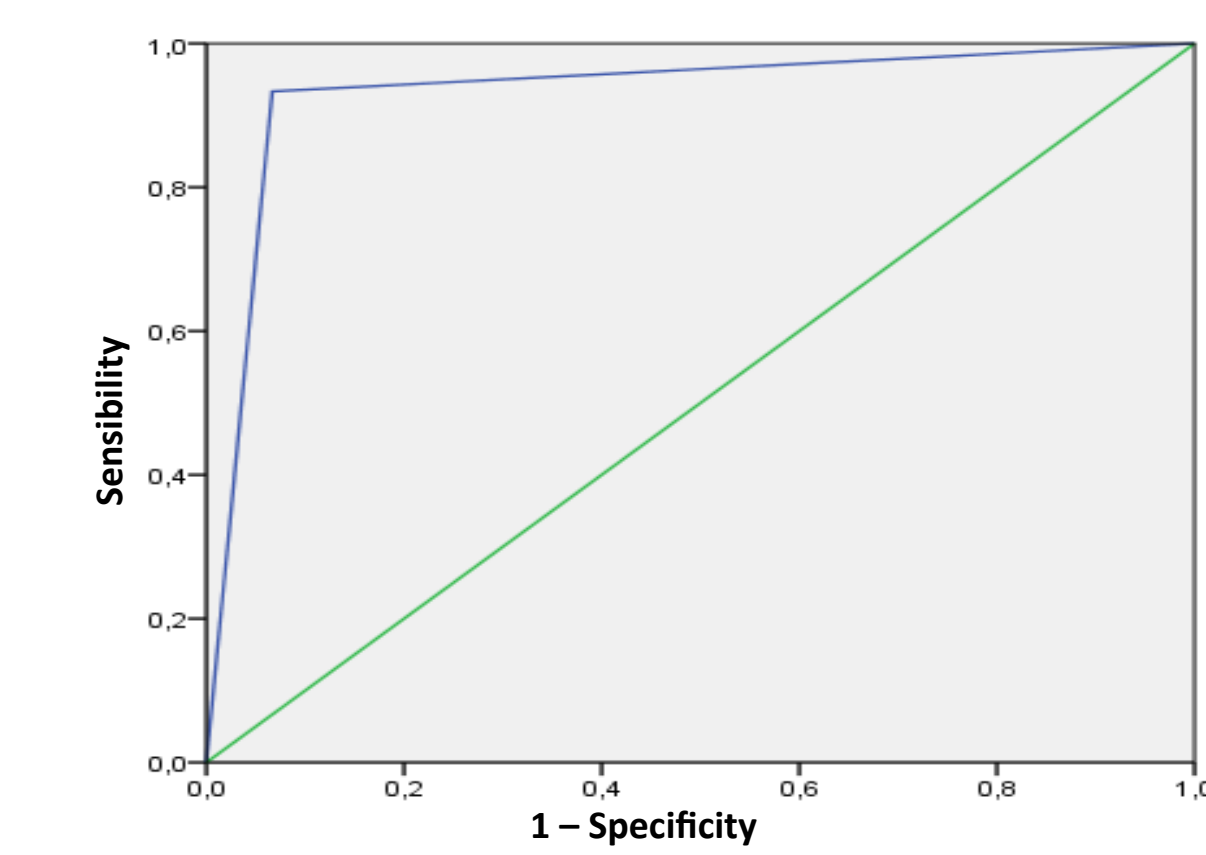

Figure 3. Curve ROC BR B
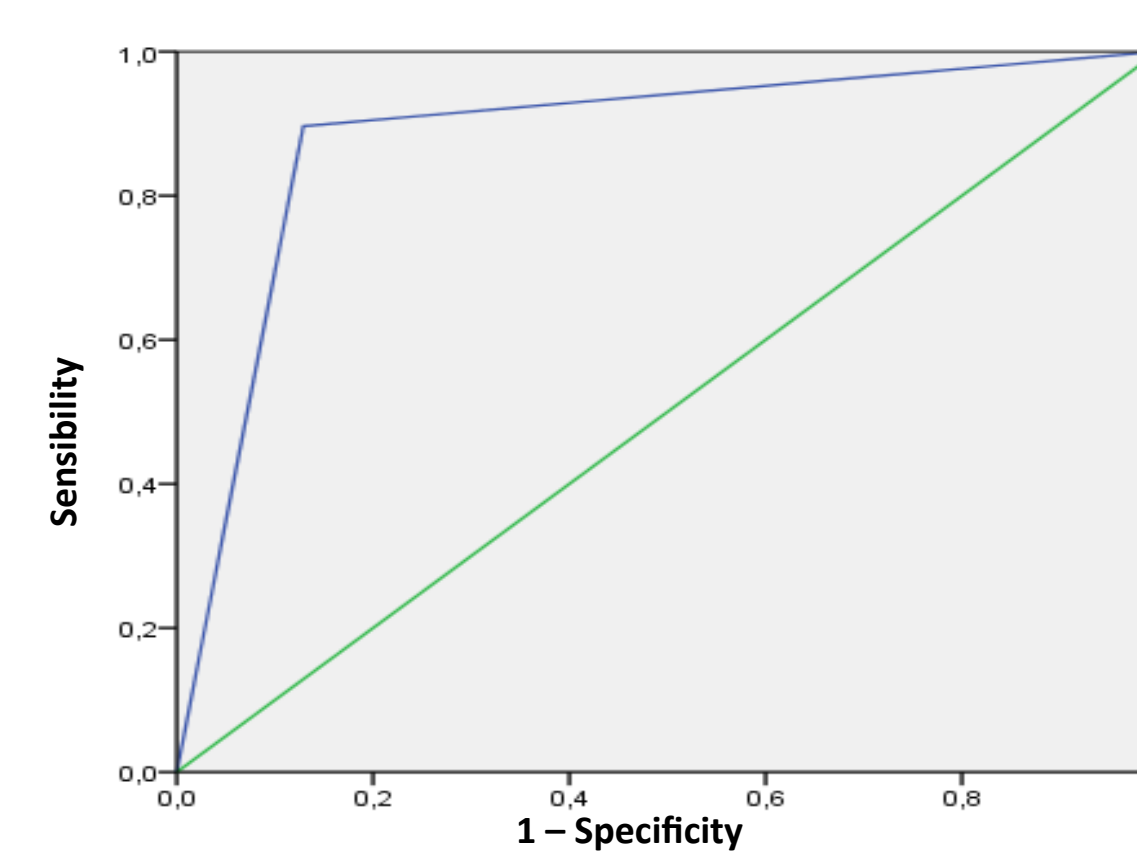

Figure 4. Curve ROC BR C

Figure 5. Curve ROC BR D
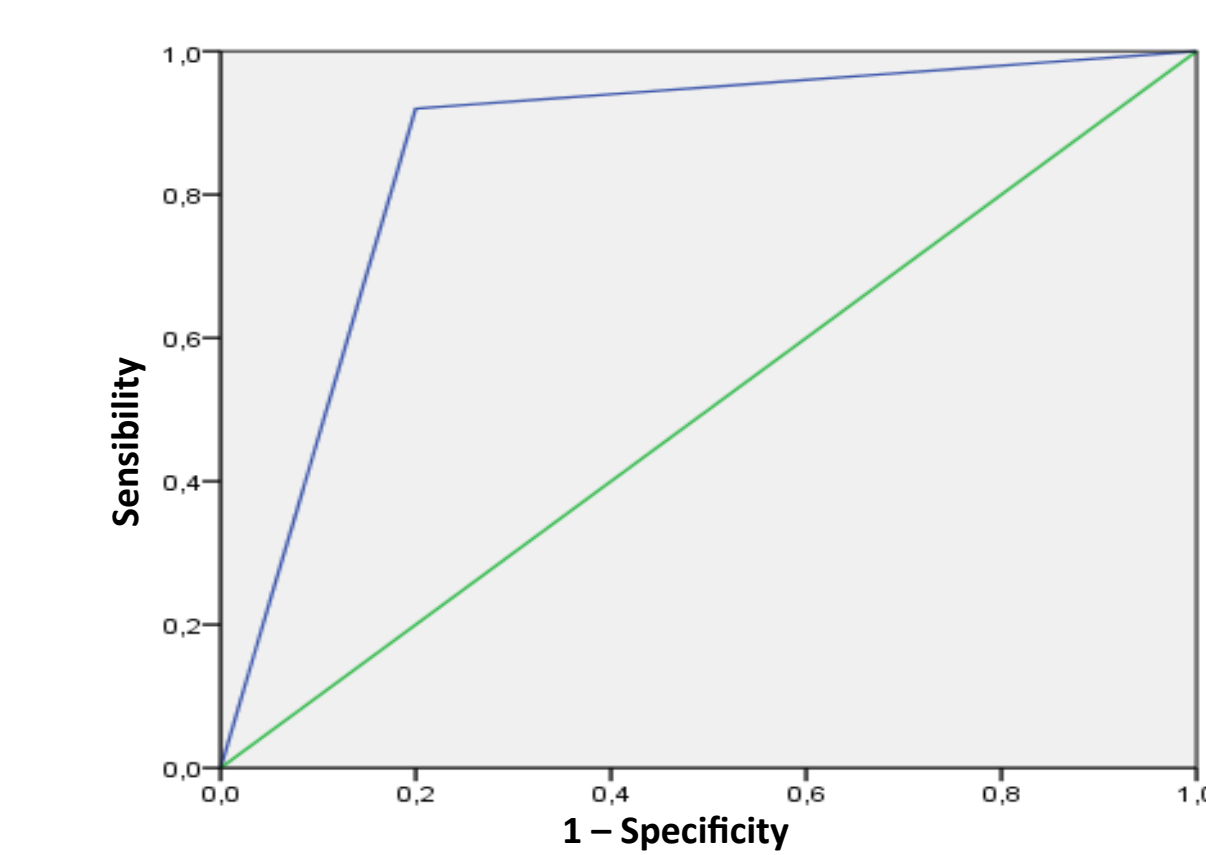

Figure 6. Curve ROC BR E
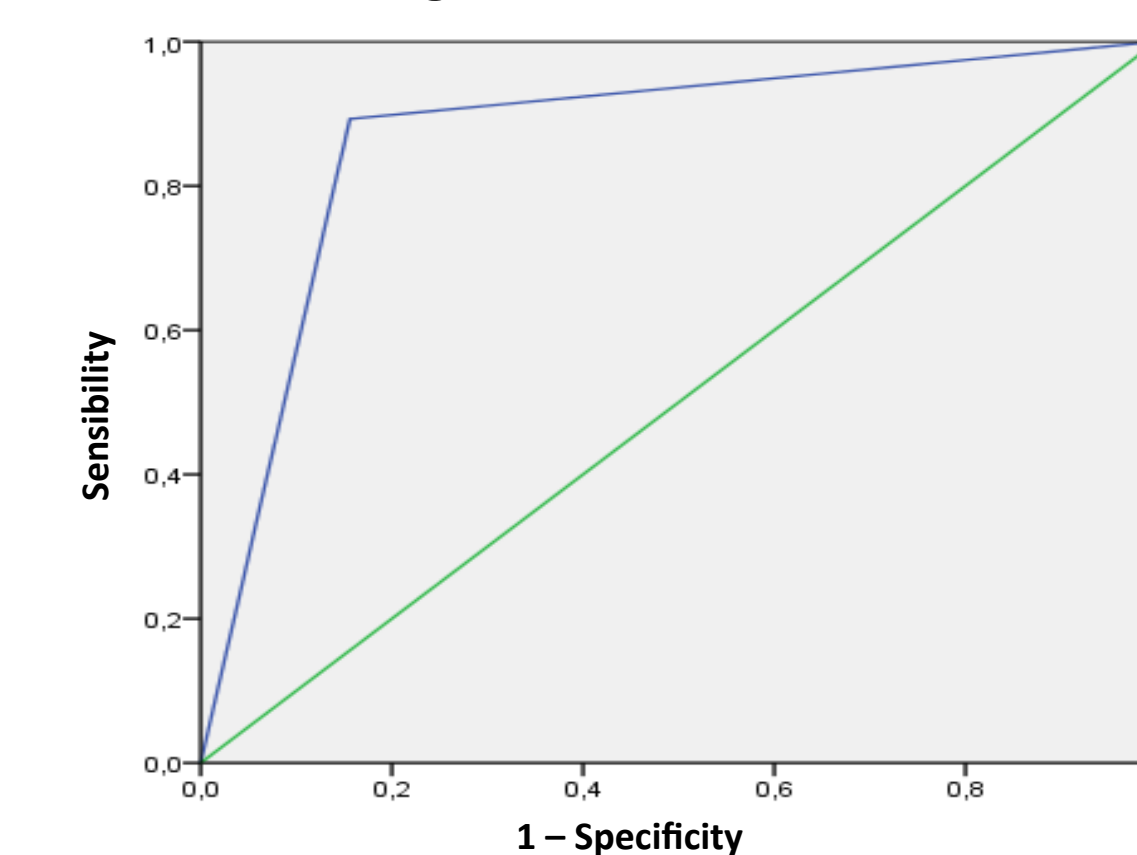

Figure 7. Curve ROC BR F
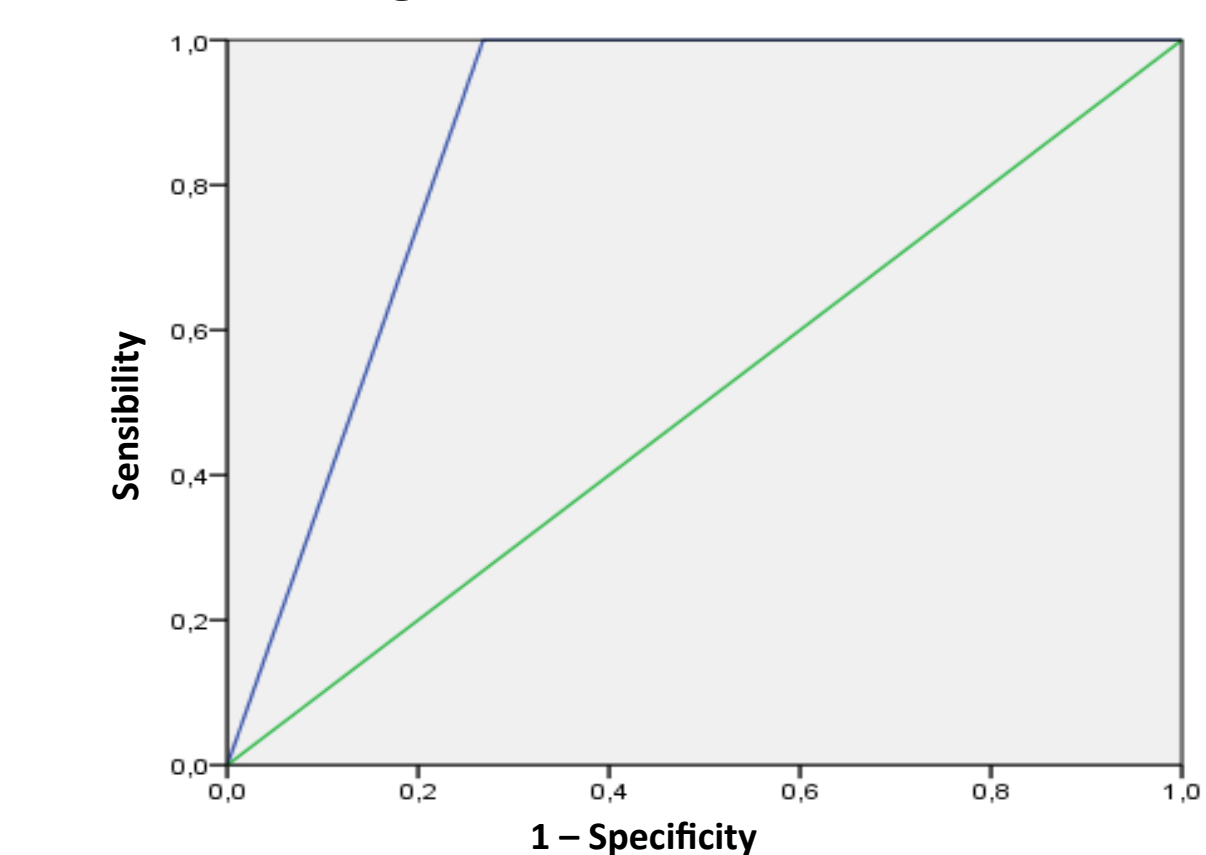

Figure 8. Curve ROC BR G

Figure 9. Curve ROC BR H

Discussion/Conclusion

The BR C and D measures the uptake from putamen, the first and main structure to degenerate in subjects with PS, so the AUC values (0.91 and 0.93) are excellent measures to distinguish between healthy patients and affected ones. The BR A and B have the lower AUC values (0.81 and 0.89) because they measures the uptake from caudate nucleus which is the last structure to degenerate in patients with PS. The remaining AUC values (0.88, 0.86, 0.87 and 0.87) of BR E, F, G and H are good discriminatory measures. [1-2,4-7]

It´s possible to conclude that the DBRV and its reference values newly created have good discriminative capability between healthy controls and subjects with PS. The new DB is an adapted and improved tool for clinical use and assessment.

References

1. Tolosa E, Vander Borght 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.
2. 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.
3. 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.
4. A. C. B. Curvas ROC: Aspectos Funcionais E Aplicacões. 2000
5. Kumar R, Indrayan a. Receiver operating characteristic (ROC) curve for medical research. Indian Pediatr. 2011;48:277-287.
6. Fawcett T. An introduction to ROC analysis. Pattern Recognit Lett. 2006;27:861-874.
7. Greiner M, Pfeiffer D, Smith RD. Principles and practical application of the receiver-operating characteristic analysis for diagnostic tests. Preventive Veterinary Medicine 45:23-41.