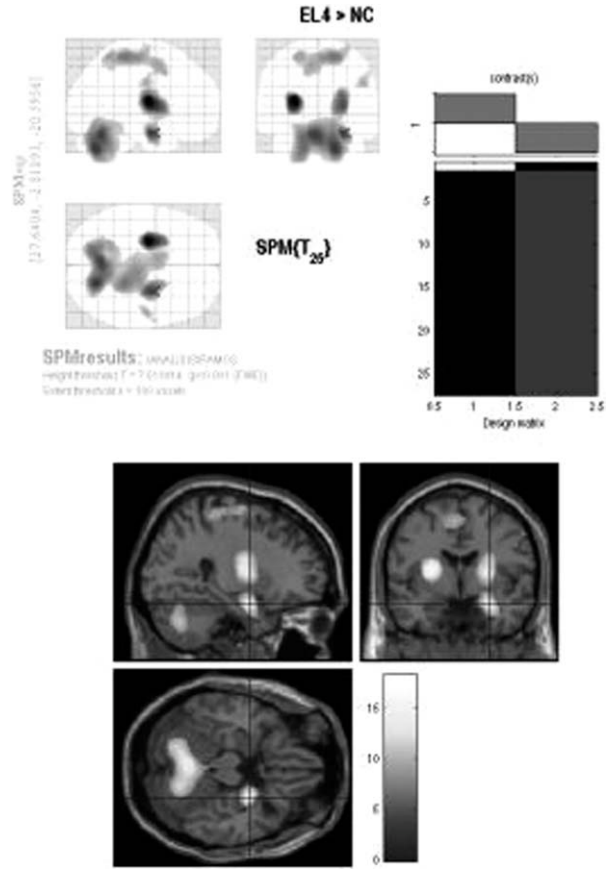

FIG. 2 (588).

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Automatic brain image reading for the differential diagnosis between atypical parkinsonian syndromes & Parkinson's disease

G. Garraux, C. Phillips, C. Lemaire, A. Luxen, A. Destée, G. Franck, E. Salmon (Liege, Belgium)

Objective: To compare the accuracy of an automatic classifier applied to resting-state 18FDG PET scans collected in patients with degenerative parkinsonism with the clinical diagnosis at follow up several years after PET.

TABLE 1 (589). *Clinical data*

	Final diagnosis	Age (years) at the time of PET (mean ± std)	Disease duration (years) at the time of PET (mean ± std)	Follow up (years) after PET (mean ± std)
Training & testing dataset (N=110)				
PD class	PD (27)/ Norm (28)	59.6 ± 8.47	4.1 ± 4	8.4 ± 4.5
APS class	MSA (22)/ PSP (17)/ CBD (16)	62.8 ± 6.5	3.3 ± 2.1	3.7 ± 3
Validation dataset (N=47)				
PD class	PD (15)	50.4 ± 9.5	5.2 ± 5.2	9.2 ± 3.5
APS class	MSA (9)/ PSP (12)/ CBD (11)	71.4 ± 8.1	4.4 ± 4.1	2.5 ± 2.7

TABLE 2 (589). *Diagnostic yield of automatic brain image reading (APS vs. PD)*

	Training & testing dataset	Validation dataset	Average
Sensitivity	89.1%	96.8%	92.9%
Specificity	92.7%	100%	96.3%
Positive predictive value	92.4%	100%	96.2%
Negative predictive value	89.5%	93.7%	91.6%

Background: Visual inspection of 18FDG-PET scans has proven valuable in discriminating Parkinson's disease (PD) from atypical parkinsonian syndromes (APS: multiple system atrophy [MSA], Progressive Supranuclear Palsy [PSP], and Corticobasal degeneration [CBD]).

Methods: We processed and analyzed 157 resting-state 18FDG-PET scans from patients with degenerative parkinsonism referred to our center because the diagnosis was felt uncertain (Table 1).

After spatial normalization onto a study-specific template and smoothing using SPM8, PET images were analyzed using relevant vector machine (RVM), a supervised multivariate Bayesian machine learning algorithm. The classifier was first trained on 110 scans to learn the differences in image pattern between the 2 classes under consideration (APS vs. PD) and then tested on the same dataset using a leave-one-out (LOO) procedure. Next, the trained classifier was validated using a new set of 47 images with unseen classes obtained on the same tomograph as the first dataset.

Results: After training, the voxels found to contribute the most to image classification into the APS group were distributed in the midbrain, striatum, anterior thalamus and frontal cortex, bilaterally. The LOO procedure on the training dataset led to a 89.1% and 92.7 % classification accuracy for the APS and PD classes, respectively, as compared to the clinical diagnosis at the last available visit. In the validation dataset, only one image from the APS class was misclassified (Table 2).

Conclusions: Automatic reading of 18FDG-PET images of the brain using RVM provides adequate diagnostic yield for discriminating APS from PD patients. Future work should examine how this approach can be generalized to other patient cohorts studied at an earlier stage of the disease. From a broader perspective, results suggest that such multivariate approaches have the potential to assist the clinicians to make accurate predictions at the individual level.

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DTI and probabilistic tractography of the premotor to basal ganglia connections in healthy subjects and patients with Parkinson's disease

S. Groppa, T. Bustorf, C. Riedel, J. Volkmann, J. Herzog (Kiel, Germany)

Objective: To study the anatomical differences in the premotor-basal ganglia loops in patients with Parkinson's disease (PD) and healthy controls (HC) by means of diffusion tensor imaging (DTI) and probabilistic tractography.

Background: PD patients do not only suffer from well-known motor symptoms but deficits in also non-motor pathology with impairment of specific domains of memory, frontal cognitive domains, sensory-motor integration and executive function. Although non-motor symptoms significantly impact therapy and course of PD, little is yet known about their anatomical correlates, disease-related morphological changes and their relation to symptom severity in individual subjects. We therefore aimed at characterizing their connectivity within the basal ganglia loop.

Methods: Twelve age matched HC and fifteen patients with idiopathic PD without dementia (7 males, mean age 52.3±7.6, Hoehn and Yahr 2.1±0.8) underwent whole-brain DTI at 3 T (Philips Achieva; 3 acquisitions of 32 directions: b=1000 and five b0 images). The data was pre-processed and analysed using FSL (FMRIBm Oxford, UK) and probabilistic tractographies were run from the dorsal-(PMD) and ventral-(PMV) premotor cortex to a tar-