



# SUBSTANTIA NIGRA LOCATIONS OF IRON-CONTENT AND FREE-WATER ABNORMALITIES IN PARKINSON'S DISEASE

ean congress

Oslo 2019

5<sup>th</sup> Congress of the European Academy of Neurology

June 29 - July 2

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## INTRODUCTION

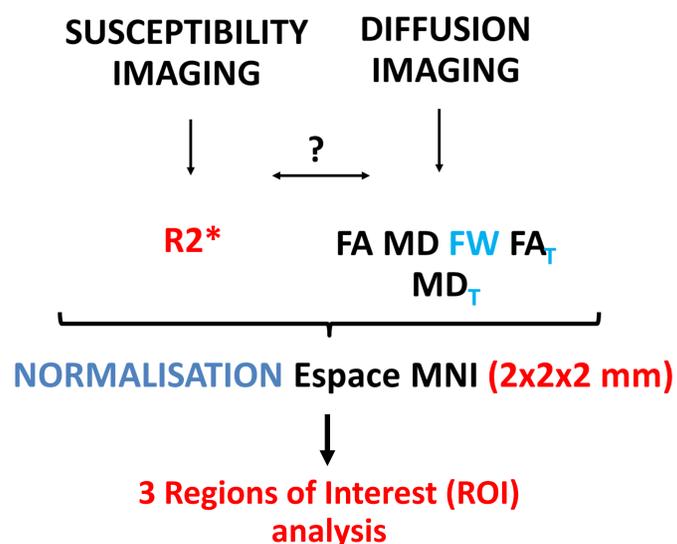
A key pathophysiological characteristic of Parkinson disease (PD) is the loss of the dopaminergic neurons of the substantia nigra (SN) [1], particularly in the SN pars compacta (SNc).

On the one hand, an increase of SN iron-related MR parameters (R2\*) have been showed in PD patients compared to healthy controls (HC) [2]. On the other hand, several diffusion markers [3] (fractional anisotropy, free-water (FW)...) located in SN showed also significant modifications in PD.

Both diffusion MRI and T2\* relaxation studies have shown promise in differentiating PD from HC brains.

The main objective of this present study was to compare these two sequences and to clarify the relationship between microstructural features and iron accumulation in the SN and provide additional information regarding PD pathology.

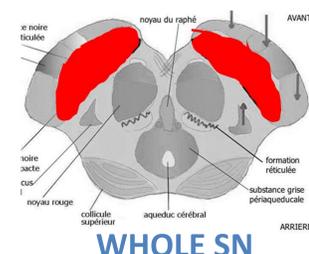
## METHODOLOGY



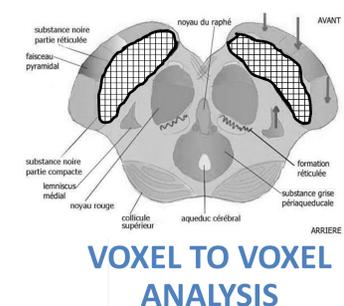
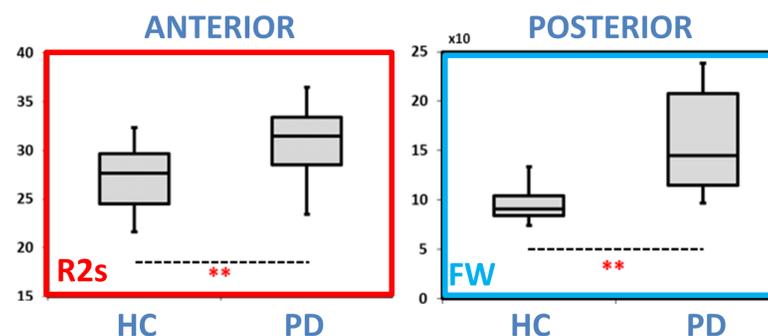
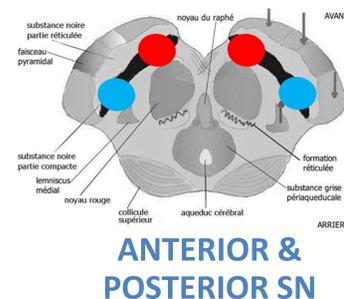
## RESULTS

PD baseline = 18. PD 2 years = 15. HC = 21. Disease duration = 7 years.

### Cross-sectional analysis

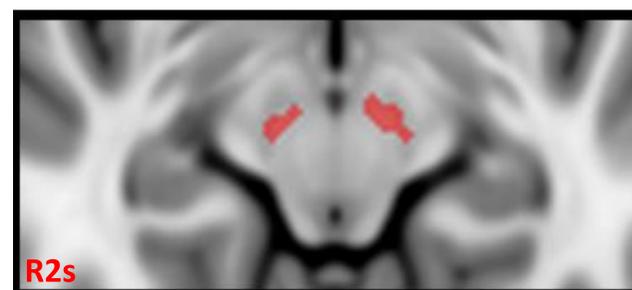


	HC (N=21)		PD Baseline (N=18)		p-value
	Mean	SD	Mean	SD	
Whole SN R2s	29.96	2.97	34.47	3.03	< 0.001***
Whole SN FW	12.17	4.19	12.99	2.28	ns



### Longitudinal analysis

No significant change were found over time in FW/R2\* maps for PD patients with moderate stage



UNCORRECTED P. Z = -12

## DISCUSSION

We collected a unique dataset that allowed comparisons of iron-related and diffusion markers in the SN and thus enabled us to determine their relative sensitivities.

We found that, relative to HC, PD patients had increased R2\* in the anterior SN and increased FW and in the posterior SN, findings suggestive of potentially distinct pathologies in the different SN subparts as well as distinct roles for these MRI markers in PD.

The increase of the Free-Water, which is highlighted by diffusion imaging is possibly related to the degeneration of dopaminergic cells within the SN (nigrosome).

The parameters of R2s and FW can have complementary roles in the pathological process. Indeed, we assume that cellular toxicity (R2\*) may precede cellular degeneration (FW). In view of our results, we find significant differences in R2\* values in some (anterior) regions where FW values are not significant, and vice versa.

## CONCLUSION AND PERSPECTIVE

Five nigrosomes measuring up to a few millimeters have been described [4].

Neuromelanin and Quantitative Susceptibility can provide further information regarding the differentiation of reticular and compact parts (nigrosomes).

Also, the acquisition with two values of b, in diffusion imaging, would allow a better estimation of the free water compartment.

## REFERENCES

- 1Lehéricy and al. Mov. Disord 2012
- 2Péran and al. Brain 2010
- 3Planetta and al. Brain 2016
- 4Lehéricy and al. Mov. Disord 2014