

Supplementary data

Differentiation of multiple system atrophy from Parkinson's disease by structural connectivity derived from probabilistic tractography

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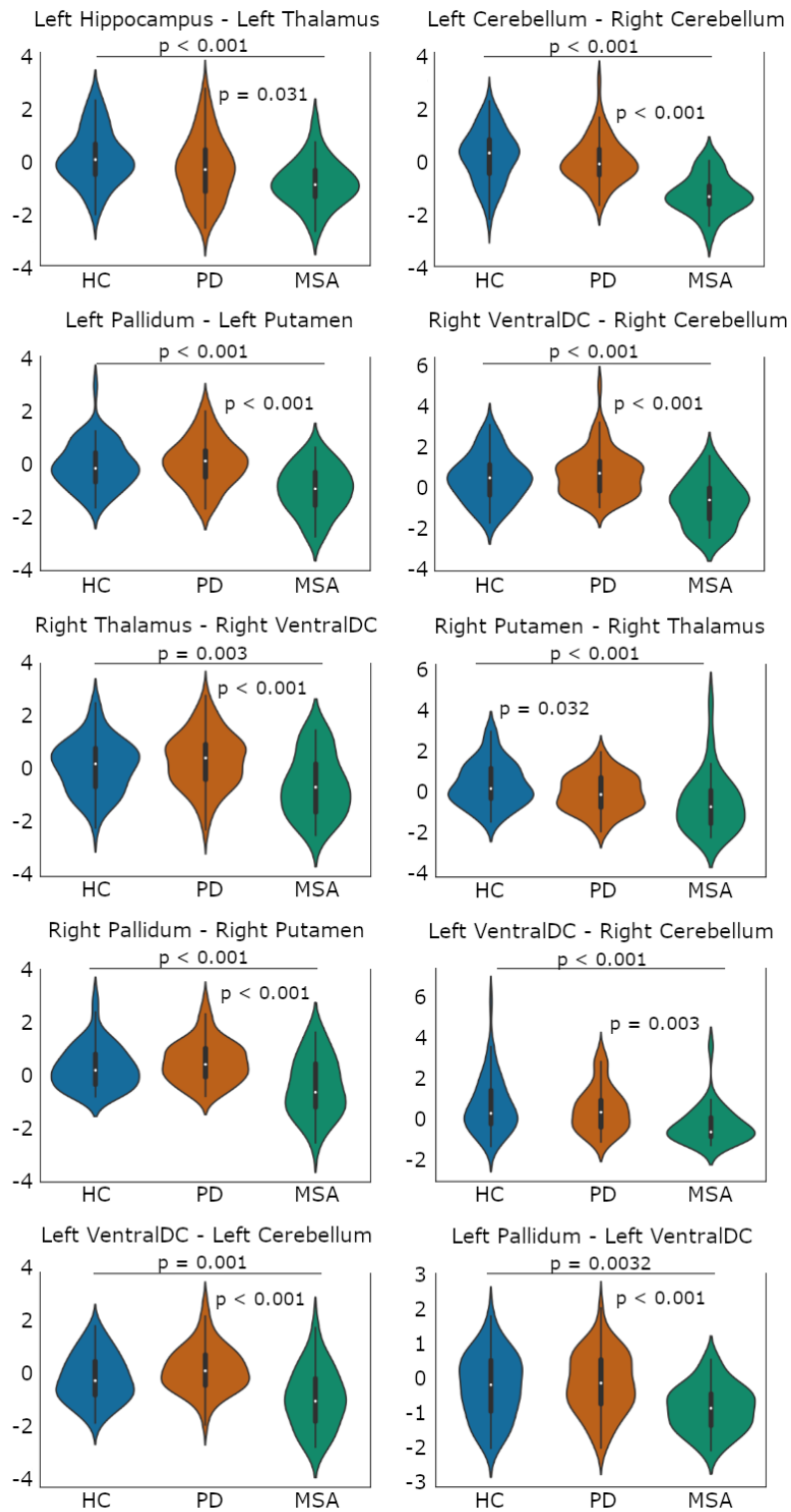
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Supplementary figure 1. Plot illustrates the distribution of the number of streamlines (NOS) between the 10 significantly reduced tracts found in MSA patients using threshold-free network based statistics (TFNBS). NOS values were Z-transformed; HC: healthy controls; PD: Parkinson's disease group; MSA: multiple system atrophy group.

Supplementary Table 1. Sociodemographic and clinical parameters by group of the balanced sample of PD and MSA patients used for the classification procedure.

	PD (n=31)	MSA (n=31)	Stat/ p
Age	64.55 (8.3)	60.9 (8.4)	1.70/p=.1969
Years of education	11.58 (5.4)	10.68 (3.8)	0.76/p=.7203
Sex (male/female)	21/10	19/12	0.52/p=.8223
Years of evolution	10.39 (6.55)	4.46 (2.75)	4.64/p<.001*
H&Y (1:2:3:4:5)	5:15:11:0:0	0:8:11:9:3	4.84/p<.001*
LEDD	629.07 (414.1)	520.67 (426.4)	0.9902/p=.1692

PD: Parkinson's disease patient group; MSA: multiple system atrophy patient group; H&Y: Hoehn and Yahr scale; LEDD: levodopa equivalent daily dose (in mg); * refers to significant results; Post-hoc differences between HC and PD¹; HC and MSA²; PD and MSA³;

Supplementary Table 2. Fractional Anisotropy (FA) of subcortical ROIs by group.

	HC (n=54)	PD (n=65)	MSA (n=31)	Stat/ p
Left Accumbens	0.2737 (0.020)	0.2705 (0.023)	0.2756 (0.021)	F=1.5978/ p=0.2618
Left Amygdala	0.2585 (0.019)	0.2535 (0.020)	0.2689 (0.029)	F=5.6173/ p=0.0144* ^{2,3}
Left Caudate	0.2865 (0.023)	0.2929 (0.027)	0.2987 (0.034)	F=2.0163/ p=0.2529
Left Hippocampus	0.2596 (0.021)	0.2525 (0.023)	0.2512 (0.022)	F=1.8303/ p=0.2598
Left Pallidum	0.4283 (0.042)	0.4303 (0.042)	0.4359 (0.038)	F=0.4489/ p=0.6749
Left Putamen	0.3771(0.027)	0.3728 (0.023)	0.3796 (0.024)	F=1.7513/ p=0.2598
Left Thalamus	0.3768 (0.020)	0.3816 (0.022)	0.3775 (0.022)	F=0.3641/ p=0.6929
Left Ventral DC	0.4327 (0.024)	0.4279 (0.029)	0.4116 (0.027)	F=7.1122/ p=0.004* ^{2,3}
Left Cerebellum	0.2894 (0.027)	0.2878 (0.021)	0.2896 (0.033)	F=0.5908/ p=0.6311
Right Accumbens	0.2490 (0.021)	0.2421 (0.018)	0.2523 (0.024)	F=3.8997/ p=0.0537
Right Amygdala	0.2733 (0.023)	0.2753 (0.029)	0.2843 (0.040)	F=1.4372/ p=0.2896
Right Caudate	0.2593 (0.022)	0.2503 (0.022)	0.2560 (0.028)	F=1.9789/ p=0.2529
Right Hippocampus	0.4100 (0.041)	0.4053 (0.037)	0.4291(0.047)	F=4.1309/ p=0.0516
Right Pallidum	0.3710 (0.021)	0.3679 (0.021)	0.3757 (0.028)	F=1.9794/ p=0.2529
Right Putamen	0.3756 (0.018)	0.3776 (0.021)	0.3696 (0.023)	F=1.6627/ p=0.2618
Right Thalamus	0.4218 (0.024)	0.4155 (0.025)	0.3997 (0.026)	F=9.7117/ p=0.0018* ^{1,2,3}
Right Ventral DC	0.4731 (0.033)	0.4766 (0.037)	0.4462 (0.030)	F=9.1112/ p=0.0024* ^{2,3}
Right Cerebellum	0.3351 (0.026)	0.3357 (0.020)	0.2884 (0.041)	F=37.0711/ p=0.0018* ^{2,3}

HC: healthy controls; PD: Parkinson's disease patient group; MSA: multiple system atrophy patient group; * refers to FDR corrected results; Post-hoc differences between HC and PD¹; HC and MSA²; PD and MSA³; Stats refers to F-test (F).

Supplementary Table 3. Mean Diffusivity (MD) of subcortical ROIs by group.

	HC (n=54)	PD (n=65)	MSA (n=31)	Stat/ p
Left Accumbens	8.755·10 ⁻⁴ (5.5·10 ⁻⁵)	9.095·10 ⁻⁴ (6.7·10 ⁻⁵)	9.213·10 ⁻⁴ (7.7·10 ⁻⁵)	F=4.5752/ p=0.0354* ^{1,2}
Left Amygdala	9.838·10 ⁻⁴ (8.3·10 ⁻⁵)	9.890·10 ⁻⁴ (9.3·10 ⁻⁵)	9.521·10 ⁻⁴ (5.9·10 ⁻⁵)	F=2.1035/ p=0.2153
Left Caudate	1.262·10 ⁻³ (1.2·10 ⁻⁴)	1.265·10 ⁻³ (1·10 ⁻⁴)	1.256·10 ⁻³ (9·10 ⁻⁵)	F=0.2476/ p=0.8758
Left Hippocampus	1.144·10 ⁻³ (9.8·10 ⁻⁵)	1.192·10 ⁻³ (1.1·10 ⁻⁴)	1.181·10 ⁻³ (9·10 ⁻⁵)	F=2.179/ p=0.2153
Left Pallidum	7.674·10 ⁻⁴ (6.8·10 ⁻⁵)	7.688·10 ⁻⁴ (6.8·10 ⁻⁵)	7.664·10 ⁻⁴ (7.2·10 ⁻⁵)	F=0.4114/ p=0.8082
Left Putamen	7.739·10 ⁻⁴ (4.5·10 ⁻⁵)	7.914·10 ⁻⁴ (4.9·10 ⁻⁵)	8.161·10 ⁻⁴ (7.8·10 ⁻⁵)	F=6.9336/ p=0.009* ^{1,2,3}
Left Thalamus	1.057·10 ⁻³ (5.9·10 ⁻⁵)	1.061·10 ⁻³ (6.4·10 ⁻⁵)	1.062·10 ⁻³ (6.4·10 ⁻⁵)	F=0.0322/ p=0.9711
Left Ventral DC	1.206·10 ⁻³ (9.9·10 ⁻⁵)	1.232·10 ⁻³ (1.1·10 ⁻⁴)	1.313·10 ⁻³ (1·10 ⁻⁴)	F=10.3436/ p=0.0012* ^{2,3}
Left Cerebellum	8.4·10 ⁻⁴ (4.8·10 ⁻⁵)	8.647·10 ⁻⁴ (5.2·10 ⁻⁵)	8.531·10 ⁻⁴ (4.8·10 ⁻⁵)	F=3.2145/ p=0.1098
Right Accumbens	9.816·10 ⁻⁴ (6.8·10 ⁻⁵)	9.964·10 ⁻⁴ (7.7·10 ⁻⁵)	9.924·10 ⁻⁴ (8.1·10 ⁻⁵)	F=0.6145/ p=0.7417
Right Amygdala	1.274·10 ⁻³ (1.2·10 ⁻⁴)	1.288·10 ⁻³ (1.1·10 ⁻⁴)	1.292·10 ⁻³ (9·10 ⁻⁵)	F=0.162/ p=0.8974
Right Caudate	1.154·10 ⁻³ (9.6·10 ⁻⁵)	1.2·10 ⁻³ (1.1·10 ⁻⁴)	1.192·10 ⁻³ (9.9·10 ⁻⁵)	F=2.0399/ p=0.2232
Right Hippocampus	7.888·10 ⁻⁴ (7.8·10 ⁻⁵)	7.878·10 ⁻⁴ (6.8·10 ⁻⁵)	7.786·10 ⁻⁴ (9·10 ⁻⁵)	F=0.4367/ p=0.8082
Right Pallidum	7.725·10 ⁻⁴ (4.3·10 ⁻⁵)	7.794·10 ⁻⁴ (4.5·10 ⁻⁵)	8.084·10 ⁻⁴ (7.9·10 ⁻⁵)	F=5.2247/ p=0.0212* ^{2,3}
Right Putamen	1.077·10 ⁻³ (6.8·10 ⁻⁵)	1.084·10 ⁻³ (6.3·10 ⁻⁵)	1.101·10 ⁻³ (5.4·10 ⁻⁵)	F=1.4494/ p=0.3609
Right Thalamus	1.24810 ⁻³ (1·10 ⁻⁴)	1.271·10 ⁻³ (1.1·10 ⁻⁴)	1.350·10 ⁻³ (1.1·10 ⁻⁴)	F=9.2948/ p=0.0012* ^{2,3}
Right Ventral DC	9.019·10 ⁻⁴ (1·10 ⁻⁴)	9.047·10 ⁻⁴ (1.1·10 ⁻⁴)	9.6·10 ⁻⁴ (1.1·10 ⁻⁴)	F=3.0339/ p=0.1222
Right Cerebellum	9.187·10 ⁻⁴ (7.5·10 ⁻⁵)	9.162·10 ⁻⁴ (7.1·10 ⁻⁵)	1.141·10 ⁻³ (1.9·10 ⁻⁴)	F=55.287/ p=0.0012* ^{2,3}

HC: healthy controls; PD: Parkinson's disease patient group; MSA: multiple system atrophy patient group; * refers to FDR corrected results; Post-hoc differences between HC and PD¹; HC and MSA²; PD and MSA³; Stats refers to F-test (F).

Supplementary Table 4. Volumetric measures (mm³) of subcortical ROIs by group.

	HC (n=54)	PD (n=65)	MSA (n=31)	Stat/ p
Left Accumbens	525.80 (102.4)	495.08 (110.5)	446.84 (128)	F=6.313/p=.0038* ^{1,2}
Left Amygdala	1588.57 (227.66)	1540.45 (304.28)	1464.26 (225)	F=4.751/p=.0171* ^{1,2}
Left Caudate	3345.61 (419.37)	3403.82 (528.38)	3065.97 (569.47)	F=4.894/p=.0102* ^{2,3}
Left Hippocampus	4055.56 (450.62)	3992.66 (627.99)	3692.87 (443.2)	F=6.018/p=.0038* ^{2,3}
Left Pallidum	1653.59 (228.69)	1771.55 (278.02)	1374.03 (285.88)	F=24.226/p<.001* ^{2,3}
Left Putamen	5048.76 (565.34)	5013.09 (767.11)	4140.52 (1121.98)	F=17.326/p<.001* ^{2,3}
Left Thalamus	6360.06 (640.82)	6643.49 (837.85)	6218.10 (710.86)	F=2.96/p=.0542
Left Ventral DC	3939.56 (448.72)	4179.68 (531)	3520.13 (500.58)	F=19.789/p<.001* ^{2,3}
Left Cerebellum	16474.33 (3715.37)	16862.20 (3434.69)	10286.74 (4016.76)	F=37.516/p<.001* ^{2,3}
Right Accumbens	577.06 (100.18)	534.75 (120.49)	485.29 (119.62)	F=8.402/p<.001* ^{1,2}
Right Amygdala	1637.39 (237.647)	1610.12 (290.03)	1516.35 (226.07)	F=3.497/p=.0325* ²
Right Caudate	3395.69 (464.35)	3469.09 (469.16)	3153.16 (570.51)	F=3.520/p=.0181* ^{2,3}
Right Hippocampus	4128.78 (514.57)	4100.46 (650.54)	3749.94 (708.31)	F=5.081/p=.0093* ^{2,3}
Right Pallidum	1445.26 (183.75)	1583.4 (218.16)	1301.19 (272.39)	F=16.732/p<.001* ^{2,3}
Right Putamen	4725.56 (536.36)	4597.25 (682.25)	3883.06 (1030.05)	F=16.800/p<.001* ^{2,3}
Right Thalamus	6539.22 (649.56)	6815.18 (885.91)	6306.74 (727.66)	F=3.767/p=0.0292* ³
Right Ventral DC	3742.09 (405.7)	3949.57 (534.02)	3493.42 (495.49)	F=8.911/p<.001* ^{2,3}
Right Cerebellum	15846.09 (2840.33)	16190.62 (3031.55)	9200.06 (3487.57)	F=60.91/p<.001* ^{2,3}

HC: healthy controls; PD: Parkinson's disease patient group; MSA: multiple system atrophy patient group; * refers to FDR corrected results; Post-hoc differences between HC and PD¹; HC and MSA²; PD and MSA³; Stats refers to F-test (F).