

Semi-Quantification of DAT SPECT Images - Survey of Normal Reference Limits Used at Different Hospitals

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Background

Interpretation of dopaminetransporter (DAT) SPECT examinations comprise:

- 1) visual inspection
- 2) semiquantitative evaluation of the regional striatal up-take ratios of ¹²³I-labelled tracers correlated to a reference (background) region.

Therefore, establishing normal values and significant thresholds are important to assist the interpretation.

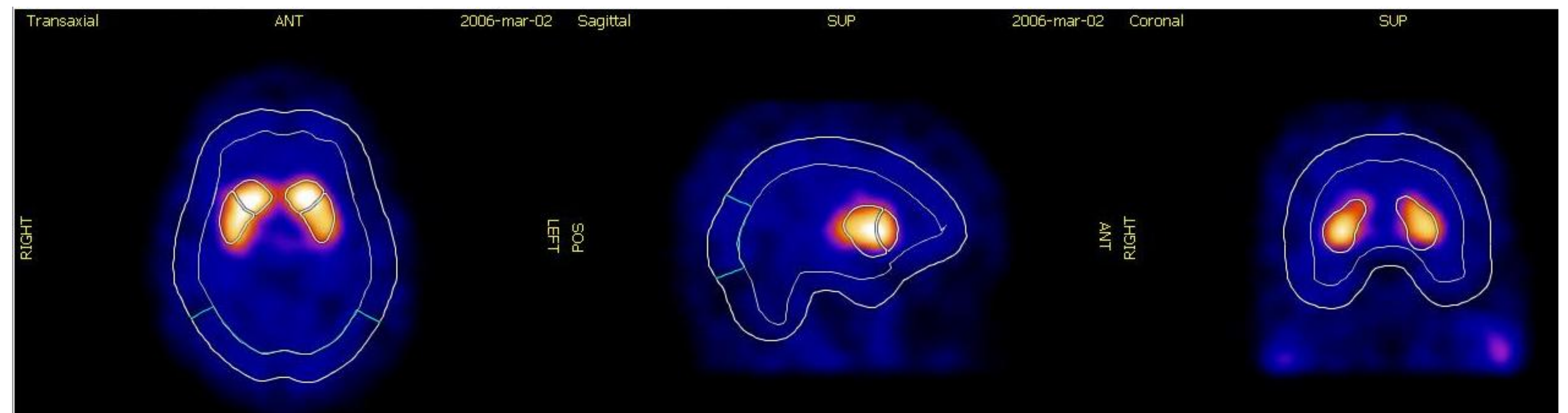
The aim of this survey was to compare different reference limits from four different hospitals where data was analysed using the same automated DAT quantification software.

Methods

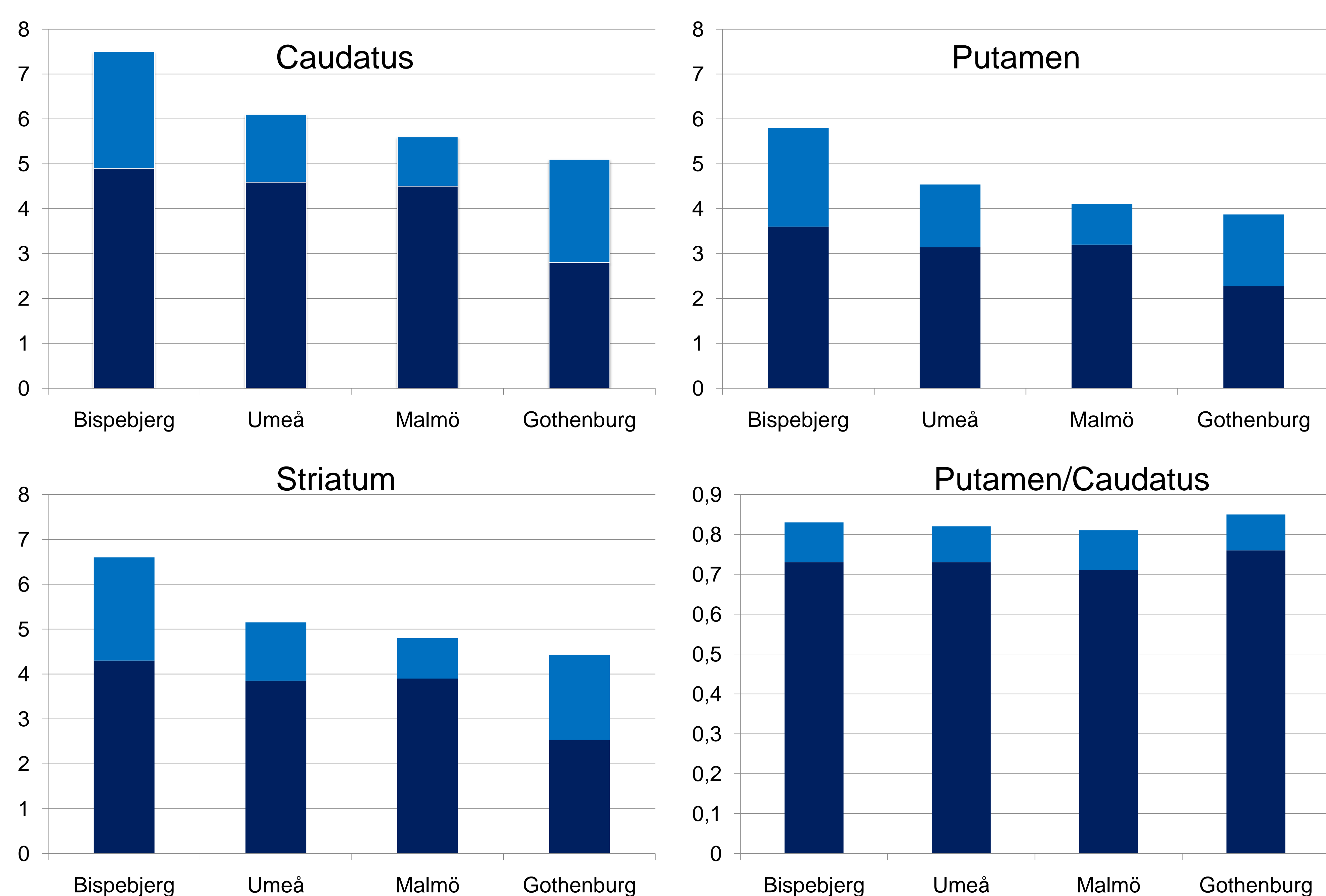
The EXINI DAT software (EXINI diagnostics AB, Lund Sweden) was used for automated quantification at all hospitals. In two hospitals, groups of 'true' healthy volunteers were examined, whereas in the two other hospitals patients that retrospectively were found to have a normal DAT scan and no clinical signs of striatal affection.

Results

Threshold values for putamen/caudate ratios were almost similar at all hospitals, but the values for specific uptake varied among hospitals. The reference limits for the three hospitals using OSEM, scatter- and attenuation correction (CT or line source) were roughly found within the same range, whereas the hospital using filtered backprojection and uniform attenuation correction (Chang), without scatter correction, presented much lower values. Among the three hospitals using OSEM and non-uniform attenuation correction algorithms, the highest specific uptake values were found in the group of normals with the lowest mean age (60years vs 66/67 years).



Normal DAT SPECT examination analyzed with EXINI DAT. The segmentation of striatum and the reference region (median counts in whole brain in 3D are shown).



Lower limits (dark blue) and mean (blue) for specific DAT uptake

Specific Uptake	Bispebjerg	Umeå	Malmö	Gothenburg
Mean (SD)				
Caudatus	7.5 (1.3)	6.1 (0.7)	5.6 (0.6)	5.1 (1.1)
Putamen	5.8 (1.1)	4.5 (0.7)	4.1 (0.5)	3.9 (0.8)
Striatum	6.6 (1.1)	5.2 (0.7)	4.8 (0.4)	4.4 (1.0)
Putamen/Caudatus	0.83 (0.05)	0.82 (0.04)	0.81 (0.05)	0.85 (0.05)
Lower Limits				
Caudatus	4.9	4.6	4.5	2.8
Putamen	3.6	3.1	3.2	2.3
Striatum	4.3	3.9	3.9	2.5
Putamen/Caudatus	0.73	0.73	0.71	0.76
Material				
Subjects	Normal volunteers	Normal volunteers	Patients	Patients
Number (Female/Male)	30 (17/13)	25 (11/14)	7 (4/3)	22 (15/7)
Age; mean (range)	60 (42/73)	67 (48-78)	66 (52-80)	60 (21-86)
Methods				
Camera	Prism 3000	Infinia GE	Siemens Symbia T6	GE Millenium
Collimator	LEUHR Fan beam	LEGP	LEHR	LEHR
Reconstruction	OSEM	OSEM	OSEM	FBP
Attenuation corr	Gd-153 line source	Low dose CT	Low dose CT	Chang
Scatter corr	Yes	TEW	DEW	No

Normal values (mean, SD) and reference lower limits (mean-2 SD) for specific DAT uptake collected from four different hospitals, using four different SPECT systems.

Conclusion

Calculation of specific uptake ratios for DAT brain SPECT studies are dependent on the type of camera, collimator, acquisition, and reconstruction parameters and, hence, are not easily transferred among hospitals.

However, calculation of the internal ratio between radioactivity in putamen and the caudate nucleus seems to be a fairly robust parameter comparable among data obtained with different SPECT systems.