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Comparison between atlas based diagrams used for indirect STN targeting and STN templates determined directly on stereotactic MRI

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Objective. Stereotactic determination of the subthalamic nucleus (STN) target is based on diagrams (indirect statistical coordinates relatively to anterior and posterior commissures AC, PC) or on direct MRI visualization. We aimed to compare both methods.

Methods. We studied 30 STN in 15 parkinsonian patients operated on for bilateral electrode placement. STN, AC and PC were identified on stereotactic 1.5-Tesla MRI slices (stereotactic frame in place; T2 weighted). We outlined STN boundaries on coronal slices. We defined a lateral template (hexagonal shape; on the sagittal slice where STN was widest) then 3 frontal templates (quadrilateral shape) located on the anterior, the intermediate and the posterior borders of lateral STN template. We built Guiot's (modified by Benabid et al.) and Talairach's STN diagrams. We tested discordance, using paired means comparisons, on locations of centres between STN diagrams and templates, for both frontal and lateral views.

Results. There were significant differences ($p < 0.05$) between diagrams and templates in laterality, in ACPC direction and in dorso-ventral direction, except for the anterior frontal template in the dorso-ventral direction. Schematically the lateral template was in a more posterior and ventral position and the frontal templates were in a more medial position. Considering only the indirect method, the locations of centres on frontal and on lateral diagrams, in the dorso-ventral direction, were significantly different.

Conclusions. A slight translation of diagrams on lateral view would probably allow a better correspondence with STN directly defined on MRI. The shape of diagram used on frontal view could also be modified.