Neurobiology & Functional Anatomy
Part I

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Training School, Catania, June 2012

What do we know?

• Dysfunction in cortico-striato-thalamo-cortical pathways
  – Involvement of basal ganglia
  – Frontal cortex
  – Limbic system
  – Thalamus

History

• 1885: G. Gilles de la Tourette \implies organic origin
• Uncertainty \implies psychogenic or organic origin ??
• 1961: haloperidol effective in tic reduction \implies organic origin
• 1993: MRI studies \implies organic origin
Cortico-striato-thalamo-cortical Circuitry

Alexander et al., Annu Rev Neurosci 1986, 9: 357-81

EUNetGTS
tourette.eu.org

Cortico-striato-thalamo-cortical Curcuits

Singer et al., Lancet Neurol 2005, 4: 149-59

Basal ganglia:
- direct pathway
- indirect pathway
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Basal Ganglia Volumes in Patients with Gilles de la Tourette Syndrome

Arch Gen Psychiatry. 2003;60(4):415-424.

- N= 154 children and adults with TS, n=130 healthy control subjects
- Caudate nucleus volumes in children and adults with TS
- Lenticular nucleus volumes in adults with TS and in children with TS plus OCD

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Enlargement of Thalamic Nuclei in Tourette Syndrome


- Basal Ganglia Nuclei in Human Brain
Lateral frontal cortex volume reduction in Tourette syndrome revealed by VBM

Hannah Firth1,6, Sarah Shorvon1, Thomas Pocock1, Julian Groen2, Alexander Sahakian7, Huber Leckband3,7, Karina Aran1,7, Rebeccah Burguiere4, and Oliver K. Meller1,6.

Figure 1 (decrease of gray matter volume in TDS patients). Correlates of gray matter concavity on the SNM's gray matter template (figure 1a: gray matter atlas). Results of group comparison revealed significant reductions in gray matter volume in TDS group compared to healthy controls.

Mean GM values extracted from clusters in both groups are shown. The display is presented in neurological convention (0 = R, 1 = L).

Thinning of sensorimotor cortices in children with Tourette syndrome

Elizabeth A. Bond3, Eric Kao1,6, June Yu1,6, Paul W Thompson1,6, Aliki Kassavetis1,6, Dongrong Tu1,6, Arthur W. Toga1,6, and Bradley S. Paterson1,6,7


Corrected for group differences by means of a linear regression analysis involving age, sex, and site of scanning. Differences between the two groups in grey matter thickness were revealed in sensorimotor cortices of both hemispheres, with a significant reduction in grey matter thickness in the children with Tourette syndrome. The grey matter thickness was thinnest in the frontal operculum and lateral orbitofrontal cortex, which is consistent with previous findings in adults.

Prefrontal and anterior cingulate cortex abnormalities in Tourette Syndrome: evidence from voxel-based morphometry and magnetization transfer imaging

Kirsten K. Meller-Vall1,5,7, John Kaufmann1,7, Julian Groen2,7, Rebeccah Burguiere4, and Thomas Pocock1,6.