Neurobiology & Functional Anatomy Part II

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Significant correlations between clinical scores and distinct cortical regions:

- Tic severity (BVTRS) ~ prefrontal cortex, insula
- OCD (Y-BOCS) ~ postcentral gyrus
- ADHD (ADHD symptom checklist): inattention ~ putamen L, hyperactivity ~ putamen R

FA: post- and precentral gyrus bilaterally, under the supplementary motor cortex L, negative correlation with tic severity
What do we hypothesize?

- Involvement of different neurotransmitter systems including
  - Dopamine
  - Serotonin
  - Glutamate
  - GABA
  - Endocannabinoids
  - Acetylcholine
  - Second messenger system
  - ...
Dopaminergic System

- Dopamine D2 receptor blocking drugs reduce tics
- Dopamine agonist can increase tics
  - increased expression or supersensitivity of postsynaptic dopamine D2 receptors?
  - phasic increased presynaptic dopamine release?

Increased ventral striatal monoaminergic innervation in Tourette syndrome

R.L. Albin, MD; R.A. Koeppe, PhD; N.I. Bohnen, MD, PhD; T.E. Nichols, PhD; P. Meyer, MD; K. Wernette, MSN; S. Minoshima, MD; PhD; M.R. Kilbourn, PhD; and K.A. Frey, MD, PhD

NEUROLOGY 2003;61:310–315

Increased binding sites using [11C]dihydrotetrabenazine (DTBZ) and PET in the right ventral striatum in TS compared to normal controls

→ abnormal ventral striatal dopaminergic innervation may underlie tics

Extrastriatal Dopaminergic Dysfunction

in Tourette Syndrome

Thomas D. L. Steeves, Ji Hyun Ko, David M. Kideckel, Pablo Rusjan, Sylvain Houle, Paul Sandor, Anthony E. Lang, Antonio P. Strafella

ANN NEUROL 2010;67:170–181

In contrast to healthy controls no significant DA release in TS in thalamus bilaterally.

→ Extrastriatal dopaminergic abnormalities at baseline

→ hyperexcitability of the thalamocortical circuits