

Is there a gender difference of somatostatin-receptor density in the human brain?

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Abstract

Animal experiments and observations in human brains have convincingly shown that sexual differentiation not only concerns the genitalia but also the brain. This has been investigated also in the light of a possible explanation of a presumed biological aetiology of transsexuality. The volume of the central subdivision of the bed nucleus of the stria terminalis, a brain area that is essential for sexual behaviour, has been reported to be larger in men than in women. Additionally, the number of somatostatin expressing neurons in this region was shown to be higher in men than in women. As neuronal production of somatostatin is involved the idea is striking whether somatostatin-receptor density in the cortex of cerebral hemispheres might be related to gender identity. We investigated *in vivo* the density of somatostatin-receptors in selected regions of the human brain in both sexes by means of receptor scintigraphy.

Basal ganglia tracer uptake of ¹¹¹In-Pentreotide was equally low in both genders at 0,80% +/- 0,26 (related to tracer uptake of the whole brain layer). Temporal cortex accumulated at 2,9% +/- 1,1 in men and at 2,3% +/- 0,76 in women. Frontal brain region had an uptake of 3,0% +/- 1,4 in male and of 2,5% +/- 1,3 in female. This shows a tendency in males for relatively augmented uptake indicating higher somatostatin receptor density in temporal and frontal cerebral cortex.

SIR – Animal experiments and observations in human brains have convincingly shown that sexual differentiation not only concerns the genitalia but also the brain. This has been investigated also in the light of a possible explanation of a presumed biological aetiology of transsexuality. The volume of the central subdivision

of the bed nucleus of the stria terminalis, a brain area that is essential for sexual behaviour, has been reported to be larger in men than in women [1]. Additionally, the number of somatostatin expressing neurons in this region was shown to be about 70% higher in men than in women [2, 3]. Meanwhile, female-like

structural changes of specific brain regions were also found in homosexual and transsexual men [4]. This data marked a pathway for the understanding of neuroendocrinological sex differences. As neuronal production of somatostatin is involved, the idea is striking whether somatostatin-receptor density in the cortex of cerebral hemispheres might be related to gender identity. We investigated *in vivo* the density of somatostatin-receptors in selected regions of the human brain in both sexes by means of receptor scintigraphy.

We reevaluated the scintigraphic pattern in brain of ten men and 14 women who had been sent to our institute to practice Octreo-Scan for calculating an activity score on the orbitae because of Graves' ophthalmopathy in the years 1997–2000. Mean age was 47 yr. \pm 9 in men and 41 yr. \pm 10 in women. No patient presented any clinical apparent neurological disease, the serum levels of thyroxin were maintained in the normal range at time of investigation.

To evaluate somatostatin-receptor status SPECT of the head was performed with a double-headed rotating gamma camera 2–4 hours after i.v. application of 110 MBq ¹¹¹In-Pentetreotide. About five layers of the transversal oblique sections were added up to cover the basal ganglia region, using PICKER software provided by the manufacturer. Regions of interest (ROI) were calculated for basal ganglia, frontal and temporal brain cortex of the same size (on right and left side). The tracer uptake of the whole brain layer was measured as well.

All values of brain regions were calculated as a mean of both sides as marked asymmetry was observed and regions were related to whole brain layer. Basal ganglia tracer uptake was equally low in both genders at 0,80% \pm 0,26. Temporal cortex accumulated at 2,9% \pm 1,1 in men and at 2,3% \pm 0,76 in women. Frontal brain region had an uptake of 3,0% \pm 1,4 in male and of 2,5% \pm 1,3 in female. By Fisher's *t-test* no statistical significant difference was found between both sexes or different cortical regions, probably due to the small number of persons. Anyhow, there was a tendency in males for relatively augmented uptake indicating higher somatostatin receptor density in temporal and frontal cerebral cortex. To be compared with, sex differences in the distribution of androgen receptors in human brain structures have already been reported [5]. Further investigation e.g. by means of immune-histochemistry or PCR of cerebral cortex is encouraged to clarify a possible gender difference on the axis of somatostatin and its receptor or receptor subtypes in human brain.

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