Brain Activation in Response to Visually Evoked Sexual Arousal In Male-to-Female Transsexuals: 3.0 Tesla Functional MRI

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Synopsis: Transsexualism is a type of the gender identity disorder and it is defined by a desire to be accepted as a member of the opposite sex. Neuroimaging studies for the male-to-female (MTF) transsexuals with a sex reassignment surgery and hormone supplementary therapy have not yet been reported. This study utilized a functional magnetic resonance imaging (fMRI) to contrast the differential brain activation patterns in response to visual stimulation with each male and female erotic nude pictures in MTF transsexuals.

Methods: A total of 9 sex-reassigned MTF transsexuals (mean age: 39.7±6.3) were recruited through a questionnaire and an interview by a psychiatrist. All of them are homosexual and right handed subjects with no history of neurological or psychiatric illness. The subjects had undergone sex reassignment surgery 2-15 years prior to this study, and they have been treated with hormone supplementary therapy since the sex reassignment surgery. The fMRI data were analyzed by post-processing and data analysis using Statistical Parametric Mapping (SPM02, Wellcome Department of Cognitive Neurology, University College London, London, UK).

Results and Discussions: The sex hormone levels of the postoperative MTF transsexuals were in the normal range of healthy heterosexual females. The brain areas, which were predominantly activated by viewing the male nude pictures over the female pictures, included the cerebellum, hippocampus, putamen, anterior cingulate gyrus, head of caudate nucleus, amygdala, midbrain, thalamus, insula, and body of caudate nucleus. On the other hand, the predominant brain activation induced by viewing the female nude pictures was observed in the hypothalamus and the septal area (Table 1, Fig.1). We utilized 3.0 Tesla fMRI to contrast the differential brain activation patterns evoked by viewing a string of male or female nude pictures, and further to clarify the gender identity for the postoperative MTF transsexuals in terms of functional neuroanatomy associated with their sexual arousal.

Conclusions: Our findings potentially suggest that the distinct brain activation patterns associated with visual sexual stimulation in postoperative MTF transsexuals reflect their sexual orientation to male. This study would be helpful to provide valuable information on the functional neuroanatomy for the assessment of patients with gender identity disorders and for the preclinical planning of a sex reassignment surgery as well.

Reference: 1. Park, K. et al, Urology 2001;57:1189-1194. 2. Karama, S, et al, Hum. Brain. Mapp. 2002;16:1-13.

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Table 1. Differential brain activities (peak *t*-value) associated with sexual arousal between male and female erotic nude pictures using two sample *t*-test in MTF transsexuals (p<0.05)

Brain areas	t-value	MNI coordinates		
		x	y	z
Males over Females [a]				
Cerebellum	5.7	12	-58	-42
Hippocampus	4.08	14	-38	9
Putamen	3.84	21	8	8
Anterior cingulate gyrus	3.68	-10	26	32
Head of caudate nucleus	3.67	16	11	8
Amygdala	3.57	-22	-4	-10
Midbrain	3.46	-14	-20	-20
Thalamus	3.43	-4	-10	6
Insula	3.25	42	-8	-2
Body of caudate nucleus	2.09	-19	-10	22
Females over Males [b]				
Hypothalamus	1.91	-2	11	-6
Septal area	1.9	-2	5	-9

[a] predominant activity in favor of male erotic nude pictures over female pictures
[b] predominant activity in favor of female erotic nude pictures over male pictures

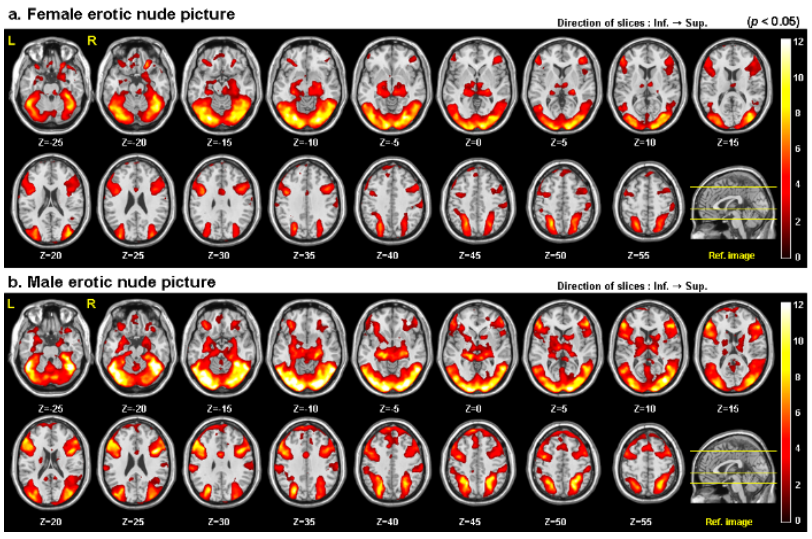

Fig. 1. A series of the axial fMR images activated by sexual visual stimulation with male (a) and female (b) erotic nude pictures in MTF transsexuals. Color-coded pixels on the activation maps were scaled to the range between the cutoff-threshold and the highest *t*-score (P < 0.05).