

Neuroanatomical Difference between Healthy Volunteers and Depressive Patients during Sexual Stimulation: functional MRI

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Synopsis

There is growing interest in the role of sexual dysfunction in the pathogenesis of major depressive disorder. We predicted that depressive patients respond to erotic stimulation in brain differently from healthy volunteers, resulting in differential neuroanatomical activation patterns. In this study, the neuroanatomical differences were evaluated by visually evoked sexual stimulation using BOLD functional magnetic resonance imaging (fMRI).

Introduction

It is well known that some of the depressed patients have difficulties in sexual function including loss of sexual interest and diminished ability to maintain sexual arousal or to achieve orgasm during an episode of major depression. The sexual dysfunction in depressive patients may be related to the neural pathogenesis. However, a few clinical studies on functional neuroanatomy underlying sexual dysfunction in depressive patients have been reported. In this study, we evaluated the brain centers associated with visual sexual arousal in healthy and depressive males using fMRI.

Subjects & Methods

Together with ten gender- and age-matched healthy volunteers (age 21-55: mean 32.5 years), ten depressive males (age 23-51: mean 34.4 years, mean BDI score of 39.6±5.9, mean HAMD-17 score of 33.5±6.0) with sexual dysfunction underwent fMRI with 1.5T MR scanner (GE Signa Horizon). The fMRI data were obtained from 7 oblique planes using gradient-echo EPI (α /TR/TE=90°/6000ms/50ms). The visual stimulation paradigm began with a 60 sec black screen, a 150sec neutral stimulation with a documentary video film, 30sec black screen, a 150sec sexual stimulation with an erotic video film, and 30sec black screen. The brain activation maps and their quantification were analyzed with the help of SPM99 and FALBA programs. The perceived sexual arousal responses were assessed using a 5-point scale: 1, no change; 2, minimal increase; 3, moderate increase; 4, large increase; and 5, maximal increase.

Results & Discussion

All of 10 healthy volunteers were sexually aroused by visual stimulation, giving a mean score of 3.9±0.8 on the 5-point scale, while the depressive patients showed a mean score of 1.8±0.6. None of both cases were sexually aroused by the documentary film.

In both the depressive subjects and healthy volunteers, the cerebral activation areas induced by sexual stimulation were hypothalamus, anterior cingulate gyrus, medial & middle frontal gyri, inferior & superior temporal gyri, inferior occipital gyrus, postcentral gyrus, cingulate, thalamus, and caudate nucleus. However, the level of activation in depressive patients was significantly less than in healthy volunteers, especially in hypothalamus, thalamus, caudate nucleus, and inferior and superior temporal gyri (Table 1). Especially, the hypothalamus is arguably the one having most frequently been claimed to play a pivotal role in regulation of sexual behavior and physiological arousal. Also, the thalamus would be implicated in cognition dimension of sexual arousal as a neural hub that is capable of communication with other brain areas. Interestingly, the depressive patients showed greater activation than did normal volunteers in the regions of middle and superior frontal gyri (Table 1). These areas are known as cerebral cortices associated with major depressive disorder.

Conclusion

These results demonstrate the functional neuroanatomy of the brain associated with sexual dysfunction in depressive patients. In order to clarify our findings with respect to neuroscience, further studies including other disorders with sexual dysfunction, depressive patients without sexual dysfunction, and after-treatment response would be needed.

References

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Table 1. Differential activation regions during sexual stimulation between healthy volunteers and depressive patients.

Brain region		Side	Talairach coordinates			t-scores (P<0.01)
Healthy > Depression*						
Temporal lobe	Inferior temporal gyrus	R	52	-56	-12	8.96
	Superior temporal gyrus	L	62	-30	10	3.94
Limbic system	Hypothalamus	L	8	6	-4	4.38
	Thalamus	R	4	-24	18	4.32
	Caudate nucleus	R	20	-14	26	3.82
Healthy < Depression**						
Frontal lobe	Middle frontal gyrus	L	-34	60	-6	4.94
	Superior frontal gyrus	L	34	64	4	5.36

* Healthy volunteers show greater activation than does depressive patients.

** Depressive patients show greater activation than does healthy volunteers.

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