Brain activation patterns and brain volume changes associated with explicit retrieval of unpleasant and neutral words in patients with obsessive compulsive disorder

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\textbf{Purpose}

Obsessive compulsive disorder (OCD) is an anxiety disorder characterized by intrusive thoughts that produce uneasiness, apprehension, fear, or worry, by repetitive behaviors aimed at reducing the associated anxiety, or by a combination of such obsessions and compulsions. The purpose of this study was to compare the differential of brain activation patterns and brain volume changes associated with the explicit retrieval of unpleasant and neutral words during conceptual processing between the healthy controls and patients with OCD by using a 3 Tesla function magnetic resonance imaging (fMRI)

\textbf{Subjects and Methods}

A total of 14 patients with obsessive compulsive disorder (mean age = 29.0±12.26 years) and 14 healthy controls (mean age = 32.9±6.17 years) who had no history of neurological or psychiatric illness underwent the functional MRI on a 3.0 Tesla Magneton Verio MR Scanner (Siemens Medical Solutions, Germany). The stimulation paradigm consisted of 5 times rest condition, 2 times encoding of two-syllable words and 2 times explicit retrieval of previously learned words, each lasted for 14, 18, and 18 seconds, respectively. All subjects were performed twice stimulation paradigm consisting of unpleasant and neutral words, respectively. Six different words were presented for 3 seconds each in the encoding and retrieval task. In the retrieval task, different and same words used in the encoding task were presented. The brain activation maps and volume changes were analyzed by SPM8 program.

\textbf{Results and Discussion}

The predominant activation areas observed in patients with OCD during explicit retrieval task with neutral words included the middle and inferior frontal gyri, superior temporal gyrus, inferior parietal gyrus and calcarine gyrus (p<0.005). In explicit retrieval task with unpleasant words, patients with OCD showed significantly increased activities in the superior, middle and inferior frontal gyri, superior and inferior temporal gyri, fusiform gyrus, superior parietal gyrus, calcarine gyrus, superior and middle occipital gyri (p<0.005), (refer to Fig.1 and Table 1). The patients showed higher number of activation areas during the explicit retrieval of unpleasant words over neutral. Patients with OCD showed significantly reduced volumes in the calcarine gyrus, middle frontal gyrus and fusiform gyrus (figure 2).

\textbf{Conclusion}

Our findings indicate that there are neurofunctional and neuroanatomical dissociation between patients with OCD and healthy controls in explicit memory retrieval with unpleasant and neutral word.

\textbf{Reference}

1. Elman et al., Neuroimage 2011 May 1 ;56(1) : 345-353
2. Kim MS et al., J Psychiatr Res 2006 sep ; 40(6) : 541-549

\textbf{Acknowledgement}

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\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|}
\hline
\textbf{Anatomical areas} & \textbf{Abbr.} & \textbf{BA*} & \textbf{MNI coordinate} & \textbf{t-value} & \textbf{RL} \\
\hline
\textbf{Neutral word} & & & & & \\
Middle frontal gyrus & MFG & 45 & -44 & 10 & 3.06 & L \\
Inferior frontal gyrus & IFG & 44 & -39 & 10 & 2.83 & R \\
Superior temporal gyrus & STG & 22 & -54 & -26 & 8 & 2.84 & L \\
Inferior parietal gyrus & IPG & 40 & -52 & -46 & 35 & 2.93 & L \\
Calcarine gyrus & CeG & 19 & -24 & -74 & 12 & 3.28 & R \\
\textbf{Unpleasant word} & & & & & \\
Superior frontal gyrus & SFG & 8 & -18 & 26 & 62 & 3.02 & L \\
Middle frontal gyrus & MFG & 45 & -28 & 42 & 8 & 2.85 & L \\
Inferior frontal gyrus & IFG & 45 & -54 & 32 & 18 & 3.19 & R \\
Superior temporal gyrus & STG & 38 & -36 & 8 & 29 & 4.25 & L \\
Inferior temporal gyrus & ITG & 37 & -40 & -54 & 4 & 3.29 & R \\
Fusiform gyrus & FuG & 37 & -40 & -50 & 12 & 3.58 & L \\
Superior parietal gyrus & SFG & 40 & -38 & -58 & 64 & 2.80 & R \\
Superior Occipital gyrus & SOG & 19 & -18 & -82 & 12 & 3.72 & L \\
Middle Occipital gyrus & MOG & 19 & -28 & -78 & 2 & 3.27 & L \\
Calcarine gyrus & CeG & 19 & -22 & -78 & 14 & 3.17 & R \\
\hline
\end{tabular}
\end{table}

*BA indicates Brodmann’s area.

Figure 1. Differential brain activation patterns associated with neutral words(a) and unpleasant words (b) in patients with OCD over healthy controls: two sample t-test(p<0.005).

Figure 2. Brain areas showing significant volume reduction in patients with OCD over the healthy controls (p<0.005).