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Transauricular vagus nerve stimulation at auricular acupoints Kindey (CO10), Yidan (CO11), Liver (CO12) and Shenmen (TF4) can induce auditory and limbic cortices activation measured by fMRI.

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Abstract

The purpose of this study was to explore the central mechanism of transauricular vagus nerve **stimulation** (taVNS) to human by fMRI and to find a suitable taVNS site for potential tinnitus treatment. 24 healthy subjects aged between 28 and 38 years were enrolled in the experiment. 8 subjects were stimulated in the **auricular** acupoints Kindey (CO10), Yidan (CO11), Liver (CO12) and Shenmen (TF4) in the left ear, 8 subjects were stimulated at the anterior wall of the auditory canal and left lower limb as an anterior **stimulation** group; 8 persons who were arranged in a sham group received taVNS at the left ear lobe and tail of the helix. **Functional magnetic resonance** imaging (fMRI) data from the cortices was collected and an Alphasim analysis was performed. We found that taVNS at **auricular** acupoints CO10-12, TF4 can instantly and effectively generate blood oxygenation level dependent (BOLD) signal changes in the prefrontal, auditory and limbic cortices of healthy subjects by fMRI. When comparing the acupoints group and the sham group in the left brain, the signals from the prefrontal cortex, the auditory ascending pathway including superior temporal gyrus, middle temporal gyrus, thalamus and limbic system regions such as putamen, caudate, posterior cingulate cortex, amygdala and parahippocampal gyrus were increased under our **stimulation**. The difference of the BOLD signal in the left brain between acupoints group and anterior group was in the superior temporal gyrus. We could also find signal differences in several regions of right brain among the groups. In conclusion, taVNS at acupoints CO10-12, TF4 could activate the prefrontal, auditory and limbic cortices of healthy brain and this scheme could be a promising tool for tinnitus treatment.

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KEYWORDS: Acupoints; BOLD; Transauricular vagus nerve **stimulation**; fMRI

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