Brain activation induced by acupoint stimulation in the Yin meridian: fMRI study

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Introduction:
Interest in understanding the principles underpinning acupuncture using fMRI techniques has been growing rapidly. Recent advances in imaging technology enables us to observe the anatomy and physiological functions involved during acupuncture in humans. According to Chinese medical thinking, the pericardium meridian is a Yin meridian. The heart and pericardium are associated with the brain and its functions, so they constitute a functional unit.¹ Notice that Yang meridians pass through the brain while Yin meridians do not. Thus, it is believed that stimulation of Yin meridian acupoints would not lead to brain activation. We postulate that 1) acupoint stimulation of PE 6 in the pericardium meridian would induce brain activation, and further that 2) brain activation induced by manual acupuncture would be stronger. The latter conjecture arises from the general belief that “deqi” can be attained more readily and effectively through manual acupuncture. 14 normal right handed male subjects (age 18-25 year old) were studied using fMRI with manual acupuncture and electrical acupuncture, respectively. Brain activation was observed in the superior temporal gyrus and superior longitudinal fasciculus bilaterally as well as in the medial areas of the frontal gyrus. We successfully observed brain activation following acupoint stimulation in PE6 of the pericardium meridian. Moreover, brain activation induced by manual acupuncture is significantly stronger.

Materials and methods:
MRT was performed on a Philips Achiva 3 T whole body MRI at the Jockey Club MRI Centre, Hong Kong with a 8 channel quadrature birdcage head coil. A sagittal spin echo localizer image was acquired initially. fMRI was performed in the transverse plane, parallel to the anterior–posterior commissura (AC-PC) line. A 34-slice set of fMRI images was acquired with the following scan parameters: TR = 3000 ms; TE = 30 ms; flip angle = 90°; matrix = 64 X 64; field of view = 23 cm X 23 cm; slice thickness = 4.0 mm, without inter-slice gap. Anatomical whole brain MRI was acquired using a T1-weighted turbo spin echo (TSE) sequence with TR 2000 ms and TE 10 ms with IR delay 800 ms.

Results:
Figure 2 illustrates fMRI images of 14 normal subjects: A refers to manual acupuncture, B refers to electrical acupuncture, and C refers to comparison of manual acupuncture vs. electrical acupuncture stimulation. Brain activation was found in the superior temporal gyrus and superior longitudinal fasciculus bilaterally. Also, activation was observed in the medial areas of the frontal gyrus (BA 8 and 32). Moreover, activation induced by manual acupuncture was significantly stronger than those elicited by electrical acupuncture.

Discussion:
The superior longitudinal fasciculus comprises numerous pathways among the frontal pole, the occipital lobe, and the posterior part of the temporal lobe. Activation of these regions following stimulation of PE 6 suggests that PE 6 may be related to mental disorder, psychiatric diseases, agitation and insomnia, and epilepsy. In particular, the observed activation of the medial frontal cortex corroborates the possible link between PE6 and mental disorder.

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