P - 32

VISUAL STIMULATION IN THE BRAIN USING SPECT IMAGING AND FMRI

MyungJa Chu[3], Tae Kim[1], TaeSuk Suh[1], HyoungKoo Lee[1], BoYoung Choe[1],
SooKyo Chung[2], SeungAi Shin[3], KyungSub Shinn[1]
[1]Dept. Of Biomedical Engineering, Catholic University, Medical College
[2]Dept. Of Nuclear Medicine, Kangnam St.Mary's Hospital
[3]Dept. Of Physics, Ewha Womans' University,

INTRODUCTION

Functional imaging primarily deals with the structural correlation of brain activity accor ding to the different stimulation in various regions of brain. There is no imaging techniq ue to measure the brain activity directly. Therefore, many techniques have been proposed for the analysis of functional brain images.

Functional magnetic resonance imaging(fMRI) is to observe focal alteration in image in tensity caused by blood oxygenation-level-dependent(BOLD) effect that is decreased param agnetic deoxyhemoglobin concentration in consequence of enhanced cerebral blood flow(C BF) without corresponding changes in oxygen consumption.

Functional SPECT Imaging shows distribution of radiopharmaceutical due to the region al Cerebral Blood Flow (rCBF) in the brain.

In the activation region, the regional concentration of deoxyhemoglobin decrease for f MRI and the regional concentration of radiopharmaceutical increase for SPECT.

The purpose of this study is to compare results of two modalities and to evaluate usef ulness according to different physiological changes through visual stimulation.

METHOD

Ten healthy human volunteers participated in this study. No evidence of neurologic, p sychiatric, or other illness was obtained by historical, physical examination.

All of the fMRI were acquired on a 1.5T MR system (Vision-Plus, Siemens, Germany, Erlangen) with EPI sequence (TR/TE=0.96ms/66ms, thickness:6mm, matrix:128*128, FO V:210mm) and used with standard head coil during supervised visual stimulation in occipi tal lobe. The red flicker with frequency 8Hz was used for visual stimulator. Visual activa tion was subsequent 2 cycles of 20s rest (20series) and 20s stimulation (20series).

SPECT brain imaging examination was underwent on two separate day one week apart. T he volunteers received an injection of about 740MBq Tc99m-HMPAO per antecubital vein on each day. On one day volunteers was studied under visual stimulation conditions and on the other day under visual deprivation conditions. Images was acquired using E-CAM (Illinois, USA. The same stimulator as fMRI was used

RESULTS

The region of rCBF increase was observed during activation. The difference between st imulation and deprivation was highly significant in SPECT images. (Fig1)

The BOLD fMRI was successfully acquired by stimulus in all of volunteers.(Fig2) In c omparison to two modalities, the response to stimulus happened on the same regions.

DISCUSSION

The results of SPECT image suggest that the distribution of Tc99m-HMPAO is able to detect rCBF increases resulting from physiologic stimulus. Because SPECT has given inv estigators a powerful physiologic imaging modality, SPECT has been used in many functi onal studies despite of its low resolution.

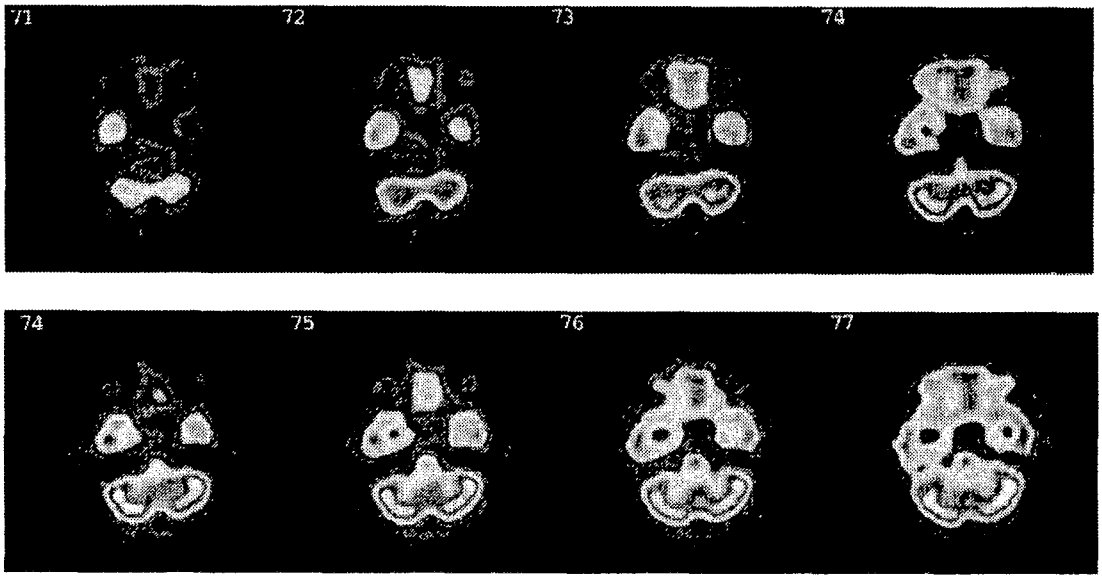
On the contrary, fMRI has relatively high resolution, no harm in radiation and availabi

lity on repetitive examination. In addition, MR images can present brain anatomy.
Functional imaging which was analyzed more exactly by many imaging modalities can be useful in surgical treatment of brain region. In many cases, the accurate pre surgical loc alization of functional region is allowed to evaluate surgical feasibility and approach to re move diseases or dysfunctional tissues

CONCLUSION

Changes in the distribution of 99mTC-HMPAO to reflect physiologic changes in region al cerebral blood flow(rCBF) was evaluated using photic stimulation, a procedure known t o increase rCBF in the striate cortex.

This new MRI technique(fMRI) produces images of activated brain regions by detecting the indirect effects of neural activity on local blood volume, flow, and oxygen saturation, and it is a promising new tool for furthering the understanding of the relationships amo ng brain structure, function, and pathology.



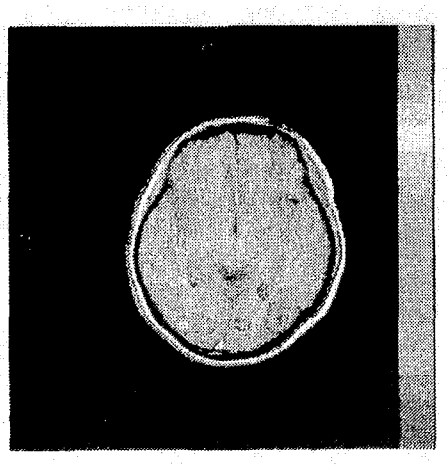


Fig.1. SPECT images
(upper) visual deprivation
(lower) visual stimulation
Fig.2. (left) functional MR imaging
by visual stimulation