

Signal change in BA17, 18 and 19: A comparative study of normal, glaucoma suspects and POAG patients

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Abstract. Magnetic resonance signal change is expected to be different between normal, glaucoma suspect (GS) and Primary Open Angle Glaucoma (POAG) subjects. Functional magnetic resonance imaging (fMRI) technique was employed to investigate the differences. This multiple subject studies were carried out to characterize the percentage of signal change (PSC) in Brodmann Area (BA) 17, 18 and 19 of the visual cortex. The block designed fMRI was implemented. The subjects were requested to focus on the black and white checkerboard stimulus of the visual world (A, B and CD), visual field (EF) and visual area (G). The data were analysed using Statistical Parametric Mapping (SPM8) via Matlab platform. results showed that GS subjects have the highest PSC, followed by normal and POAG subjects. However, no significant difference was observed in PSC between BA17, 18 and 19 for normal, GS and POAG groups with $p = 0.0869$, $p = 0.0688$ and $p = 0.2690$, respectively. In conclusion, none of the BA can be suggested to be the most dominant area in responding to the visual stimuli used in this study.

1. Introduction

Early diagnosis is important as a prevention and early treatment for glaucoma patient. One of the ways to evaluate glaucoma is by using functional magnetic resonance imaging (fMRI) technique. fMRI has been widely used to investigate the brain function and its abnormalities since 1990s. It is incredibly safe, non-invasive, no ionizing radiation and radioactive source involved as well as able to fabricate prompt and confidence results [1].

Percentage of Signal Change (PSC) analysis is very rarely used in evaluating the results of previous studies. The value of the signal change is measured by the intensity value rather than the number of activated voxel. Since early 90s when the fMRI scans and analysis were introduced, the assessment intensity signal cannot be determined directly using the session scan. However, the intensity changes are compared to the baseline which can be accurately evaluated through the effects of PSC[2].

PSC is the magnetic resonance signal change ratio in the brain while it is working, against the average change in magnetic resonance signal absorbed from the overall measurement. The PSC value is within 0.5% to 3% [3]. PSC is interpreted as the ratio of the average ratio of change in a trial to the average overall signal measurement of brain activity in fMRI study [4]. If referred to the definition, researchers are compulsory to select and designate areas to compare. Therefore, this study has selected BA17, 18 and 19 for PSC assessment analysis. Earlier studies using PSC analysis were conducted on fingertip study and for various conditions [4] as well as distance temporal sampling [5].

