



CHAPTER II

REVIEW OF RELATED LITERATURES

Although SPM program has increasingly been used in neuroactivation study and epilepsy, only a limited number of theoretical and simulation studies have been conducted as the followings:

Lahort, et al [3] studied the influence of the study size and the activation foci characteristics (dimension and activation level) in SPECT neuroactivation studies on the detection of the foci following statistical analysis with statistical parametric mapping. A simulation was performed with the use of the Hoffman brain phantom. For selected combination of study size and foci diameters, minimal activation levels required for detection were determined. For the simulation he proposed the number of 15 subjects as a guideline for the size of groups in SPECT activation studies where small activation intensities $<5\%$ are expected. For more robust activation levels around 10%, the group size can be lowered to minimally 10. Furthermore, the effect of a varying p-value on the size was found that for the large size, height threshold has to be lowered to about 0.01 and the threshold has to be increased for small size .

Stamatakis, et al [4] studied the height and size and defined the best transformation method for the best size detection. Two simulations

were performed. The first determined the minimum hypoperfusion depth detectable using SPM program by altering mean local intensity while keeping the size of lesion constant. The second simulation determined the cluster size that SPM can detect by keeping the mean intensity of the lesion constant while altering its size. From two studies, he reported that the large lesion (3976 voxels) was detected when its intensity was 20 % or more and 30 % or more for small lesion (20 voxels). Besides, he found that gray matter threshold setting could have an effect on the result, especially if the volume of lesion detected was large. He also reported suitable gray matter threshold adjustment was set to below 0.5 level .

Schoenahl, et al [5] studied the sensitivity and specificity of SPM analysis. Neuroactivation studies were performed with respect to design parameters such as size, localization and intensity. The experiment was done by using five sphere foci which had 6 mm and 8 mm diameters located in digital Hoffman 3D brain phantom. The five foci were defined in different brain region and different activation levels. Fifteen data sets were generated. There was no cluster detected with this design when using the smallest sphere of 6mm diameter. He also found that the depth of spheres within brain structures had impact on detection sensitivity- spheres located in the peripheral structures were detected more efficiently.

However, several studies in the literature compared activation study to normal brain data, which is not used in epilepsy studies.