Executive Summary

Diagnostic usefulness of brain FDG-PET for Alzheimer's dementia

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□ Introduction

: As aging population is rapidly increasing, it is estimated that prevalence of dementia among older adults would be doubled every twenty years and number of patients would increase by one million until 2027. Dementia would lead to a burden of care on family members, care-givers, and even societies due to social and economic cost. In addition, early diagnosis of the disease is essential to improve quality of life of patients and their family, and to reduce cost of patient care and treatment for disease. Therefore, early diagnosis of dementia is important step to prevent further worsening of disease and improve quality of life of dementia patients and their family. In this study, we assessed diagnostic accuracy of

FDG-PET in evaluation of dementia, which known as a tool for detecting reduced glucose metabolism in patient's brain even before the development of dementia symptoms.

□ Systematic review of diagnostic accuracy of FDG-PET in dementia and Alzheimer's disease

To evaluate diagnostic accuracy in early detection of dementia and Alzheimer's disease, we conducted systematic reviews of published articles, and identified 9 cross-sectional studies and 13 delayed cross-sectional studies. Meta-analysis of 9 cross-sectional studies resulted in a pooled sensitivity (SN) of 0.61 (95% CI: 0.42-0.79), a pooled specificity (SP) of 0.81 (95% CI: 0.55-1.07), a positive likelihood ratio of 3.50 (95% CI: 0 - 7.43), and a negative likelihood ratio of 0.42 (95% CI: 0.23-0.62). In 13 delayed cross-section studies, it resulted in a pooled SN of 0.81 (95% CI: 0.72-0.91), and a pooled SP of 0.78 (95% CI: 0.65-0.92). With subgroup analyses in amnestic mild cognitive impairment (MCI) patients, the result suggested a pooled SN of 0.92 (95% CI: 0.75-1.00), a pooled SP of 0.88 (95% CI: 0.77-0.98), a positive likelihood ratio of 7.49 (95% CI: 1.35-13.62), and a negative likelihood ratio of 0.09 (95% CI: 0-0.29). These results indicate that FDG-PET among amnestic MCI patients was most accurate in the aspects of pooled SN and SP in delayed cross-sectional studies.

□ Retrospective cohort study using medical charts of patients to evaluate diagnostic accuracy of FDG-PET in dementia and Alzheimer's disease:

We collected information from medical charts of amnestic MCI patients in a study site and followed them up for two years retrospectively, then compared diagnostic accuracy of FDG-PET with MRI. In qualitative assessment of dementia, MRI resulted in SN of 0.37(95% CI: 0.19-0.59), SP of 0.69(95% CI: 0.52-0.81), and accuracy of 0.57(95% CI: 0.44-0.71), AUC(area under the curve) 0.53(95% CI: 0.39-0.66) whereas FDG-PET showed SN of 0.79(95% CI: 0.19-0.59), SP of 0.60(95% CI: 0.44-0.74), and accuracy of 0.67(95% CI: 0.54-0.79), and AUC 0.68(95% CI: 0.56-0.79). In quantitative assessment of dementia, MRI demonstrated in parahippo campal gyrus region, SN 0.74(95% CI: 0.51-0.88), SP 0.54 (95% CI: 0.38-0.70), accuracy 0.61(95% CI: 0.48-0.74), AUC 0.62(95% CI: 0.54-0.70). In FDG-PET qualitative assessment of dementia, we found AUC of 0.62(95% CI: 0.53-0.70) in precuneus region which was one of ROIs generated by using cutoff of p<0.001 among non-demented normal older adults, SN of 0.68 (95% CI: 0.46-0.84), SP of 0.63 (95% CI: 0.46-0.77), accuracy of 0.65(95% CI: 0.52-0.78).

□ Conclusions

In conclusion, we found that the pooled estimate of SN and SP of FDG-PET was the highest among amnestic MCI patients in the systematic analysis. Therefore, it will be efficient to apply FDG-PET test to population diagnosed as amnestic MCI by neuropsychological tests in the aspect of clinical utility. In outcome analysis of the retrospective cohort, we could not find significant difference of diagnostic accuracy between MRI and FDG-PET, thus these two tests may complement each other depending on characteristics of target population.

Key Words: dementia, mild cognitive impairment, Alzheimer's disease, 18F-fludeoxyglucose(FDG) Positron emission tomography(PET), diagnostic accuracy