Brain Atrophy and Regional Cerebral Glucose Metaborism in Senile Dementia

IV.13. Brain Atrophy and Regional Cerebral Glucose Metaborism in Senile Dementia

Kinomura S., Yamada K., Yoshioka S., Yamaguchi T., Matsui H., Kawashima R., Hatazawa J. , Matsuzawa T.** and Fukuda H.*

*Department of Radiology and Nuclear Medicin,The Research Institute for Tuberculosis and Cancer,Tohoku University Cyclotoron and Radioisotope Center ,Tohoku University**
*Morinosato Hospital,The Public Health Research Center***

Intoroduction

The imaging studies of senile dementia have been reported mainly from two approachies. From the functional approach with Positoron Emission Tomography (PET) or Single Photon Emission Tomography, the decreased metabolism has been described in the demented brain, especially in the association cortex[1,2]. From the morphological approach with X-ray computed tomography (X-CT) or Magnetic Resonance Imaging, characteristic atrophy of the amygdala and the hippocampus has been reported in the demented brain[3,4]. In the present study, we tried to evaluate relationship between deletion of brain metabolism and brain atrophy in senile dementia.

Materials and Methods

23 patients with senile dementia (15 with multi infarct type dementia ; MID, 8 with Senile dementia of Altzheimer type ; SDAT) were selected for measurement of regional cerebral metabolc rate of glucose (regional CMRglc) with PET,and measurement of brain atrophy with X-CT. Each patient was injected with ^{18}F-fluolodeoxyglucose (^{18}FDG) intra-venously, and scanned after 40 minutes from injection over orbito- meatal line (OM line) using PT931/4 positoron camera (CTI, FWHM 6.1mm). CMRglc(mg/100 g/min) was calculated from brain radioactivity, plasma radioactivity, and plasma glucose concentration with the autoradiograph method modified by Phelps et.al[5]. Regional CMRglc was measured in 8 cortical regions of interest (ROIs) and 6 subcortical ROIs over 45 mm of OM line (Fig 1, 2). Indicators of brain atrophy (inferior horn volume of lateral ventricle/cranial space volume, sylvian fissure volume /cranial space volume,anterior horn volume of lateral

ventricle/cranial space volume) were calculated using X-CT.(Fig 3) The correlation analysis was performed between regional CMRglc and indicators of brain atrophy .

Result

Results of correlation analysis between regional CMRglc and indicators of brain atrophy were summarized in table 2, 3 (Table 1 : MID ,Table 2 : SDAT). The area which had significant negative correlation was expressed as *, which did not have was expressed as NS. Both in MID and SDAT the indicator of brain atrophy of inferior horn had significant negative correlation with regional CMRglu in more ROIs than indicators of Sylvian fissure and anterior horn.

Discussion

It has been believed that dilatation of inferior horn is caused by atrophy of amygdala and hippocampus. In our present work atrophy of amygdala and hippocampus had strong relationship with decrease of regional CMRglc in the global brain. A pathological study of SDAT revealed the existece of more neurofibrillary tangles in amygdala, hippocampus, and association cortex than in the other areas. And it reported the connection of amygdala and hippocampus with many cortical areas, especially association cortecs via cholinergic fiber[6]. We believe that our results support those histopathological findings in the living human brain.

References

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Table 1. Correlation between brain astrophy and regional CMRglc in MID

	Inferior Horn		Sylvian Fissure		Anterior Horn	
	L	R	L	R	L	R
Cortex R1	*	*	NS	*	NS	NS
R2	*	*	*	*	*	*
R3	*	*	*	*	NS	NS
R4	*	*	NS	NS	NS	NS
R Caudate N	NS	NS	NS	NS	NS	NS
R Putamen	*	*	NS	NS	NS	NS
R Thalamus	NS	NS	NS	NS	NS	NS
Cortex L1	*	*	NS	*	*	*
L2	*	*	NS	*	*	*
L3	*	*	NS	*	*	*
L4	*	*	NS	NS	*	NS
L Caudate N	*	*	NS	*	NS	NS
L Putamen	*	*	*	*	*	NS
L Thalamus	*	*	NS	NS	*	NS

* : p<0.05 NS : not significant
L : Left R : Right
Caudate N : Caudate Nucleus

Table 2. Correlation between brain astrophy and regional CMRglc in SDAT

	Inferior Horn		Sylvian Fissure		Anterior Horn	
	L	R	L	R	L	R
Cortex R1	*	NS	NS	NS	NS	NS
R2	*	*	NS	NS	NS	NS
R3	*	*	NS	NS	NS	NS
R4	*	*	NS	*	NS	NS
R Caudate N	NS	*	NS	*	NS	NS
R Putamen	*	*	NS	NS	NS	NS
R Thalamus	*	*	NS	NS	NS	NS
Cortex L1	*	*	NS	NS	NS	NS
L2	NS	NS	NS	NS	NS	NS
L3	*	*	NS	NS	NS	NS
L4	*	NS	NS	*	NS	NS
L Caudate N	*	*	NS	*	NS	NS
L Putamen	*	*	NS	NS	NS	NS
L Thalamus	*	*	NS	NS	NS	NS

* : p<0.05 NS : not significant
L : Left R : Right
Caudate N : Caudate Nucleus

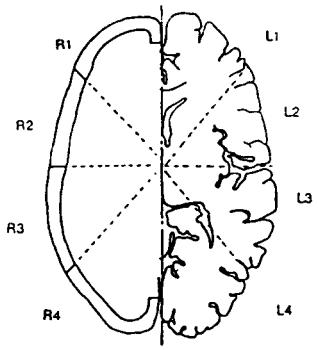

Fig. 1. Schema of cortical regions of interest L1-L4 ; Left hemisphere, R1-R4 : Right hemisphere.

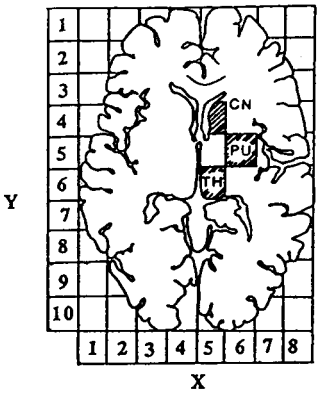

Fig. 2. Schema of subcortical regions of interest CN : caudate nucleus, PU : putamen, TH :thalamus.

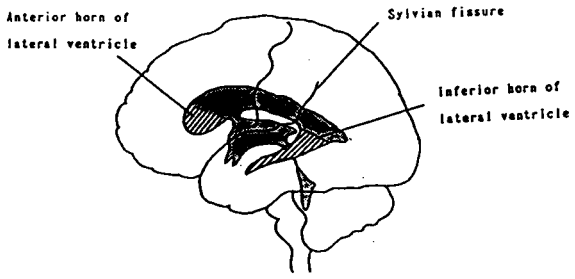

Fig. 3. Schematic model of atorophic indicator inferior horn volume of lateral ventricle/cranial space volume, Sylvian fissure volume / cranial space volume and anterior horn volume of lateral v entricle/cranial space volume were measured as atorophic indicators.