—Preliminary Note—

Cerebral blood flow and mental function in dementia

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Studies were made on geriatric patients with dementia in regard to the correlation between regional cerebral blood flow (rCBF) and mental function.

Forty-five dementia and 12 cerebrovascular disease patients were included in this study. According to Hachinski's ischemic score¹⁾, a particular attention was given to such features as abrupt onset, fluctuating course, disease recognition, emotional incontinence, history of hypertension and strokes, focal neurological signs and symptoms, and relative preservation of personality. Also, with careful reference to the findings on the brain CT scan, the cases were classified into two groups, cerebrovascular and senile dementias. The patients we studied were classified into three types, mild, moderate and severe dementias, according to the DR scale originated by Hasegawa²⁾. The rCBF was measured at 16 regions of each hemisphere by the intracarotid Xenon 133 method and ISI as flow parameter, placing the patients in supine position with the head tilted up at 30° and 5% CO₂ inhalation.

Simultaneously, the cerebral oxygen consumption (CMRO₂) was measured on the intracarotid and jugular blood samples.

The vascular response was studied after giving CO₂ inhalation.

The mean rCBF and CMRO₂ values in dementia and cerebrovascular patients are shown in **Table 1 A**. The values were higher in senile dementia group than in the cerebrovascular dementia group.

These were significantly decreased in the cerebrovascular dementia group than the cerebrovascular patients without mental deterioration, but significant decrease was noted among the senile dementia patients.

The rCBF pattern are shown in **Table 1 B**. As to the regional flow, the hypofrontal

Table 1 A Mean rCBF and CMRO₂ values in the patients studied

Classification	No. of patients	Average age	Mean rCBF ± S.D. (ml/100 g/min)	CMRO ₂ ± S.D. (ml/100 g/min)
Cerebrovascular dementia	37	64	27.7 ± 3.1	2.45 ± 0.35
Senile dementia	8	73	35.6 ± 3.0	2.96 ± 0.37
CVD without mental deterioration	12	67	46.5 ± 4.6	3.23 ± 0.61

Table 1 B The rCBF decrease noted in cerebrovascular and senile dementia

	No. Pts	Regions		
		No. focal	Frontal	Parietotemporal
Cerebrovascular dementia	37	15(40.5%)	15(40.5%)	7(19%)
Senile dementia	8	0	2(25%)	6(75%)

(The ischemic foci revealed over 20% below the mean rCBF)

pattern was noted in about 40% of the cerebrovascular dementia cases, while the flow was decreased at the parietotemporal region in about 75% of the senile dementia group. In the both dementia groups, the cerebral autoregulation was maintained comparatively well, without any significant difference.

Regarding the vascular response during CO₂ inhalation (**Fig. 1**), the flow increase was below the normal level among the cerebrovascular dementia patients ($p < 0.01$), but it was within the normal limits among the senile dementia group.

In senile dementia, the flow was not impaired strikingly.

However, in cerebrovascular dementia it was disturbed due to arterial stenosis and occlusion, and consequently the flow and oxygen consumption were decreased.

This fact can be considered as the cause of the dementia of the latter type.

The rCBF is controlled and regulated by cerebral metabolism. Therefore, cerebral atrophy was suggested as one of the causes for decreased of rCBF in dementia³⁾.

In senile dementia, mental processes are depressed not only because of cerebral atrophy but because of reduced activity of the diseased malfunctioning neurones. Since rCBF is coupled to cerebral metabolism, it may be reduced in dementia mainly because of its adaptation to the diminished metabolic rate of neurones affected by the degenerative process⁴⁾.

The cerebrovascular dementia was correlated with CBF, but the senile dementia was not⁵⁾.

The autoregulation was normally maintained in both groups.

The carbon dioxide response was normal in senile dementia, but it was less normal in the cerebrovascular dementia.

Fig. 1 The CO₂ reactivity following 5% CO₂ inhalation in the cerebrovascular and senile dementia groups. The flow increased in response to 5% CO₂ inhalation. The CO₂ reactivity was less in the cerebrovascular than in the senile dementia group.

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