

## Single lacunar brain infarction with transient signs versus those with long-lasting signs

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**Background.** In order to find out the difference between single brain lacunar infarctions with transient signs and those with long-lasting signs, cerebral blood flow studies and blood tests were performed.

**Methods.** Ten cases of single lacunar infarction with transient signs and 10 of single lacunar infarction with long-lasting signs were studied. Subcortical cystic infarctions with a diameter of less than 1.5 cm were defined as lacunar infarction. Episodes lasting less than 24 hours were classified as transient signs and those lasting 24 hours or more as long-lasting signs. Measurements: cerebral blood flows were measured using the stable xenon computed tomography method. The regional cerebral blood flows were measured before and 20 minutes after the intravenous injection of 17 mg/kg acetazolamide. Plasma fibrinopeptide A, platelet factor 4 and  $\beta$ -thromboglobulin concentrations were determined at the Special Reference Laboratories.

**Results.** Blood flows in the cerebral cortex and cerebral white matter contralateral to the lacunar infarction were lower in the group with long-lasting signs than in that with transient signs. Cerebrovascular acetazolamide reactivity in the cerebral cortex and white matter contralateral to the lacunar infarction were lower in the group with long-lasting signs than in that with transient signs. Plasma fibrinopeptide A, platelet factor 4 and  $\beta$ -thromboglobulin concentrations were higher in the long-lasting signs group than in that with transient signs.

**Conclusions.** There may be some differences in pathogenesis between single lacunar infarction with transient signs and those with long-lasting signs.

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**Key words:** Cerebral infarction - Cerebrovascular circulation - Acetazolamide - Fibrinopeptide A - Platelet factor 4 -  $\beta$ -thromboglobulin.

Cerebral infarction may be found on computed tomography (CT) or magnetic resonance imaging in patients with transient ischaemic attacks (TIA).<sup>1-5</sup> The subgroup of TIA patients with cerebral infarction

has been called as cerebral infarction with transient signs (CITS),<sup>6,7</sup> lacunar transient ischaemic attack syndrome (LTIAS),<sup>8</sup> or transient neurologic dysfunction in the setting of cerebral infarction.<sup>9</sup>

In order to find out the difference between single lacunar infarction with transient signs and those with long-lasting signs, cerebral blood flow studies and blood tests were performed in patients with single lacunar infarction.

### Materials and methods

Ten cases of single lacunar infarction with transient signs and 10 of single lacunar infarction with long-lasting signs were studied after getting the patients' informed consent (Table I). Subcortical cystic infarctions with a diameter of less than 1.5 cm were defined as lacunar infarction.<sup>4</sup>

Episodes lasting less than 24 hours were classified as transient signs and those lasting 24 hours or more as long-lasting signs.

Cerebral blood flows were measured using the stable xenon CT method.<sup>10-13</sup> Serial CTs were taken once before inhalation, three times during inha-

TABLE I.—Clinical profiles of the two groups.

Parameters	Lacunar infarction with transient signs group	Lacunar infarction with long-lasting signs group
No. of cases	10	10
Age (years)	63.4±5.4	61.5±7.3
Male:female	6:4	6:4
Diameter of lacuna (cm)	1.1	1.2
Hypertension	7	8
Diabetes mellitus	2	3
Hyperlipidaemia	6	5

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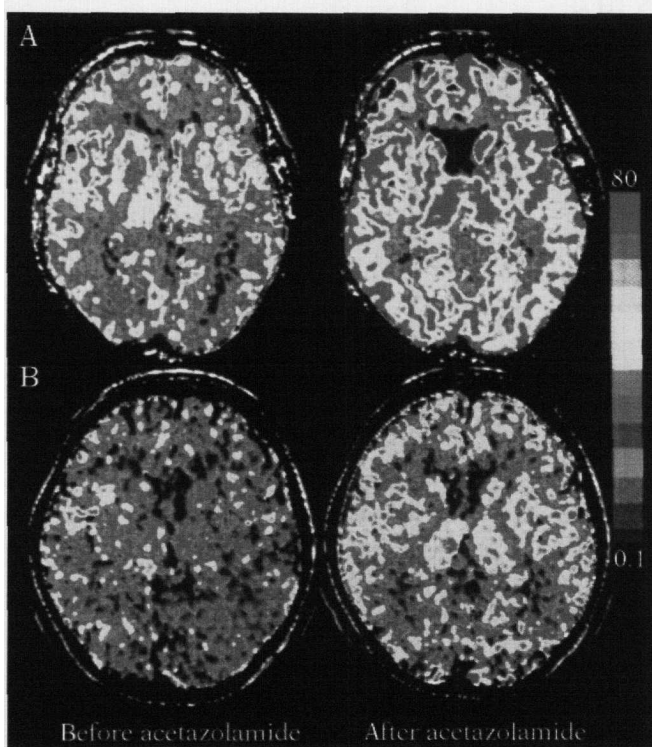


Fig. 1.—Actual records of xenon CT. A) Cerebral blood flows in a patient with lacunar infarction with transient signs. B) Cerebral blood flows in a patient with lacunar infarction with long-lasting signs. Both patients had lacunar infarction in the left hemisphere. The cerebral blood flows in the cerebral cortex and cerebral white matter contralateral to the lacunar infarction were lower in B than in A. After the intravenous injection of acetazolamide, the cerebral blood flows were increased. The cerebrovascular acetazolamide reactivity was lower in B than in A.

lation of 30% xenon and 50% oxygen for 3 minutes and five times during the five minutes after inhalation. The picture analysis was performed using AZ-7000 (Anzai Medical, Tokyo, Japan).

By identifying specific anatomical locations on the plane CT images with a cursor, regional cerebral blood flows (rCBF) were measured before and 20 minutes after intravenous injection of 17 mg/kg acetazolamide.

Blood extraction was performed using a polystyrene syringe and a 20 gauge needle. The blood drawn was left for 15-30 minutes in iced water and then centrifuged at 2000 G for 30 minutes at a temperature of 2-4°C. Plasma fibrinopeptide A, platelet factor 4 and  $\beta$ -thromboglobulin concentrations were determined at the Special Reference Laboratories.

## Results

Figure 1 shows actual records of xenon CT. Xenon CT cerebral blood flow studies were performed within one week after the onset of symptoms.

Table II shows the mean and standard deviation of cerebral blood flows, cerebrovascular acetazolamide reactivity (the cerebral blood flow change by acetazolamide), and the results of blood tests in the two groups. The cerebral cortex blood flow and cerebral white matter blood flow were significantly less in the lacunar infarction with long-lasting signs group than in the transient signs group.

The cerebral cortex cerebrovascular acetazolamide reactivity and cerebral white matter cerebrovascular acetazolamide reactivity were significantly less in group with long-lasting signs than in the transient signs group.

The concentrations of fibrinopeptide A, platelet factor 4, and  $\beta$ -thromboglobulin were signifi-

TABLE II.—The mean and standard deviation of cerebral blood flows, cerebrovascular acetazolamide reactivity, and the results of blood tests in the two groups.

Parameters	Lacunar infarction with transient signs group	Lacunar infarction with long-lasting signs group
Cerebral cortex blood flow (ml/100 g/min)	42.8±7.8	33.1±7.2*
Cerebral white matter blood flow (ml/100 g/min)	20.3±7.7	14.8±5.9**
Cerebral cortex cerebrovascular acetazolamide reactivity (%)	+39.2±12.4	+28.7±10.2*
Cerebral white matter cerebrovascular acetazolamide reactivity (%)	+33.6±11.8	+26.3±9.8**
Fibrinopeptide A (ng/ml)	6.8±2.4	10.3±3.1*
Platelet factor 4 (ng/ml)	14.5±3.8	25.6±9.2*
$\beta$ -thromboglobulin (ng/ml)	47.3±13.1	78.2±22.7*

\*p<0.01 versus cerebral infarction with transient signs group; \*\*p<0.05 versus cerebral infarction with transient signs group.

cantly higher in the long-lasting signs group than in the transient signs group.

Statistical analysis was performed using Mann-Whitney's U tests for comparison between the two groups.

### Discussion

Mochizuki *et al.*<sup>11</sup> reported that cerebral blood flows were decreased in patients with lacunar infarction and suggested widespread cerebral arteriosclerosis as the basis of the infarction. The fact that blood flows in the cerebral cortex and cerebral white matter contralateral to the infarction were lower in the long-lasting signs group than in the group with transient signs in the present study would therefore suggest that widespread cerebral arteriosclerosis<sup>11-14</sup> is more severe in single lacunar infarction with long-lasting signs than in that with transient signs.

Acetazolamide dilates cerebral arterioles by inhibiting carbonic anhydrase and increasing arteriolar CO<sub>2</sub>,<sup>15-16</sup> and is useful for examining cerebrovascular dilatory reserve capacity.<sup>17-18</sup> The result that cerebrovascular acetazolamide reactivity in the cerebral cortex and cerebral white matter contralateral to the lacunar infarction were lower in the long-lasting signs group than in the group with transient signs in the present study suggests that cerebrovascular dilatory reserve capacity is less in single lacunar infarction with long-lasting signs than in single lacunar infarction with transient signs.

Fibrinopeptide A levels have been reported to be increased in patients with lacunar infarction<sup>19</sup> or ischaemic stroke.<sup>20</sup>  $\beta$ -thromboglobulin levels were reported to be increased in stroke patients<sup>21</sup> but normal in most TIA patients.<sup>22</sup> The fact that plasma fibrinopeptide A, platelet factor 4 and  $\beta$ -thromboglobulin concentrations were higher in the long-lasting signs group than in the transient signs group in the present study suggests that platelet activation occurs more frequently in single lacunar infarction with long-lasting signs than in that with transient signs.

### Conclusions

There may be some differences in pathogenesis between single lacunar infarction with tran-

sient signs and single lacunar infarction with long-lasting signs.

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