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ATHEROTHROMBOTIC LESION OF THE MIDDLE CEREBRAL ARTERY: REPORT OF 21 CASES WITH STENOTIC AND OBSTRUCTIVE LESIONS

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ABSTRACT

This was a retrospective analysis of 12 consecutive cases of middle cerebral artery stenosis and 9 consecutive cases of middle cerebral artery occlusion that presented to our hospital with acute cerebral ischemia. The degree and area of the cerebral infarctions were assessed with the Alberta Stroke Program Early CT Score (ASPECTS) and ASPECTS-DWI (APSECTS with assessment of white matter lesion using diffusion-weighted image). As for cerebral infarctions in the region of the perforating artery, lesions that were more than 20 mm long in the caudal-cranial direction were diagnosed as branch atheromatous disease (BAD).

Activities of daily living (ADL) were poorer in the cases with lower ASPECTS and ASPECTS-DWI. ADL tended to be worse in cases with BAD than in those without. The prognosis was significantly poorer in the group with ASPECTS \leq 7 points. ASPECTS tended to be lower in cases with BAD than in those without. ADL, ASPECTS and the presence of BAD were not significantly different between the stenosis and obstruction groups.

In summary, the neurological prognosis was dependent on the extent of the cerebral infarction and was related to BAD to some extent. These findings will be important when considering medical treatment at the outpatient clinic setting.

Key Words: Middle cerebral artery, Branch atheromatous disease, Lacunar infarction, Atherosclerosis, Atherothrombosis

INTRODUCTION

When atherothrombotic lesions of the middle cerebral artery cause ischemia, the prognosis can be poor. We investigate the relation between the degrees and types of cerebral infarction and its prognosis.

SUBJECTS

This was a retrospective analysis of 12 consecutive cases of middle cerebral artery stenosis

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and 9 consecutive cases of middle cerebral artery occlusion that presented to our hospital with acute cerebral ischemia from January 2001 to September 2010. The patients had a past history of hypertension in 12 cases, hyperlipidemia in 5 cases, and diabetes mellitus in 6 cases.

Thirteen patients (9 cases of middle cerebral artery stenosis and 4 cases of middle cerebral artery occlusion) were hospitalized for treatment, and 8 patients (3 cases of middle cerebral artery stenosis and 5 cases of middle cerebral artery occlusion) were treated only in the outpatient department. Among the hospitalized patients, it took 1.9 ± 1.8 days (mean \pm standard deviation) from onset to MRI examination and 23.9 ± 15.6 days from onset to discharge. The duration of hospitalization was 20.7 ± 16.1 days. Among the non-hospitalized patients, it took 26.1 ± 18 days from onset to MRI examination.

METHODS

Cerebral infarction was assessed with diffusion-, T1- and T2-weighted images as well as FLAIR (Fluid Attenuated Inversion Recovery) images. The degrees and areas of the cerebral infarctions were assessed with ASPECTS (Alberta Stroke Program Early CT Score; full score: 10 points) and ASPECTS-DWI (ASPECTS with assessment of white matter lesion using diffusion-weighted image, full score: 11 points). The scores were lower when the area of the cerebral infarction was enlarged. As for the cerebral infarction in the region of the perforating artery, lesions that were more than 20 mm long in the caudal-cranial direction were diagnosed as branch atheromatous disease (BAD).

Activities of daily living (ADL) were defined as follows: modified Rankin Scale (mRS) 0: no deficit, mRS 1, 2: independent social and daily life, mRS 3, 4: dependent daily life, mRS 5: bed-ridden. For statistical comparison using the χ^2 test, ADL was classified into two groups, i.e., good or fair prognosis (mRS 0–2) and poor prognosis (mRS 3–5). ADL was evaluated at the time of discharge for the hospitalized patients, and at the day of the first MRI examination in the non-hospitalized patients.

RESULTS

The mean duration from onset to MRI assessment was 2, 2, 1, 27.5, 5.8, 8.5, and 12 days for patients with ASPECTS scores of 3, 4, 6, 7, 8, 9 and 10 points, respectively. The mean duration of the ADL assessment from the onset in patients with different ASPECTS scores was 34, 58, 10, 32, 22, 11, and 24.2 days for patients with ASPECTS scores of 3, 4, 6, 7, 8, 9 and 10 points, respectively.

Five cases showed wide-spread infarction (ASPECTS ≤ 7 points), and 8 cases showed ASPECTS-DWI ≤ 8 points. BAD was observed in 8 cases. The prognosis was as follows: mRS 0 in 14 cases, mRS 1, 2 in 2 cases, mRS 3, 4 in 2 cases, and mRS 5 in 3 cases.

ADL was poorer in the cases with lower ASPECTS ($p < 0.01$ by Kruskal-Wallis test; Fig. 1) and ASPECTS-DWI ($p < 0.01$ by Kruskal-Wallis test; Fig. 2). χ^2 test was used to compare between the groups with ASPECTS ≥ 8 points or ≤ 7 points, and between the groups with mRS 0–2 or mRS 3–5. The prognosis was significantly poorer in the group with ASPECTS ≤ 7 points ($p = 0.03$, Table 1).

ADL tended to be poorer in cases with BAD than in those without ($p > 0.05$ by Mann-Whitney U test; Fig. 3). ASPECTS tended to be lower in cases with BAD than in cases without ($p > 0.05$ by Mann-Whitney U test; Fig. 4).

ADL did not differ between the stenosis and obstruction groups (Mann-Whitney U test, Fig. 5), nor did ASPECTS differ between the stenosis and obstruction groups (Mann-Whitney U test, Fig. 6). The presence of BAD did not differ significantly between the stenosis and obstruction cases (χ^2 test, Table 2).

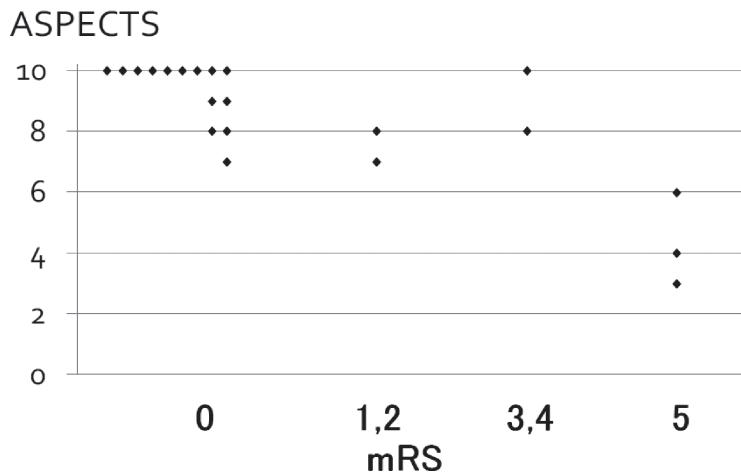


Fig. 1 Relation between modified Rankin Scale (mRS) at discharge and Alberta Stroke Program Early CT Score (ASPECTS).
Activities of daily living (ADL) was poorer in cases with lower ASPECTS ($p<0.01$, Kruskal-Wallis test).

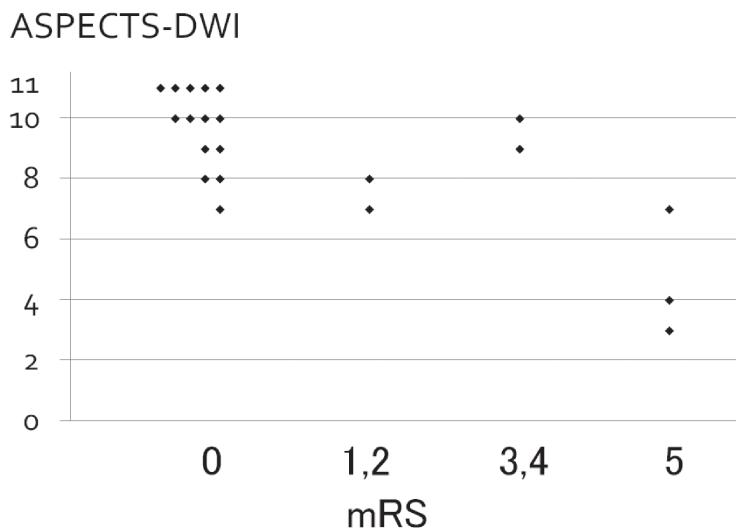


Fig. 2 Relation between modified Rankin Scale (mRS) at discharge and ASPECTS-DWI (ASPECTS with assessment of white matter lesion using diffusion-weighted image).
ADL was also poorer in cases with lower ASPECTS-DWI ($p<0.01$, Kruskal-Wallis test).

Table 1 Relation between modified Rankin Scale (mRS) at discharge and Alberta Stroke Program Early CT Score (ASPECTS).

χ^2 test was performed between groups with ASPECTS ≥ 8 points or ≤ 7 points, and between groups with mRS 0–2 or mRS 3–5. The prognosis was significantly poorer in the group with ASPECTS ≤ 7 points ($p=0.03$).

	mRS 0–2	mRS 3–5	total
ASPECTS (≥ 8)	14	2	16
ASPECTS (≤ 7)	2	3	5

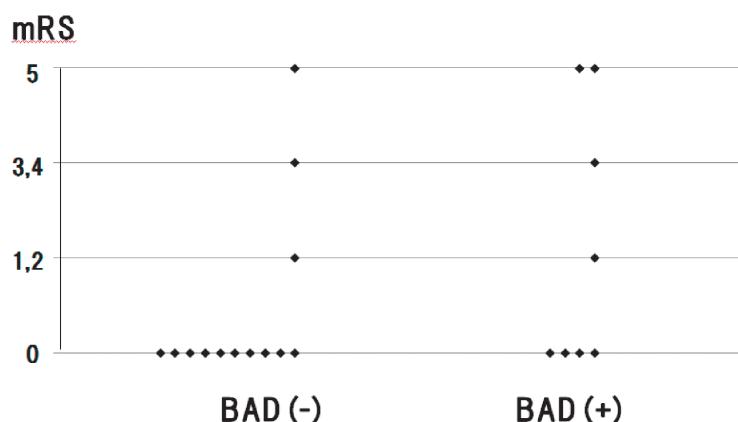


Fig. 3 Relation between modified Rankin Scale (mRS) at discharge and branch atheromatous disease (BAD). ADL tended to be poorer in cases with BAD than in those without ($p>0.05$, Mann-Whitney U test).

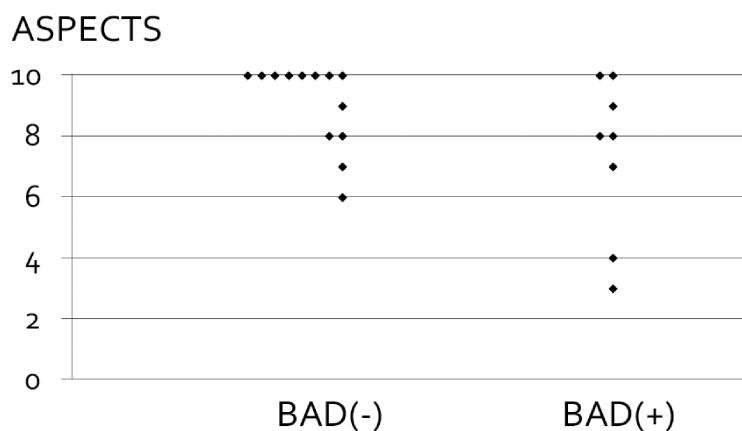


Fig. 4 Relation between Alberta Stroke Program Early CT Score (ASPECTS) and branch atheromatous disease (BAD).

ASPECTS tended to be lower in cases with BAD than in those without ($p>0.05$, Mann-Whitney U test).

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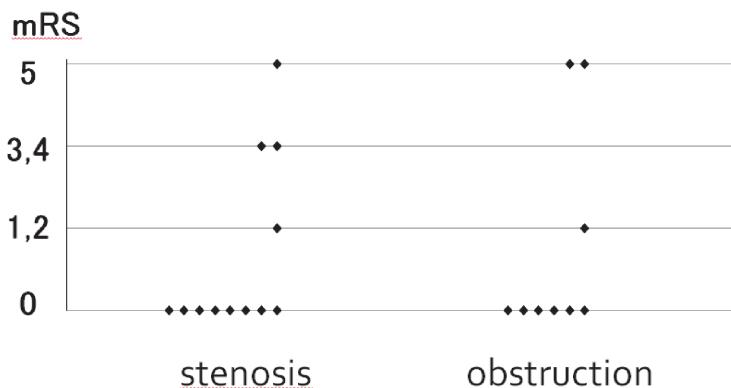


Fig. 5 Relation between modified Rankin Scale (mRS) at discharge and the lesion of the middle cerebral artery. ADL did not differ between the stenosis and obstruction of middle cerebral artery groups ($p>0.05$, Mann-Whitney U test).

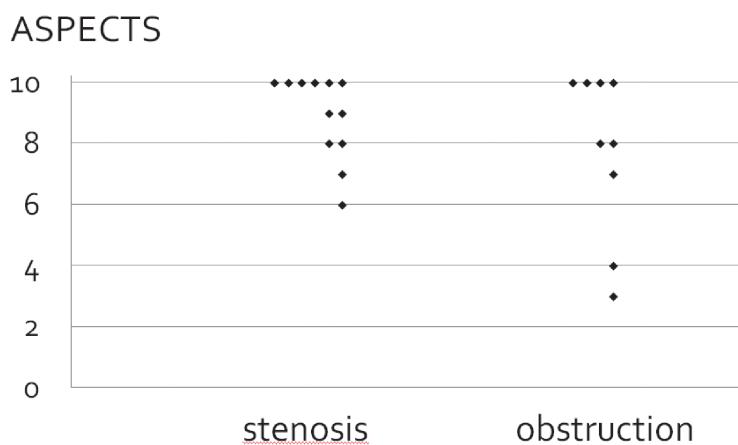


Fig. 6 Relation between Alberta Stroke Program Early CT Score (ASPECTS) and the lesion of the middle cerebral artery. ASPECTS was not significantly different between the stenosis and obstruction of middle cerebral artery groups ($p>0.05$, Mann-Whitney U test).

Table 2 Relation between branch atheromatous disease (BAD) and the lesion of the middle cerebral artery. The presence of BAD did not differ significantly between stenosis and obstruction of middle cerebral artery groups ($p>0.05$, χ^2 test).

	BAD (-)	BAD (+)	total
obstruction	5	4	9
stenosis	8	4	12

DISCUSSION

Hemodynamic ischemia and microembolism occur frequently in the progression of cerebral infarction due to atherosclerotic lesions of the middle cerebral artery.¹⁾ Wide-spread cerebral infarction is a major factor related to a poor prognosis.¹⁾ We assessed the degree of cerebral infarction using ASPECTS, and discovered that the prognosis was significantly poorer in patients with ASPECTS≤7 points.

In BAD, the orifice of the perforating artery is obstructed, and cerebral infarction occurs throughout the whole perfusion area of the perforating artery.²⁻⁴⁾ Thus, BAD exhibits characteristics similar to atherosclerotic cerebral infarction rather than lacunar infarction. BAD is often resistant to medical treatment and the functional prognosis is frequently poor. In the current series, ADL tended to be poorer in cases with BAD than in those without, and ASPECTS tended to be lower in cases with BAD than in cases without.

This study revealed that symptoms deteriorated with stenosis of the middle cerebral artery, and in cases of obstruction. The neurological symptom(s) quickly deteriorated during the progression of arterial stenosis, even if the artery was not completely obstructed. The neurological prognosis was dependent upon the extent of the cerebral infarction and was related to BAD to some extent. These findings will be important when considering medical treatment in the outpatient clinic setting.

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