SHORT REPORT

Clinical study of 39 patients with atypical lacunar syndrome

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The aim of this study was to describe the clinical characteristics of atypical lacunar syndrome (ALS) based on data collected from a prospective acute stroke registry. In total, 2500 acute stroke patients were included in a hospital based prospective stroke registry over a 12 year period, of whom 39 were identified as having ALS and radiologically proven (by computed tomography or magnetic resonance imaging) lacunes. ALS accounted for 1.8% of all acute stroke patients, 2.1% of acute ischaemic stroke, and 6.8% of lacunar syndromes. ALS included dysarthria facial paresis (n=12) or isolate dysarthria (n=9), isolated hemiataxia (n=4), pure motor hemiparesis with transient internuclear ophthalmoplegia (n=4), pure motor hemiparesis with transient subcortical aphasia (n=3), unilateral (n=2) or bilateral (n=3) paramedian thalamic infarct syndrome, and hemichorea hemiballismus (n=2). Atypical lacunar syndromes were due to small vessel disease in 96% of patients. Atherothrombotic infarction occurred in one patient and cardioembolic infarct in another, both presenting pure dysarthria. Outcome was good (in hospital mortality 0%, symptom free at discharge 28.2%). After multivariate analysis, the variables of speech disturbances, nausea/vomiting, ischaemic heart disease, and sensory symptoms were found to be significantly associated with ALS. In conclusion, atypical lacunar syndrome is an infrequent stroke subtype (one of each 14 lacunar strokes). ALS occurred in 6.8% of lacunar strokes. Isolated dysarthria or dysarthria facial paresis were the most frequent presenting forms. The prognosis of this infrequent non-classic lacunar syndrome is good.

In contrast to well defined classic or typical lacunar syndromes,¹ there is little information on atypical lacunar syndrome (ALS).^{2–4} To further contribute to the characterisation of ALS, we collected data on patients with different types of ALS from a prospective hospital based registry and compared them with patients with typical lacunar syndrome and non-lacunar stroke.

PATIENTS AND METHODS

Since January 1986, the Hospital of Sagrat Cor (an acute care 350 bed hospital in Barcelona) has had an ongoing hospital based stroke registry.⁵ Data from first ever stroke patients are entered following a standardised protocol with 186 items detailing demographics, risk factors, clinical features, laboratory and neuroimaging data, complications, and outcome. This study is based on the data included in the registry up to December 1997, the particular time at which 2500 patients had been entered in the database. Subtypes of stroke were classified according to the Cerebrovascular Study Group of the Spanish Society of Neurology⁶ and have been used in previous reports.^{7–8} Cerebrovascular risk factors and lacunar syndromes (pure motor stroke, pure sensory stroke, sensorimotor stroke, ataxic hemiparesis, dysarthria clumsy hand

syndrome, and ALS) were defined as in other studies by our group.^{5–7–8}

For the purpose of the present study, 570 consecutive patients with lacunar syndromes due (n=484) or not due (n=86) to lacunar infarcts were collected: 277 pure motor stroke, 99 pure sensory stroke, 81 sensorimotor stroke, 23 ataxic hemiparesis, 35 dysarthria clumsy hand, and 55 ALS. The definition of ALS for the current analysis included the following clinical and neurological criteria.² (a) The patient did not have one of the five classic lacunar syndromes. (b) There was presence of any of the following clinical syndromes at the time of maximum neurological deficit: a paucisymptomatic form of a classic lacunar syndrome (such as pure dysarthria or dysarthria facial paresis^{9–10} or isolated hemiataxia¹¹), lateralised movement disorders (such as hemichorea hemiballismus¹²), miscellaneous syndromes due to vertebrobasilar small infarcts^{1–3} (such as pure motor hemiparesis with transient internuclear ophthalmoplegia, paramedian thalamic infarct syndrome^{13–14}), or pure motor hemiparesis with transient subcortical aphasia.² (c) Patients with lacunes that were proven radiologically (computed tomography (CT) or magnetic resonance imaging (MRI)), and defined as a small infarct with a maximum diameter of 15 mm on no more than two adjacent 10 mm tomographic cuts and located in the vascular territory of the perforating territories (subcortical or brainstem). Imaging negative patients (when the two brain CT or CT and MRI scans obtained during hospitalisation did not reveal lacunes) were excluded.

On admission (within 48 hours of the onset of symptoms), demographic characteristics, salient features of clinical history and neurological examination, results of routine laboratory tests, chest radiography, and 12 lead electrocardiography were recorded. Brain neuroimaging studies were performed within the first week of admission. Patients with negative results in the first CT scan had a second during their stay in hospital or were studied by MRI. Other investigations included angio-MRI in 45.5% of patients, echo Doppler of the supra-aortic trunks in 40%, arterial digital subtraction angiography in 5.5%, B mode echocardiography in 25.5%, and lumbar puncture in 3.6%. From the results of these complementary studies, some cases of ALS syndrome were attributed to other ischaemic stroke subtypes: cardioembolic infarction, atherothrombotic infarction, brain infarction of unusual aetiology, or cerebral infarct of unknown cause.⁶

Statistical analysis

Student's *t* test and the χ^2 test (with Yates' correction when necessary) were used to compare features of patients with ALS with patients with other lacunar syndromes and with patients with non-lacunar stroke. Bonferroni's correction for multiple tests was computed. Variables related to ALS in the univariate analysis plus age and sex were studied in multiple regression models based on demographic, vascular risk factors, and clinical variables, in which ALS was the dependent variable.

Abbreviation: ALS, atypical lacunar syndromes

Table 1 Comparison of atypical lacunar syndromes (ALS) with other lacunar and non-lacunar strokes

Data	ALS	Other lacunar stroke	p*	Non-lacunar stroke	p†
Total no. of patients	39	515	—	1540	—
Male sex	26 (66.7)	305 (59.2)	NS	731 (47.5)	0.05
Age, years, mean (SD)	74.0 (8.4)	72.3 (10.8)	NS	74.0 (12.7)	NS
Age ≥ 65 years	4 (10.3)	61 (11.8)	NS	271 (17.6)	NS
Vascular risk factors					
Hypertension	29 (74.4)	371 (72)	NS	727 (47.2)	0.003
Diabetes	16 (41.0)	141 (27.4)	NS	274 (17.8)	0.001
Ischaemic heart disease	11 (28.2)	65 (12.6)	0.018	206 (13.4)	0.024
Atrial fibrillation	5 (12.8)	77 (15)	NS	493 (32)	0.033
Valvular heart disease	3 (7.7)	24 (4.7)	NS	110 (7.1)	NS
Congestive heart disease	1 (2.6)	15 (2.9)	NS	95 (6.2)	NS
Previous TIA	7 (17.9)	50 (9.7)	NS	182 (11.8)	NS
Previous cerebral infarct	7 (17.9)	78 (15.1)	NS	234 (15.2)	NS
Previous intracerebral haemorrhage	1 (2.6)	6 (1.2)	NS	20 (1.3)	NS
COPD	3 (7.7)	34 (6.6)	NS	104 (6.8)	NS
Nephropathy	2 (5.1)	14 (2.7)	NS	37 (2.4)	NS
Chronic liver disease	1 (2.6)	9 (1.7)	NS	39 (2.5)	NS
Alcohol abuse (>80 g/day)	2 (5.1)	13 (2.5)	NS	42 (2.7)	NS
Smoking (>20 cigarettes/day)	8 (20.5)	68 (13.2)	NS	140 (9.1)	0.048
Obesity	2 (5.1)	33 (6.4)	NS	54 (3.5)	NS
Hyperlipidaemia	13 (33.3)	110 (21.4)	NS	235 (15.3)	0.006
Symptomatic peripheral disease	3 (7.7)	45 (8.7)	NS	103 (6.7)	NS
Clinical findings					
Sudden onset	23 (59.0)	214 (41.6)	NS	882 (57.3)	NS
Decreased consciousness	1 (2.6)	13 (2.5)	NS	437 (28.4)	0.001
Early seizures	—	—	—	47 (3.1)	NS
Headache	7 (17.9)	47 (9.1)	NS	258 (16.8)	NS
Nausea, vomiting	4 (10.3)	16 (3.1)	NS	168 (10.9)	NS
Limb weakness	17 (43.6)	412 (80)	0.001	1188 (77.1)	0.001
Sensitive deficit	6 (15.4)	187 (36.3)	0.024	677 (44)	0.001
Ataxia	4 (10.3)	26 (5.0)	NS	99 (6.4)	NS
Dysarthria, aphasia	29 (74.4)	179 (34.8)	0.001	847 (55)	0.048
Stroke subtype	—	—	NS	—	0.001
Lacunar infarction	37 (94.9)	431 (89)	NS	—	0.001
Atherothrombotic infarction	1 (2.9)	34 (6.6)	NS	518 (33.6)	0.001
Cardioembolic infarction	1 (2.6)	20 (3.9)	NS	447 (29)	0.001
Infarction of unusual causa	—	2 (0.4)	NS	85 (5.5)	NS
Infarction of unknown aetiology	—	8 (1.6)	NS	240 (15.6)	NS
Intracerebral haemorrhage	—	20 (3.9)	NS	250 (16.2)	NS
Neuroimaging findings					
Frontal	1 (2.6)	12 (2.3)	NS	260 (16.9)	0.05
Parietal	—	24 (4.7)	NS	439 (28.5)	0.001
Temporal	—	11 (2.1)	NS	495 (32.1)	0.001
Internal capsule	14 (35.9)	180 (35)	NS	227 (14.7)	0.001
Thalamus	9 (23.1)	73 (14.2)	NS	107 (6.9)	0.001
Basal ganglia	4 (10.3)	39 (7.6)	NS	286 (18.6)	NS
Corona radiata	3 (7.7)	26 (5)	NS	11 (0.7)	0.001
Pons	6 (15.4)	45 (8.7)	NS	64 (4.2)	0.003
Middle cerebral artery involvement	20 (51.3)	227 (44.1)	NS	846 (54.9)	NS
Vertebrobasilar artery involvement	15 (38.5)	99 (19.2)	0.012	271 (17.6)	0.003
Outcome					
Symptom free at discharge	11 (28.2)	130 (25.2)	NS	211 (13.7)	0.030
Severe limitation at discharge	1 (2.6)	12 (2.3)	NS	209 (13.6)	NS
Urinary dysfunction	2 (5.1)	16 (3.1)	NS	187 (12.1)	NS
Infectious complications	1 (2.6)	20 (3.9)	NS	271 (17.6)	0.05
Respiratory complications	0 (0.0)	13 (2.5)	NS	183 (11.9)	NS
Length of stay, days (median, IQR)	11.5 (7.4)	12.7 (8.3)	NS	20.6 (25.1)	0.006
In hospital mortality	0 (0.0)	1 (0.2)	NS	340 (22.1)	0.003

Data are n (%) unless otherwise indicated. Comparison between: *ALS and other lacunar strokes; †ALS and non-lacunar strokes. TIA, transient ischaemic attack; COPD, chronic obstructive pulmonary disease; IQR, interquartile range.

RESULTS

Of the initial 55 patients with ALS, 16 imaging negative patients were excluded (isolated dysarthria 10 patients, hemichorea hemiballismus 3, isolated hemiataxia 1, dysarthria facial paresis 1, and pure motor hemiparesis with transient subcortical aphasia 1). The study population included 39 patients with radiologically proven ALS, which accounted for 1.8% of all cases of acute stroke (39/2110), 2.1% of ischaemic stroke (39/1840) and 6.8% of lacunar syndromes (39/570). The ratio of ALS to classic lacunar syndromes was 1:14. Men made up 66% of patients, with a

mean (SD) age of 74.0 (8.4) years. As shown in table 1, hypertension was present in 74.4% of cases, diabetes in 41%, hyperlipidaemia in 33.3%, and ischaemic heart disease in 28.2%. The onset of symptoms was sudden in 59% of patients. Involvement of the internal capsule was the most frequent topography, followed by the thalamus, pons, basal ganglia, and corona radiata.

ALS included dysarthria facial paresis (n = 12) or isolated pure dysarthria (n = 9), isolated hemiataxia (n = 4), pure motor hemiparesis with transient internuclear ophthalmoplegia (n = 4), pure motor hemiparesis with transient

subcortical aphasia ($n = 3$), unilateral ($n = 2$) or bilateral ($n = 3$) paramedian thalamic infarct syndrome, and hemichorea hemiballismus ($n = 2$).

With regard to stroke subtype, lacunar infarction was diagnosed in 37 patients and non-lacunar stroke in the remaining two (cerebellar atherothrombotic infarction with isolated dysarthria, in one case previously published,¹⁵ and frontal cardioembolic infarction with pure dysarthria in another case). Outcome of ALS was good, with 0% in hospital mortality rate and 28.2% of absence of neurological disability at discharge. The mean length of hospital stay was 11.5 days.

When the groups of ALS and other lacunar syndromes were compared, ischaemic heart disease, speech disturbances (dysarthria or aphasia), and vertebrobasilar artery involvement were significantly more frequent in the ALS group, whereas limb weakness and sensory symptoms were significantly less frequent (table 1). The comparison between the groups of ALS and non-lacunar stroke showed important differences, particularly in respect to the unfavorable outcome of non-lacunar stroke (higher in hospital mortality, longer hospital stay, and fewer symptom free patients at discharge) (table 1). In the multivariate analysis, only speech disturbances (odds ratio 9.1; 95% confidence interval 3.9 to 21.0), nausea or vomiting (8.3; 2.2 to 30.3), ischaemic heart disease (2.8; 1.2 to 6.5), and limb weakness (0.12; 0.06 to 0.25), appeared to be significant variables related to ALS compared with other lacunar syndromes, whereas hypertension (3.1; 1.5 to 6.6), diabetes (2.9; 1.5 to 5.7), ischaemic heart disease (2.4; 1.1 to 4.9), hyperlipidaemia (2.3; 1.1 to 4.6), limb weakness (0.32; 0.16 to 0.64), atrial fibrillation (0.32; 0.12 to 0.84), sensory symptoms (0.31; 0.13 to 0.78), and decreased consciousness (0.08; 0.01 to 0.62) were significant variables related to ALS compared with non-lacunar stroke.

DISCUSSION

In this study, radiologically proven ALS accounted for 6.8% of lacunar syndromes, 2.1% of ischaemic stroke, and 1.8% of all cases of acute stroke. Isolated dysarthria or dysarthria facial paresis followed by isolated hemiataxia were the most frequent ALS.

ALS was caused by small vessel disease in 96% of patients and by other ischaemic stroke subtypes in 4%. Isolated dysarthria or dysarthria facial paresis is related to selective involvement of the motor fibre along the course of the pyramidal tract secondary to a small cerebral lacunar infarct that disrupts the corticospinal fibres independently of the sites of the lesion (internal capsule, pons or corona radiata).^{16–18} Hemichorea hemiballismus, another ALS in our study, is the most frequently reported movement disorder in patients who have suffered acute stroke.^{2–19} In our experience, presumed lacunar infarcts are the most common substrate for hemichorea hemiballismus, and other ischaemic stroke subtypes are rare.²⁰ These findings agree with the results of the study of Ristic *et al.*²¹ in which 78% of their series of 27 patients with hemichorea hemiballismus had lacunar infarctions, and with those reported by others.¹² In our study, other less frequent ALS were miscellaneous syndromes due to vertebrobasilar small infarcts.

Clinically, this study highlights the favourable outcome in ALS and, as expected, the difference between ALS and other lacunar stroke. However, only speech disturbances, nausea/vomiting, ischaemic heart disease, and sensory symptoms were variables significantly associated with ALS in the multivariate analysis. Nausea or vomiting were more frequent in ALS than in other lacunar syndromes and this may be explained by the higher percentage of basilar artery involvement. It is known that nausea or vomiting occurs

more frequently in vertebrobasilar strokes than in carotid events.²²

With regard to vascular risk factors, ischaemic heart disease was the only risk factor more frequent in ALS than in other lacunar syndromes. This finding is consistent with the study of Baumgartner *et al.*²³ in which ischaemic lacunar stroke in patients with potential mechanism other than small artery disease had a higher prevalence of coronary artery disease (35% *v* 9%) and with the study of Besson *et al.*²⁴ who reported that in ataxic hemiparesis the frequency of ischaemic heart disease is higher in the pontine than in the hemispheric location. These results suggest that patients with ALS have occlusive atherosclerosis affecting at least the cerebral and coronary arteries.

There were important differences between ALS and non-lacunar strokes. Hypertension, diabetes mellitus, ischaemic heart disease, and hyperlipidaemia were independent variables significantly associated with ALS, whereas atrial fibrillation, sensory symptoms, limb weakness, and decreased consciousness were associated with non-lacunar strokes. The favourable outcome of ALS compared with non-lacunar strokes was shown by a lower frequency of medical complications, 0% in hospital mortality, shorter duration of hospital stay, and higher numbers of symptom free patients at discharge.

In summary, ALS occurred in 6.8% of lacunar strokes in our study and was frequently caused by small vessel disease at capsular, thalamic or pontine sites. Isolated dysarthria or dysarthria facial paresis were the most frequent presenting forms.

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Competing interests: none

The institutional review board approved the use of data collected in the hospital-based stroke registry

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