Seizures and Epilepsy in Patients With a Posterior Circulation Infarct

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Seizures occur mainly in patients with cortical infarcts in the anterior circulation. Those related to a posterior circulation infarct (POCI) are considered rare. This study investigated the characteristics of patients with seizures related to a POCI. A total of 180 consecutive patients admitted with a POCI had a 2- to 7-year follow-up; 24 of them (13.6%) developed seizures. Vascular risk factors, etiology and extension of the infarct, degree of neurologic impairment, and outcome were compared in the patients with and without seizures. Complex partial type seizure was the most common presentation. Stroke characteristics were largely the same in the patients with and without seizures. History of a previous stroke was noted in 62.5% of the seizure group and in 17.9% of the nonseizure group ($P < .001$). Clinical outcome was worse in the seizure group ($P = .004$). The relative incidence of seizures in patients with a POCI was not lower than that in the overall stroke population. The high incidence of recurrent stroke is the main risk factor for seizures in patients with a POCI. The seizures themselves are responsible for the increased dependence rate. **Key Words:** Stroke-related seizure—posterior circulation—infarct—complex partial spell—stroke recurrence—stroke outcome.

In a recent large prospective study, the overall incidence of seizures related to ischemic stroke was 8.9%.[1] The seizures were mainly of the simple partial (SP) type, with or without secondary generalization.[2] Numerous studies have demonstrated that seizures occur mainly in patients with infarcts in the anterior circulation, predominantly in the middle cerebral artery territory.[3-5] Seizures are most closely associated with cortical infarcts in the temporal and parietal lobes.[6,7] In contrast, the frontal lobe is more frequently involved in seizures due to hemorrhagic stroke.[8]

Whether seizures can occur in case of isolated brainstem lesions is a matter of debate. Seizure-like episodes have been occasionally reported in patients with acute hemorrhagic and ischemic pontine stroke.[9-11] Although infarcts in the posterior circulation are responsible for 16.5%-39.8% of all ischemic strokes,[12,13] the relative incidence in those with seizures is considered lower than that of anterior circulation infarcts.[14-16]

The present study compared the characteristics of patients with a posterior circulation infarct (POCI) who developed seizures and those who did not develop seizures.

Patients and Methods

This open observational retrospective study involves 180 patients with a POCI out of a series of 1082 consecutive patients admitted with ischemic stroke to the Department of Neurology of the Ghent University Hospital between January 2000 and September 2005. Patients with a transient ischemic attack were not included in the study.

Twenty-four of the 180 patients with a POCI developed seizures during a follow-up that ranged from 2 to 7 years. In a paradigm comparable to posttraumatic seizures, an arbitrary cutpoint of 2 weeks after stroke onset was considered to distinguish early-onset and late-onset seizures.[17] According to information provided by family members or caregivers, seizures were classified as SP or complex partial (CP) with or without secondary

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generalization, and primary generalized tonic-clonic (TC), with the latter likely of focal onset with rapid secondary generalization. Characteristics were compared between the patients with and without seizures.

All patients were admitted to our department for investigation and treatment of stroke. Patients with seizures were readmitted after the first or the last episode. All patients underwent a complete cardiovascular workup and a computed tomography (CT) scan on admission for stroke or seizure episode. Brain magnetic resonance imaging (MRI) was performed in 18 of the 24 patients with seizures (75%) and in 108 of the 156 patients without seizures (69.2%). Additional neuroimaging investigations were performed as necessary. Electroencephalography (EEG) was performed within 48 hours in all patients who developed seizures. Only a limited number of patients underwent EEG after stroke, precluding a comparison of the seizure and nonseizure groups.

Age, sex, vascular risk factors, stroke type and etiology, and degree of neurologic impairment on admission based on the National Institutes of Health Stroke Scale (NIHSS),[18] and modified Rankin Scale (mRS) score[19] on discharge after stroke or seizure were compared. Patients with a mRS score ≤2 were considered independent, and those with a score ≥3 were considered dependent. No patient died during the hospital stay.

Statistical analysis was performed with R.[20] Univariate comparisons of unpaired groups were done with Fisher's exact test for categorical data. The nonparametric Mann-Whitney *U* test was used to compare unpaired continuous variables. Multiple logistic regression analysis was performed to examine the effects of the independent variables. The significance level was set at $\alpha = 0.05$ (2-tailed).

Results

Of the 24 patients with a POCI, 10 developed CP seizures and 8 developed SP seizures with or without secondary generalization, and 6 experienced a TC insult. Two patients presented with status epilepticus. Early-onset seizures occurred in 3 patients; in the remaining patients, the mean time of onset of seizures after stroke was 12.3 ± 11.32 months. Seizures occurred in 10 patients (41.7%), with a mean incidence of seizure recurrence of 3.8 ± 1.48. Only 1 of the 3 patients with early-onset seizures also developed late-onset seizures. Antiepileptic drugs were prescribed in all the patients with recurrent seizures. Seizure control was obtained in only half of the patients who received montherapy with carbamazepine.

Patient age was similar in the patients with and without seizures (mean, 71.0 ± 10.8 years vs 65.4 ± 15.8 years; $P = .144$). There was no significant difference in sex distribution between the 2 groups, with a male predominance of 66.7% in the former group and 60.3% in the latter group ($P = .655$). Vascular risk factors were similar in the 2 groups (Table 1).

Table 1. *Percentage comparison of the vascular risk factors in patients with a POCI who developed seizures (S) and did not develop seizures (NS)*

	S (n = 24)	NS (n = 156)	P*
Arterial hypertension	75.0	61.5	.258
Coronary heart disease	25.0	28.2	.812
Isolated atrial fibrillation	16.7	23.7	.603
Peripheral vascular disease	0.0	6.4	.363
Cardiac valve disease	0.0	6.4	.363
Hypercholesterolemia	20.8	26.3	.802
Diabetes	25.0	24.4	1.00
Migraine	0.0	5.8	.610
Smoking	8.3	14.7	.537
Chronic obstructive pulmonary disease	4.2	7.1	1.00

*Fisher's exact test.

A history of previous ischemic stroke was recorded in 62.5% of the patients with seizures, compared with only 17.9% of those without seizures ($P < .001$). Stroke etiology and NHISS score on admission were not different between the groups, but more patients in the seizure group remained dependent ($P = .004$) (Table 2).

Brain CT and/or MRI revealed infarction in the supratentorial territory of the posterior circulation in 58.3% of the seizure group and 49.4% of the nonseizure group ($P = .512$). Brainstem and cerebellar involvement was similar in the 2 groups (Table 3). Only 1 patient with an isolated infarct involving brainstem and cerebellum developed seizures.

On multiple logistic regression analysis, the only significant variables for seizures in the patients with a POCI were a history of previous stroke (odds ratio [OR],

Table 2. *Percentage comparison of stroke recurrence and etiology, NIHSS score, and outcome in patients with a POCI who developed seizures (S) and did not develop seizures (NS)*

	S (n = 24)	NS (n = 156)	P*
History of previous stroke	62.5	17.9	<.001
Stroke etiology			
Thromboembolic	79.2	67.3	
Cardioembolic	20.8	32.7	.344
NIHSS score, mean ± SD	8.8 (5.7)	7.2 (5.9)	.102
Outcome			
Independent (mRS score ≤2)	25.0	57.7	
Dependent (mRS score ≥3)	75.0	42.3	.004

*Fisher's exact test.