

REVISITING THE WELL-ESTABLISHED SUBJECT OF STROKE AND EPILEPSY

The Epidemiology of Post-Stroke Epilepsy According to Stroke Subtypes. Benbir G, Ince B, Bozluolcay M. *Acta Neurol Scand* 2006;114:8–12. **OBJECTIVES:** Strokes represent the most common etiology of epilepsy in patients over the age of 60 years, with an incidence of 2–4% occurring in different studies. **MATERIALS AND METHODS:** In this observational study, 1,428 patients were included who had stroke and were admitted to our Stroke Unit between the years 1996 and 2005. **RESULTS:** Overall, 51 patients had post-stroke epilepsy (3.6%). Post-ischemic epilepsy occurred in 70.6% of the patients, post-hemorrhagic epilepsy occurred in 21.6% of the patients and epilepsy following venous infarctions occurred in 7.8% of all post-stroke epilepsy patients. Of 1,327 patients having ischemic stroke, 36 patients (2.7%), 11 out of 86 patients with hemorrhagic stroke (12.8%) and 4 of 15 patients with venous infarctions (26.6%) developed epilepsy. Compared with stroke patients without epilepsy, hemorrhagic ($P < 0.001$) and venous infarctions were more common in patients with post-stroke epilepsy ($P < 0.001$). The right hemisphere and the middle cerebral artery (MCA) territory were most commonly observed in ischemic and hemorrhagic stroke patients. **CONCLUSIONS:** Our results indicate that post-stroke epilepsy is more common among patients who have experienced venous infarctions. Hemorrhagic and venous infarctions are more commonly encountered in post-stroke epilepsy patients. Atherosclerotic and cardioembolic strokes were similar to those that occurred in post-stroke epilepsy patients. Localizations in post-stroke epileptic patients showed that the majority occurred in the right hemisphere, in the territory of the MCA. However, prospective, multicentered studies are needed for a better understanding of the epidemiology and social impact of post-stroke epilepsy.

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COMMENTARY

Since the time of Hippocrates and of Jackson and Gowers in the mid-19th century, stroke has been reported to

be a cause of seizures and epilepsy, particularly in the elderly. Subsequently, the association has been confirmed by numerous different studies (1–5). Are there new developments on this previously studied topic? In this regard, the study of Benbir et al. does address some important issues. The authors performed a well-designed study, noteworthy for their inclusion of three elements. First, they used the guidelines developed by the International League Against Epilepsy to define epilepsy (6), which in turn underscores the ongoing need for a definition of epilepsy. Second, problems with acute seizures (which can arise from a metabolic disarrangement or other reversible insult) were eliminated altogether by excluding patients with provoked seizures, thus increasing the validity of the study. Third and most important, the authors included patients with venous infarctions, particularly dural sinus thrombosis—patients typically not included in such studies.

Cerebral venous thrombosis is a well-known cause of seizures. However, evidence for this finding comes from descriptive studies or case series in which seizures were part of the clinical presentation (7). Thus far, no prospective studies have been performed to evaluate the development of epilepsy in patients who have venous infarctions. Benbir and colleagues provide some of the best systematic documentation that this type of stroke (i.e., cerebral venous thrombosis) is associated with the development of epilepsy. It is known that a prothrombotic risk factor is identified in about 85% of patients with sinus thrombosis. In the other 15% of cases, sinus thrombosis typically is caused by a precipitating factor (such as a head injury or obstetrical delivery). Some of these conditions are considered risk factors not only for stroke but also for seizures and epilepsy. Another risk factor for poststroke epilepsy identified by Benbir et al. is that all patients who developed epilepsy had a late-onset seizure (2 weeks after stroke), extending the findings of the Seizures After Stroke Study Group published in 2000 (4), which found that that epilepsy occurred in up to 55% of patients with late-onset seizures after ischemic strokes.

Using the Trial of Org 10172 in Acute Stroke Treatment (TOAST) criteria (8), Benbir and colleagues assessed the association between seizures and different subtypes of ischemic stroke. The authors determined that strokes of atherothrombotic and cardioembolic origin were responsible for up to 36% and 28% of the cases with poststroke epilepsy. Surprisingly, there were patients with lacunar infarcts who developed epilepsy; this finding most likely is related to concomitant cortical involvement. When the group was evaluated as whole, atherothrombotic poststroke epilepsy encompassed 2.7% of all patients with atherothrombotic origin, cardioembolic poststroke epilepsy comprised 2.6% of all patients with cardioembolic origin, and poststroke epilepsy following lacunar infarctions constituted 1.3% of all lacunar strokes.

An interesting finding reported by Benbir and colleagues is that the location of the affected arterial territory is a prognostic factor for the development of epilepsy. The middle cerebral artery territory was the most common location to be associated with seizures—a finding that is similar to what occurs in patients with hemorrhagic strokes. This outcome was expected since the middle cerebral artery covers a great amount of cerebral cortex and is a common arterial distribution for major strokes, although one study found that atherothrombotic infarction of occipital topography has been shown to be an independent predictor of early seizures (9).

Status epilepticus was not found in any of the 1,327 patients included in the Benbir et al. study. This finding contradicts the 9% rate for status epilepticus previously reported among 180 patients with poststroke, first-time seizures (10). However, as Benbir et al. indicate, the overall percentage of poststroke patients who typically develop status epilepticus is so low (i.e., 0.14–0.8%) that it could be assumed that after a stroke, status epilepticus is less common than in other disorders (e.g., tumor, hypoxia).

The study by Benbir et al. has merits; the inclusion of patients with cerebral venous thrombosis is perhaps the most valuable of all. The finding that poststroke epilepsy is common with venous infarctions is novel. However, there still is a need for future studies on stroke and epilepsy to focus on prognosis and long-term outcome. Such findings would provide a clearer picture of the key epidemiological issues and risk factors in the development of seizures and epilepsy in poststroke patients, and, thus, would help to better identify the population at greatest risk for developing poststroke epilepsy.

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