

Study of the Incidence of Convulsive and Non-Convulsive Seizures in the Acute Phase of Ischemic Cerebrovascular Stroke

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Abstract: Background: Stroke is a major health problem including both ischemic and hemorrhagic types. Although a long-recognized clinical phenomenon, there remain many questions regarding the epidemiology of Seizures and epilepsy after ischemic stroke, their effect on outcome, and their treatment. This pilot study assesses the incidence of Seizures in acute ischemic cerebrovascular disease. **Objective:** To assess the incidence of convulsive and non-convulsive seizures during the first two weeks after ischemic stroke. **Patients and Methods:** The study was carried out on all patients presented within the first 24 of ischemic cerebrovascular stroke admitted to the units of Critical Care Medicine, Alexandria Main University Hospital, during a period of 6 months. EEG was performed in the first 24 of presentation, at the end of the first and second week of admission and if the level of consciousness deteriorated at any time during the acute phase of cerebral infarction and not explained by CT findings or any metabolic derangement. **Results:** Among all the study group, the incidence of overall Seizures was 20%, of them, incidence of non-convulsive Seizures were 13.3% compared to 6.6% of the patients showed convulsive seizures. Most seizures occurred on the first 24 hours of ischemia (66.7%) compared to those occurring at the end of first week (25%) and those at the end of the second week (8.3%). **Conclusion:** Ischemic stroke is considered as a risk factor for the development of seizures and status epilepticus both convulsive and non-convulsive types especially during the first twenty-four hours.

[Tahoun S, Abdallah T, Abdelmonem S and Meligy H. **Study of the Incidence of Convulsive and Non-Convulsive Seizures in the Acute Phase of Ischemic Cerebrovascular Stroke.** *J Am Sci* 2014;10(11):181-184]. (ISSN: 1545-1003). <http://www.jofamericanscience.org>. 24

Keywords: Convulsive, Non-Convulsive, Seizures, Ischemic, Cerebrovascular

1.Introduction

Stroke is a major health problem and it is the most common life threatening neurological disease worldwide. ⁽¹⁾ According to World Health Organization (WHO) estimates, 15 million people each year suffer strokes. ⁽¹⁾

Cerebrovascular disease encompasses ischemic stroke from thrombosis or embolism, and hemorrhagic stroke including intracerebral hemorrhage (ICH) and subarachnoid hemorrhage. ⁽²⁾ Many patients require management in the intensive care unit (ICU) due to the severity of disease or for monitoring after acute thrombolytic therapy. ⁽²⁾

Ischemic Cerebrovascular Disease (ICVD) comprises 85% of all strokes and is the most common neurologic problem that leads to acute hospitalization. ⁽³⁾ Admission to the ICU is indicated in patients with (a) impaired consciousness; (b) associated comorbid conditions, particularly myocardial infarction; (c) stroke after coronary artery bypass grafting (d) symptomatic secondary hemorrhagic conversion with neurologic deterioration; (e) for the initial 24 hours after administration of intravenous (IV) recombinant tissue plasminogen activator (rt-PA); and (f) after intra-arterial thrombolysis, angioplasty, stenting, or thrombectomy. ⁽³⁾

To ensure accurate diagnosis and appropriate therapy, ICVD is categorized along three axes: degree of completeness, anatomic territory, and underlying mechanism. ⁽¹⁾

According to the underlying mechanism, Acute ICVD can be categorized as large vessel thrombosis, small vessel thrombosis (lacune), or due to cardioembolism. ⁽³⁾ Large vessel atherothrombotic occlusion is due to atherosclerosis in the carotid or vertebral-basilar arteries and is a common cause of acute ICVD. ⁽³⁾ The pattern and severity of the neurologic deficit depend on the arterial territory, completeness of occlusion, and collateral flow. ⁽²⁾ If a lacune is strategically placed in the internal capsule, thalamus, or basis pontis, substantial neurologic deficits occur. ⁽³⁾

Watershed infarction is due to globally diminished cerebral blood flow resulting from cardiac arrest or systemic hypotension, with focal infarction and deficits occurring in well-described patterns in the endarterial distribution between major vessels. ⁽⁴⁾ (Fig.1). In the carotid circulation, watershed infarcts occur between the distribution of the middle cerebral artery and either the anterior or posterior cerebral arteries. ⁽⁴⁾

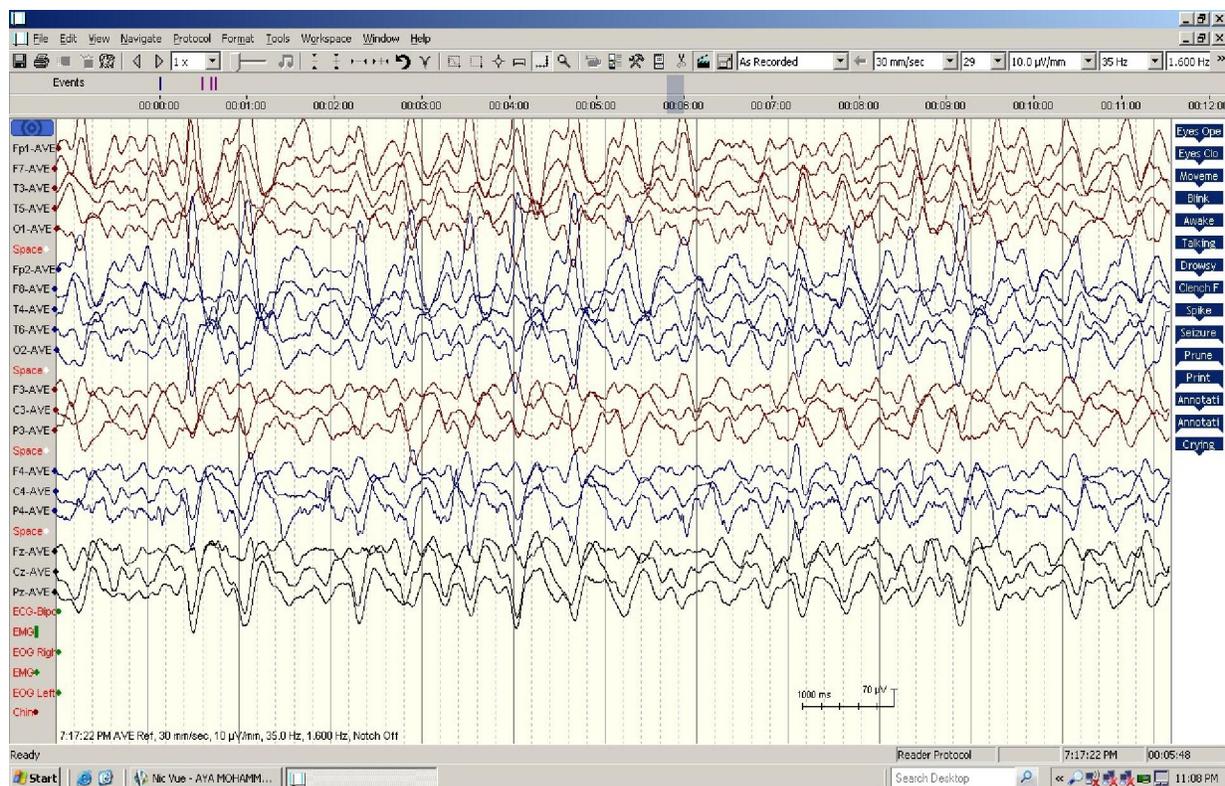


Figure (1) Stroke patient with Non convulsive seizures

Poststroke seizures are often characterized as “early” and “late” with definitions varying.⁽⁵⁾ Early seizures are frequently defined as seizures that occur within the first 7–14 days of stroke symptoms onset,⁽⁶⁾ but many studies examining the incidence of early poststroke seizures (ES) and epilepsy focus either on poststroke seizures occurring within the first 1–4 weeks after the Stroke,⁽⁷⁾ or on comparing the characteristics and outcomes of early and late seizures.⁽⁸⁾

Seizures may be classified for practical purposes into convulsive seizures, which must be rapidly stopped to prevent death or neurologic impairment, and non convulsive seizures, which are usually characterized by some degree of clouding of consciousness, and should be rapidly treated because of the acute neurologic impairment of the patients, because of the attendant morbidity including physical injury, and because it may evolve on to generalized convulsions.⁽⁹⁾

2. Patients and methods

The study was carried out on all patients presented within the first 24 of ischemic cerebrovascular stroke admitted to the units of Critical Care Medicine, Alexandria Main University Hospital, during a period of 6 months and all patients included in the study were subjected to Complete history taking

including age, sex, past medical history and drug history, Complete physical and neurological examination and assessment using Glasgow coma score⁽¹⁰⁾. It was done on admission, and repeated daily till the end of the study. Electroencephalogram was recorded using a 21-channel Recorder according to the international 10–20 system using Ag/AgCL electrodes. Impedance was kept less than 20 k. Filter settings of (15–35)Hz. Average reference montage was used. EEG was performed in the first 24 of presentation, at the end of the first and second week of admission and if the level of consciousness deteriorated at any time during the acute phase of cerebral infarction and not explained by CT findings or any metabolic derangement. The studied group was classified into those with convulsive seizures and those with non-convulsive seizures. The incidence of convulsive and non-convulsive status epilepticus was also reported. CT brain was done on admission, after 48 hours, and as needed and MRI brain when feasible, ECG every day, Echocardiography and carotid doppler on admission and routine Laboratory investigations including CBC, Na, K, Calcium, random blood sugar, PT, PTT, INR, SGOT, SGPT, BUN and creatinine were done on admission and every other day and correction of any abnormal values were done.

3.Results

Regarding the demographic data, (56.6%) of the study population were males while (43.3%) were females with age ranged between 28 and 91 years with a mean age (59.65 ± 13.85) years and median (61) years. The percentage of patients with age more than 60 years old was (51.7%) which was higher than those between age of 40 years to 60 years (38.3%) and those less than 40years old (10%).

Ischemic cerebrovascular stroke was classified into cortical infarctions with percentage (58.33%) compared to subcortical infarctions (21.66%) and lacunar infarcts (20%) **figure(2)**. In another classification, ischemic cerebrovascular strokes were classified into large, small and cardioembolic infarcts. The percentage of patients with large infarcts (48.3%) was more as compared to cardioembolic infarcts (31.7%) and small infarcts (20%) **figure(3)**.

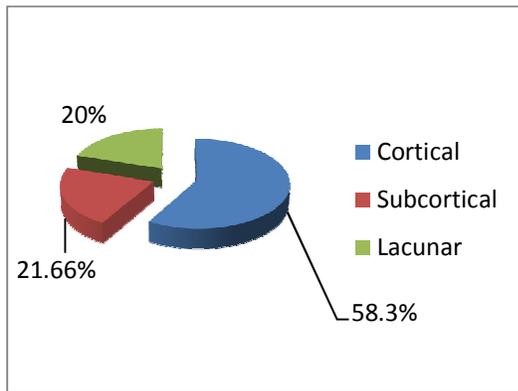


Figure (2) Classification of ischemic strokes according to site.

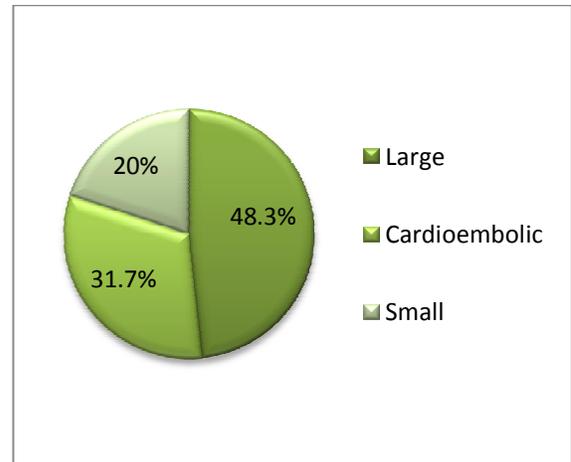


Figure (3) Distribution of infarctions according to the size

Among all the study group, the incidence of overall seizures was 20%, of them, incidence of non-convulsive seizures were 13.3% compared to 6.6% of the patients showed convulsive seizures. Seizures were higher on cortical ischemia (25.75%) compared to subcortical ischemia (15.4%) and lacunar infarctions (8.33%). Seizures were higher among cardioembolic strokes (26.3%) compared to large strokes (20.7%) and small (lacunar) infarctions (8.3%). Status epilepticus incidence was (24.9%) with higher incidence of non-convulsive status epilepticus (16.6%) compared to convulsive status epilepticus (8.3%).

Most seizures occurred on the first 24 hours of ischemia (66.7%) compared to those occurring at the end of first week (25%) and those at the end of the second week (8.3%).

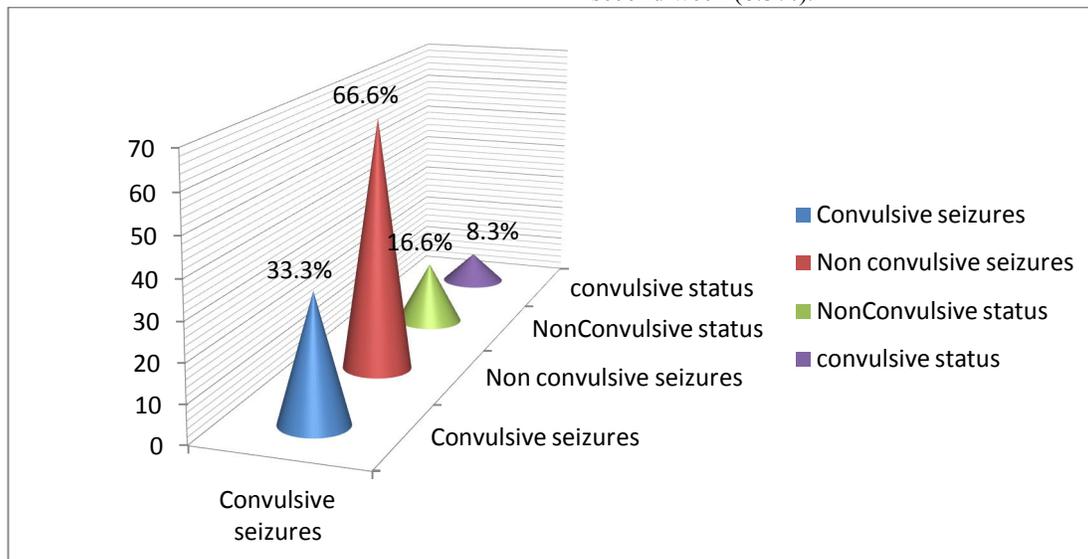


Figure (4) Incidence of convulsive and non convulsive seizures and status epilepticus

The major risk factors among the study group were: Hypertension in 35.5%, smoking on 18.4%, diabetes mellitus on 15.78%, atrial fibrillation on 13.1%, ischemic heart disease on 11.8%, rheumatic heart disease on 3.94% and 1.3% of the patients had a history of transient ischemic attack.

4. Discussion

The aim of our study is to evaluate the incidence of convulsive and non convulsive seizures during the first two weeks after ischemic cerebrovascular stroke including convulsive and nonconvulsive status epilepticus. Also, we clarify this incidence in relation to the size of stroke as classified by the American Stroke Association (ASA).⁽¹¹⁾

Broderick *et al.* a study involved collection of all strokes that occurred in the study population of Greater Cincinnati metropolitan region between July 1, 1993 and June 30, 1994 and between January 1, 1999 and December 31, 1999 showed that the median age of patients was around (69) years and similarly showed higher incidence on patients older than 60 years old.

Regarding sex, the percentage of males among the study group (56.6%) which is higher as compared to Broderick *et al.* which was (43.7%).

The incidence of convulsive seizures showed to be about 6.6% in our study which appears higher than that detected by Broderick *et al.* which was 2.4%. However, the findings from the largest seizure incidence studies in the immediate post stroke period are similar, approximately 4.2–6.1% of patients develop seizures within the first two weeks after stroke.⁽¹²⁾ Non-convulsive seizures incidence was 13.3%.

Regarding Jordan *et al.*, the incidence of non-convulsive seizures was 26%. This difference may be attributed to the use of cEEG monitoring by Jordan.

Among all seizures, the incidence of convulsive status epilepticus was 8.3% which was very close to that detected by Lamy *et al.* who detect that (9%) of the study group had convulsive status epilepticus and Jordan *et al.* who found that (27%) of the patients had non-convulsive status epilepticus compared to (16.6%) on our study.

Regarding the size of infarction, incidence of seizures related to lacunar infarcts was (3.5%) on a study conducted by Benetes *et al.*⁽⁶⁾ compared to (8.3%) on our study. However, brain MRI was not performed to all patient on our study; therefore, the possibility of cortical involvement cannot be completely excluded and that may explain the higher

incidence of seizures compared to Benetes *et al.*⁽⁶⁾. The current study detected (26.3%) of seizures were due to cardioembolic infarcts and that was higher than that detected by Broderick *et al.* (25.4%).

In the current study, (66.6%) of seizures occurred during the first 24 hours of stroke onset. Lamy *et al.* also found that 70–90% of early poststroke seizures occurred during the first 24 hours. Also, Seizures After Stroke Study showed that 70% of seizures had occurred during the first 24 hours. Similarly, non-convulsive status epilepticus incidence were higher during the first 24 hours which account for (66.7%) which was similar to that found by Afsar *et al.*⁽¹³⁾

Conclusion

Ischemic stroke is considered as a risk factor for the development of seizures and status epilepticus both convulsive and non-convulsive types especially during the first twenty-four hours.

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