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Case Report: EEG Picture in a Patient with Post-Stroke Epilepsy

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ABSTRACT

Introduction: Epilepsy is a chronic brain disorder that affects people all over the world. Seizures are the most common neurologic symptom in stroke patients. Approximately 10% of all stroke patients have experienced seizures, and post-stroke seizures generally begin several years after the stroke.

Case Illustration: A male patient, 55 years old, Balinese, Kinan, came to the emergency room of Prof. Dr. I.G.N.G. Ngoerah General Hospital with complaints of seizures. The first seizure occurred on December 19, 2021, with a pattern of glancing at the left eye then, followed by full-body twitching, which lasted approximately 5 minutes and stopped on its own. The patient said that before the seizure, the patient was well conscious; during the seizure, the patient was unconscious, and after the seizure, the patient regained consciousness as before the seizure. Then, the seizure repeated the next day (December 20, 2021) with the same pattern and duration, but the patient was not taken for treatment. On physical examination, the patient was alert with vital signs and general physical examination within normal limits. Neurologic examination revealed no focal neurologic deficits. Electroencephalography (EEG) examination showed intermittent slow activity in the left and right fronto-centro-occipital areas. Computed tomography scan (CT-Scan) examination of the head without contrast revealed a hypodense image in the right temporo-parietal lobe. The patient then received anti-epileptic drug (OAE) therapy, OAE therapy given Phenytoin 200 mg every 12 hours intra-orally, Folic Acid 1 mg every 24 hours intra-orally, and anti-platelet and anti-hypertension continued.

Discussion: Post-stroke seizure (PSS) is an episode of convulsion that occurs either single or multiple after a stroke, which is thought to be due to irreversible or reversible brain damage. At the same time, post-stroke epilepsy is convulsions after a stroke that occur at least two revivals without provocation with a distance between revivals of more than 24 hours. PSS classification is divided into early post-stroke seizure, where seizures occur onset two weeks early post-stroke, and late (delayed) post-stroke seizure if seizures occur onset after two weeks post-stroke. Post-stroke seizures' most common electroencephalography (EEG) waves are generalized slow waves, focal slowing, focal sharp and slow waves, and periodic lateralized epileptiform discharges (PLEDs). However, 5.1% of patients have normal EEG. The administration of anti-convulsants to prevent recurrent seizures is recommended by the European Guidelines of The European Stroke Organization. In comparison, prophylaxis is not recommended for patients with post-stroke.

Keywords: Post-stroke Epilepsy, Stroke, Electroencephalography

INTRODUCTION

Electroencephalography (EEG) records the electrical activity of brain neurons. Fluctuations in electrical currents are obtained from voltage differences measured from electrodes attached to the scalp directly on the cerebral cortex's surface or brain tissue.[8] Seizures are the most common neurologic symptom. Approximately 10% of all stroke patients experience seizures, and post-stroke seizures generally begin several years after the stroke.[10] Epilepsy is a chronic brain disorder that affects people all over the world. The incidence of epilepsy reaches 50.4 per 100,000 population per year worldwide. Manifestations of epilepsy generally take the form of typical awakenings.[9]

If the evocation is supported by an appropriate set of symptoms based on the type of evocation, EEG picture, and brain imaging, it will be called a post-stroke seizure. Post-stroke seizures are classified into several parts, one of which is post-stroke epilepsy. Post-stroke epilepsy is the most common cause of most hospital admissions, either as a clinical symptom or as a post-stroke complication. Age is an independent risk factor for stroke, with a trend toward increasing incidence and prevalence of post-stroke epilepsy. Secondary seizures in stroke survivors have been found for many years and are considered by some to be the leading cause of epilepsy in the elderly. Although the frequency of post-stroke seizures is estimated to only range from 4% to 10%. It is common in patients with arteriovenous malformations, brainstem stroke, subarachnoid haemorrhage or a history of seizures or epilepsy. Previous assumptions, such as seizures are more common in cerebral haemorrhage or cardioembolic stroke, are not supported by solid evidence.[3] [11]

CASE ILLUSTRATION

A male patient, 55 years old, Balinese, Kinan, came to the emergency room of Prof. Dr. I.G.N.G. Ngoerah General Hospital with complaints of seizures twice. The first seizure occurred on December 19, 2021, with a pattern of glancing at the left eye then, followed by whole body twitching. The seizure was said to last approximately 5 minutes and stopped on its own. The patient is said to be well conscious before the seizure; during the seizure, the patient is unconscious, and after the seizure, the patient regains consciousness as before the seizure. Then, the seizure repeated the next day (December 20, 2021) with the same pattern and duration, but the patient was not taken for treatment. The patient and family denied a history of previous head trauma. Other complaints, such as weakness of half of the body, tingling on one side of the body, head pain, blurred vision, nausea/vomiting, loose lips, slurred speech, trauma and decreased consciousness, were previously denied.

Previous medical history: In 2016, the patient was said to have had a stroke. At that time, the patient was difficult to communicate, and when hospitalized, the patient was said to have a blockage in the blood vessels of the brain. The patient denied any history of metabolic disease, hypertension or heart disease.

On physical examination, he was found with vital signs of blood pressure (BP) 150/90 mmHg, pulse 92 x/min, breathing 18 x/min, temperature 36.7^{o}C, SpO2 98%, and NPRS 0/10. Neurological status examination obtained GCS E4V5M6 (compos mentis), nervus cranialis, and motor examination and sensibility within normal limits. No pathological reflexes were found, but there was a history of focal onset to bilateral tonic-clonic awakening. The patient was clinically diagnosed with post-stroke epilepsy.

Electroencephalography (EEG) examination showed intermittent slow activity in the left and right front-centre-occipital areas (Figure 1). Laboratory examination and Thorax RO results were within normal limits. A head Computed Tomography Scan (CT-Scan)

examination without contrast revealed a hypodense image in the right temporoparietal lobe (Figure 2). The patient then received anti-epileptic drug (OAE) therapy, OAE therapy given Phenytoin 200 mg every 12 hours intra-orally, Folic Acid 1 mg every 24 hours intra-orally, and anti-platelet and anti-hypertension continued. Education about the risk of injury while driving, side effects of drugs and the importance of regular consumption of anti-epileptic drugs was carried out to patients and families. The patient was asked to have a monthly follow-up to evaluate seizure complaints and drug side effects.

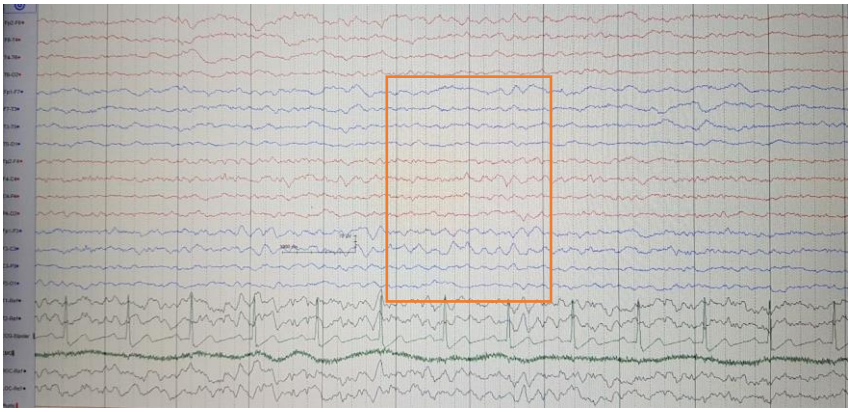

Figure 1. EEG results show a picture of Intermittent Slow Activity (ISA) in the left fronto-centro-occipital area and ISA in the right fronto-centro area.

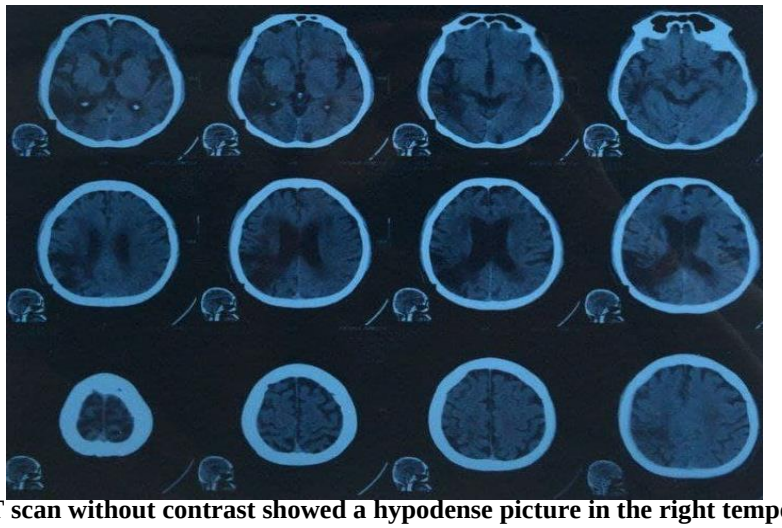

Figure 2. A Head CT scan without contrast showed a hypodense picture in the right temporoparietal lobe.

DISCUSSION

This case is a male, 55 years old, diagnosed with post-stroke epilepsy. Epilepsy is a brain disease characterized by one of the following conditions/symptoms: At least two unprovoked awakenings or two reflex awakenings with an interval between the first and second awakening of more than 24 hours; One unprovoked awakening or one reflex awakening with the possibility of recurrent awakening in the next ten years is equal to when there are two unprovoked awakenings or reflex awakenings; And a diagnosis of epilepsy syndrome has been established (by a competent doctor). Post-stroke epilepsy is an episode of convulsion that occurs either single or multiple after a stroke attack that is appropriate according to the diagnosis of epilepsy. In general, about 5-15% of stroke patients will develop a seizure within two years of their stroke. Brain ischemia can cause *reversible* or *irreversible* damage that will trigger disorganized electrical activity, which in turn leads to seizure manifestations.[1 3 5]

The classification of epilepsy itself is grouped into three groups, including idiopathic epilepsy, cryptogenic epilepsy, and symptomatic epilepsy. Idiopathic epilepsy is epilepsy with generalized seizures with an unknown cause of seizures. It is generally due to genetic predisposition. Cryptogenic epilepsy is epilepsy that is considered symptomatic, but the cause is unknown, as in West syndrome, Lennox gestalt syndrome, and myoclonic epilepsy. Symptomatic epilepsy is when there is an underlying structural lesion in the brain, for example, secondary to head trauma, central nervous system (CNS) infection, congenital abnormalities, space destructive processes in the brain, vascular disorders in the brain, toxic (alcohol, drugs), metabolic disorders and neurodegenerative disorders. In this case, it was found that the patient had experienced a previous stroke attack, so epilepsy experienced by the patient was included in the symptomatic type of epilepsy. Bladin et al. found that the incidence of seizures ranged from 10.6% of 265 patients with intracerebral haemorrhage to about 8.6% of 1632 patients with ischemic stroke. In another study conducted, seizures occurred in 4.4% of 1000 patients, including 15.4% with lobar intracerebral haemorrhage, 8.5% with subarachnoid haemorrhage, 6.5% with cortical infarction, and 3.7% with ischemic transient attacks in the hemispheres. Seizures representing intracranial haemorrhage ranged from 30% to 1402 patients. There are two epilepsy classifications recommended by the International League Against Epilepsy (ILAE), namely in 1981 and 1989. ILAE in 1981 determined the classification of epilepsy based on the type of generation (type of epileptic seizure): 1. Partial attacks are divided into two groups, namely simple partials and complex partials. In simple partials, good consciousness, while in complex partials, disturbed consciousness symptoms include motor, sensory, autonomic, and psychic; 2. Generalized seizures (disturbed consciousness) symptoms include absans / lena, atonic, tonic, clonic, tonic-clonic, and myoclonic.[1 3 5 11]

Based on ILAE 2017 classifies the type of awakening into several parts, namely:[8]

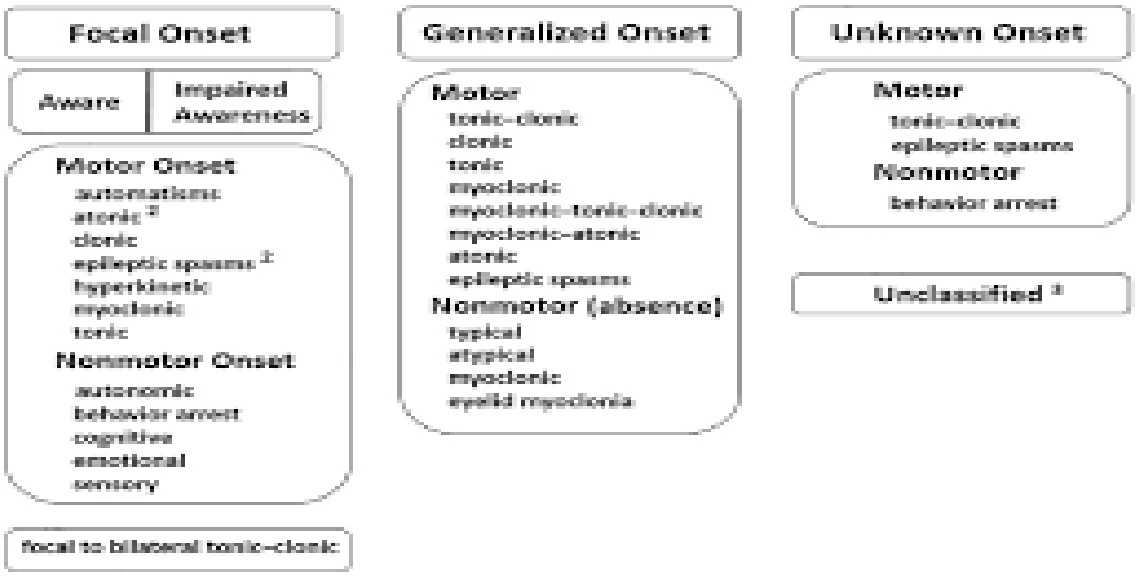

Figure 3. ILAE 2017 classification of evocation types.

In this case, the seizure occurred with a glancing eye pattern towards the left then, followed by a full-body glance accompanied by a decrease in consciousness as the seizure progressed so that the type of seizure generation in the case was a focal to bilateral tonic-clonic seizure.[8]

EEG plays an essential role in diagnosing and classifying epilepsy. EEG can provide information for predicting anti-epileptic drugs and the location of the epileptogenesis trigger. One study reported the appearance of PLED waves in the penumbra area in rats with focal ischemia. At the same time, Intermittent Rhythmic Delta Activities (IRDAs) appeared in the contralateral heifer area, mainly in the frontal and parietal lobes in early post-stroke seizures. Another study found PLEDs in late post-stroke seizure only occurred in a few cases, while focal slowing in the infarct area was more common; on the other hand, another study suggested PLEDs were more common in early post-stroke seizure (25%) while in late post-stroke seizure about 1%. IRDAs and diffuse slowing waves were seen in 26.5% of patients with late post-stroke seizures. The most common EEG waves found in post-stroke seizures were generalized slow waves, focal slowing (19.5%), focal sharp and slow waves (9.8%), focal spikes and slow waves (4.9%), focal sharp waves (4.9%), focal spike waves (2.4%) and PLEDs (2.4%). About 17.1% of patients had normal EEG. In this case, based on the EEG results that have been carried out, it is found that there is a picture of intermittent slow activity in the left and right fronto-centro-occipital areas.[1 10]

Silverman et al. (2018) presented the results of their study of 90 patients with early post-stroke seizures, having a seizure pattern of simple partial seizures (61%) and 28% with secondarily generalized seizures. De Reuck et al. (2019) reported that simple partial seizures occurred in about 50% of cases, while complex ones were about 25%.[9 11]

The goal of therapy in epilepsy cases is no seizure symptoms and few side effects. The principle of epilepsy therapy is to use monotherapy. ILAE recommendations for the administration of anti-epileptic drugs (OAE) for partial seizure types, namely Carbamazepine, phenytoin, topiramate, oxcarbazepine, levetiracetam, lamotrigine and valproic acid. In adults with generalized seizure type, valproic acid, levetiracetam, topiramate, lamotrigine, phenobarbital, phenytoin, Carbamazepine, and oxcarbazepine. The European Guidelines of the European Stroke Organization recommend the administration of anticonvulsant drugs to prevent recurrent seizures in post-stroke seizures. Meanwhile, prophylactic administration of anticonvulsant drugs in stroke patients who do not experience seizures is not recommended.[8 9]

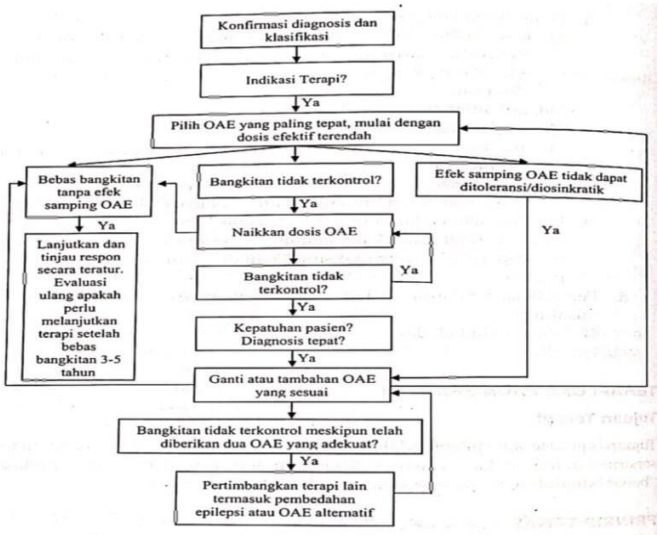

Figure 4. Epilepsy Management Algorithm.

In this case, phenytoin was given at 300mg/day. Phenytoin can be given with an initial dose of 15-25 mg/kg, a maintenance dose of 300 mg/day, or 5-6 mg/kg/day at

three divided doses or one to two divided doses for gradual release. Phenytoin is effective for focal to bilateral tonic-clonic awakening. In addition, phenytoin also rarely causes Steven-Johnson syndrome compared to the administration of OAEs such as Carbamazepine, which, according to the literature, often causes Steven-Johnson syndrome. The administration of folic acid 1x1 mg in the case was intended to reduce the side effects of phenytoin, as it is known that phenytoin has side effects of bone marrow depression. All guidelines suggest that gradual discontinuation of AED therapy can be considered after 3-5 years of absence. The quo ad vitam prognosis is good if the patient takes anti-epileptic drugs regularly. Quo ad functionam dubia and quo ad sanationam dubia.[1 6 8 9]

CONCLUSION

In this case report, a 55-year-old man was diagnosed with post-stroke epilepsy, which is an episode of convulsions that occurs either single or multiple after a stroke that is appropriate according to the diagnosis of epilepsy. The diagnosis of epilepsy is based on a directed history, physical examination and supporting examination. Based on the results of the history that has been taken, the patient meets the criteria for post-stroke epilepsy, with a physical examination (clinical neurological) obtained a history of focal to bilateral tonic-clonic awakening, and supporting examination provides results that support the diagnosis in the patient. In choosing therapy, it is recommended to use OAEs with the supervision of side effects and possible resistance, as well as considering the underlying aetiology. Education related to basic knowledge of epilepsy for patients and families is essential.

Declaration by Authors

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