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Reference: 1. Guerrini R. Valproate as a Mainstay of Therapy for Pediatric Epilepsy. *Pediatr Drugs* 2006;8(2):113-129.

For full prescribing information refer to the package insert(s) approved by the medicines regulatory authority.

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Lifelong Learning

Investigating a Seizure: Is it Epilepsy?

Epileptic seizures have varied symptoms and many paroxysmal events can be imitators of epileptic attacks. A detailed eyewitness report of the patient's behaviour during a seizure can be a valuable diagnostic tool.

Epilepsy is a disorder of the brain characterised by a predisposition to recurrent seizures together with particular neurobiological, cognitive and psychosocial consequences. Unfortunately, the word 'seizure' is used by health professionals to mean different things: for most, it refers to a convulsion, usually epileptic, but for others it refers to a convulsion and also to loss of consciousness from causes other than epilepsy.

Epileptic seizures, either first-ever or break-through, must be clearly differentiated from other paroxysmal events because of the different prognoses and therapeutic approaches. This article discusses the investigation of a patient with a seizure, with a view to confirming the diagnosis, defining the aetiology and assessing the risk for recurrence.

Diagnosis and differential diagnoses

The best way of identifying an epileptic seizure is from a detailed description of the patient's behaviour during the event. Obtaining a precise history from eyewitnesses soon after the event is paramount. This information becomes increasingly difficult to obtain as time passes.

Epileptic seizures have varied symptoms and many paroxysmal events can be imitators of epileptic attacks. These other causes of transient neurological disturbance and collapse include syncope, hyperventilation, toxic and metabolic disturbances, cardiovascular disorders, sleep disorders, paroxysmal dyskinesias, hemifacial spasms, paroxys-mal vertigo, trigeminal neuralgia, migraine, transient global amnesia, psychogenic seizures, episodic dyscontrol and psychiatric dissociative states. It is estimated that 20 to 30% of paroxysmal events are misdiagnosed as epileptic seizures because of an incomplete history or a poor description of events.[1]

One of the most common misdiagnoses is that of convulsive syncope, where a patient may have body jerks as a consequence of cerebral hypoperfusion during a syncopal attack. The clues in the history and physical examination that distinguish seizures from syncope are outlined in the Table. Although presyncopal symptoms and signs such as lightheadedness, fading vision and hearing, sweating and pallor may be useful indicators of an imminent event, they are often not good discriminators of syncope and epilepsy.

Symptomatic seizure, first seizure or epilepsy

Not all patients who have a first seizure have epilepsy. Some of these patients have acute symptomatic seizures that occur at the time of a systemic insult or in close association with a documented brain injury. It is estimated that the incidence of acute symptomatic seizures ranges from 29 to 39 per 100 000 per year, and common causes include traumatic brain injury, cerebrovascular disease, drug withdrawal and metabolic insults.[2]

Overall, about 40 to 50% of untreated individuals can expect to have a recurrence within two years of an initial seizure.[3] Treatment can reduce this risk

Key points

- A detailed eyewitness report of the patient's behaviour during a seizure can be a valuable 'diagnostic tool'. The best chance of obtaining this is when the patient presents.
- EEG remains the best diagnostic test for epilepsy but has a low yield unless prolonged studies are performed.
- Structural brain imaging abnormalities may be found on MRI in almost half of adults and up to one-third of children who present with a first seizure.
- Metabolic derangement is the aetiology for a seizure in only a small proportion of patients.

About the author

Dr Armin Mohamed, *MB BS(Hons), BSc(Maths), FRACP is Clinical Associate Professor in Medicine at the University of Sydney, and Director of the Comprehensive Epilepsy Service and Senior Staff Specialist, Positron Emission Tomography, at the Royal Prince Alfred Hospital, Sydney, Australia.*
Associate Professor Christopher S Pokorny, *MB BS, FRACP, FRCP, FACG is Conjoint Associate Professor of Medicine, University of New South Wales, and Visiting Gastroenterologist, Sydney and Liverpool Hospitals, Sydney, Australia.*

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TABLE

Distinguishing features of syncope versus epileptic seizures[1]

Feature	Syncope	Epileptic seizure
Occurrence	Provocation by prolonged standing, hunger, heat, pain, micturition, cough, etc	In the context of sleep deprivation, drug or alcohol withdrawal, intermittent flashes, etc
Automatism	No automatism	Oroalimentary automatisms, manual automatisms, complex behaviour
Duration	10 to 30 seconds	1 to 2 minutes
Symptoms	Flaccidity, with or without brief myoclonus, opisthotonus (rare)	Strained cry, tonic-clonic jerks, severe tongue biting, incontinence, limb posturing
Postictal phase	Minimal (few seconds)	Several minutes

by up to half. Therefore, success or failure of treatment with anticonvulsants cannot be used to judge whether the diagnosis was correct. Patients with abnormal EEGs or identifiable neurological conditions have greater risks of recurrence.[3]

Once it is has been established from the history that the event was probably an epileptic seizure, tests are performed to search for an underlying treatable cause and, in the case of a first seizure, to assess the risk of recurrence. The diagnostic evaluation should also aim at determining whether the patient has a generalised or partial epilepsy syndrome. This distinction is important because it will determine the choice of anticonvulsant if treatment is to be initiated.

Investigating patients following a seizure

Electroencephelography

Although the EEG is the most important diagnostic test for epilepsy, it is important to recognise that the detection of epileptiform activity on a routine 20-minute EEG recording in wakefulness ranges from 12 to 27%.[4,5] In addition, 10 to 20% of patients with epilepsy do not demonstrate interictal epileptiform abnormalities, and 2,8% of children and 0,4% of adults have paroxysmal epileptiform discharges in the absence of epileptic seizures.[6] Therefore, the interpretation of the interictal EEG requires considerable expertise and correlation with the clinical data. The only way a definitive diagnosis of epilepsy can be made is if a seizure is recorded. Long-term EEG recordings are the most effective way to evaluate epileptic attacks.

The presence of interictal epileptiform activity on the EEG indicates an increased risk of seizure recurrence.[7] Despite the heterogeneity of the characteristics of cohorts in first seizure studies, EEG abnormalities and the underlying aetiology are consistently found to be the best predictors for seizure recurrence. An EEG performed when the patient is sleep-deprived may increase the yield of epileptiform changes.[8,9]

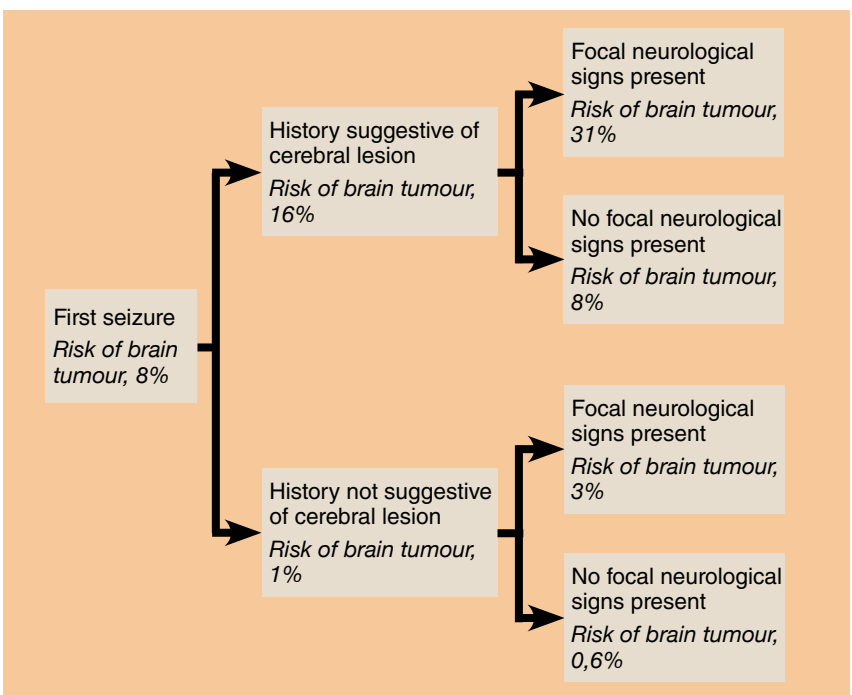

Figure. Risk of a brain tumour in a patient with a first seizure[16]

Laboratory tests

Sodium disorders and the resultant effects on osmolality, and hypocalcaemia, hypomagnesaemia and hypoglycaemia are the main metabolic abnormalities that lead to seizures. Seizures generally occur if the serum sodium concentration rapidly decreases to below 115mmol/L. Hypocalcaemia is defined as a serum calcium level of less than 2,13mmol/L or an ionised calcium concentration below 1,0mmol/L. Hypomagnesaemia is defined as a serum magnesium concentration below 0,8mmol/L. Seizures, usually generalised tonic-clonic, can occur in neonates and adults in association with severe hypomagnesaemia, at serum magnesium levels below 0,5mmol/L.[10]

Routine blood testing (levels of glucose, electrolytes and calcium, and full blood count) is expected to show significant metabolic abnormalities in only a small proportion of patients.[11] Additional blood and urine testing should be performed only when clinically indicated (eg, by screening for alcohol or illicit drug

use). The utility of laboratory testing outside the emergency room setting is questionable. The prevalence of metabolic abnormalities has been reported to range from 0 to 15% and rarely to be of clinical significance.[12] However, patients who present with a seizure to an emergency department should have these metabolic tests performed.[13]

Lumbar puncture

If there is clinical reason to suspect an infectious aetiology then a lumbar puncture might be appropriate. However, only a few studies have explored the utility of lumbar puncture in patients with single unprovoked seizures, and there is no evidence to support routine CSF examinations in patients with such seizures.

ECG

When a diagnosis of epilepsy is not definite, a routine ECG is recommended to exclude a long QT interval and to look for other conduction abnormalities that may have led to convulsive syncope.

Brain imaging

Despite the improvement in imaging that magnetic resonance offers over CT, the CT scan is the fastest and most widespread brain imaging modality available. Nevertheless, CT has a low sensitivity (4% to 6%) in the absence of abnormal neurological signs.[14] MRI is the best method for structural imaging, being able to detect an abnormality in 47% of adults and up to one-third of children who present with a first seizure. However, it is not available to general practitioners.

It is, therefore, wise to obtain a CT scan in a patient who presents with a first-ever seizure or who has a focal neurological abnormality on examination. If the history in a patient with a first seizure is suggestive of a cerebral lesion and there are focal neurological signs, there is a 31% probability that the patient has a brain tumour (Figure).

However, if the history and physical signs are not suggestive of a focal lesion, the chance of a brain tumour is 6 in 1000 (0,6%).[16]

Conclusions

EEG remains the best diagnostic test for epilepsy but has a low yield unless prolonged studies are performed. EEG is also important in defining the epilepsy syndrome present, which may have a bearing on the choice of antiepileptic medications.

Structural brain imaging abnormalities may be found on MRI in almost half of adults and up to one-third of children who present with a first seizure. CT has a low sensitivity in comparison but may be useful in patients with focal neurological signs and in the emergency setting. Patients with first seizures who present to the emergency department should have laboratory testing performed and also a drug screen if clinically indicated. Metabolic derangement, however, is the aetiology in only a small proportion of patients with a seizure. A lumbar puncture should only be considered if there is clinical reason to suspect an infectious aetiology.

References are available on request.