

Epilepsia Arithmetices

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Epileptic seizures are usually spontaneous and unprecipitated. In about 7% of all epileptics the seizures are precipitated by some highly specific stimuli (Reflex epilepsies).¹ In most of these reflex epilepsies the stimuli are derived from the external environment.² Rarely the evoking stimulus may be within the internal milieu of the patient. A case in which seizures were precipitated by concentrating on mathematics or mathematical problem is reported here.

CASE REPORT:

An 11 year old island student put his right hand through a glass window and suffered multiple lacerations. He required four operations. While being premedicated for the fourth operation he had his first grand mal attack which lasted a few minutes. No further attacks occurred till the age of 14. One day he was found lying with a small cut on the forehead and frothing at the mouth. Some months later he had another attack while tying a rope to a post. Anticonvulsants were prescribed. In the next 18 months seizures occurred at intervals of 3-6 weeks. His school work deteriorated.

He was first seen at the CWM Hospital aged 16 years, following a grand mal attack while repairing a punctured bicycle tyre.

He was the second eldest in a family of six. He was the product of normal pregnancy and delivery. Birth weight was 10lbs and milestones were normal. There was no history of any serious childhood illness, or head injuries. There was no family history of epilepsy, or any neurological or familial disease.

On examination he was a physically well built 16 year old. The chest, abdomen and the heart were normal. Neurological examination was normal except for a partial ulnar nerve lesion in the right hand.

He was right handed but since the injury he preferred to use the left.

A full blood count, blood urea, serum electrolytes, serum calcium, and chest and skull xrays were normal. V.D.R.L. was non-reactive. EEG showed bilaterally synchronous and symmetrical 3Hz spike and wave activity.

Phenytoin sodium and phenobarbitone were prescribed. Two months later a grand mal seizure occurred while playing ping-pong. Phenytoin sodium dosage was increased. No further attacks occurred. Twelve months later he sat a major external examination and failed. He gained 20% in mathematics, the lowest of all the five subjects. On further questioning he admitted to having difficulty with mathematics and mathematical problems since the age of 15 years. When concentrating on mathematics he would experience slight headache, numbness on the forehead and face, and this associated

with slight jerking of the head or hands. He would immediately stop doing mathematics, relax and the episodes would subside. These episodes occurred only on doing mathematics or drawing mathematical figures but did not occur while concentrating on English, Geography, History or Biology, the other major subjects at school. Once he was warned by his teacher for not concentrating during a maths lesson.

He was then subjected to solving math problems while under electroencephalographic control. Several paroxysms of 3Hz spike and wave discharges occurred. These were associated with slight jerking of the head or the hand. No EEG discharges occurred while doing Geography, History, Biology and on reading, drawing simple figures and looking at photographs. He was again subjected to mathematical drawing and again paroxysmal EEG dysrhythmias occurred accompanied by slight jerk of the head or the hand. EEG changes occurred whether he was doing mental or written maths problems.

Review of school marks showed poor performance in mathematics during the only year at school in Fiji. Also his school record revealed low interest scores for numerical, clerical and sales abilities and high scores for practical and outdoor abilities on an aptitude test.

DISCUSSION

A large number of stimuli may induce seizures in epileptic patients. The evoking stimuli may be visual as in photogenic epilepsy. In this condition a number of stimuli such as passing from dim to bright light, driving along a tree-lined road when the sun is shining through the branches of the trees, watching a wheel revolving, a pendulum swinging or when viewing television,³ (television epilepsy) may induce an attack. Seizures may be induced by auditory stimuli such as a loud noise or a particular music (musicogenic epilepsy). Likewise cutaneous stimuli such as touching, rubbing, hurting a particular part of the body¹ and contact with water⁴ may precipitate attacks. Other examples of reflex epilepsies are movement-induced attacks, reading epilepsy⁵, and language-induced⁶ (attacks occurring with reading, writing and speaking). In all the above reflex epilepsies, with a possible exception of reading epilepsy, the evoking stimuli are derived from the external

environment.

In rare cases of reflex epilepsies the evoking stimuli may be internal and reside in the higher cognitive functions of the brain as in attacks evoked by decision making² and in Epilepsia Arithmeticae.⁷ The term Epilepsia arithmeticae was first used by Ingvar and Nyman to refer to a type of epilepsy pertaining to the art of calculation. They described a 19 year old patient with both minor and major epileptic attacks. The minor attacks were provoked by the performance of simple arithmetical calculations and were accompanied by irregular bilaterally synchronous 2.5 to 3Hz spike and wave activity during which the patients' consciousness was impaired.

In the case described here, some of the attacks occurred when the patient was concentrating as in fastening a rope, playing ping pong and repairing a punctured tyre. Concentrating on mathematics or mathematical problems consistently caused 3Hz spike and wave discharge which were associated with myoclonic jerks. No E.E.G. arrhythmias or myoclonic jerks occurred when concentrating on non-mathematical problems. Low marks in the external examination, poor performance in mathematics at school, low scores for numerical, clerical and sales abilities on aptitude test all of which involve considerable calculation, indicates a very high specificity of mathematics or calculation as an evoking stimulus. As is not uncommon in reflex epilepsies, this patient was willfully able to avert the attacks by diverting his concentration away from mathematics.

SUMMARY

A case of epilepsia arithmeticae is described in a 16 year

old student. He developed grand mal seizures at the age of 11 years. There was deterioration in his school work which was most obvious in mathematics. Very low marks in a major school examination led to further investigations which revealed poor performance in mathematics at school and poor calculating abilities on aptitude testing. Concentrating on mathematics or mathematical problems consistently caused 3Hz spike and wave discharges on electroencephalogram and was associated clinically with slight myoclonic jerks of either the head or hand.

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