

Epilepsy in Childhood

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The epilepsies are defined as a group of conditions characterized by recurrent seizures.

In 1890, Sir Hughlings Jackson defined a seizure as "an occasional excessive and a disorderly discharge of nerve tissue" and we have not improved that definition in the past 90 years. A seizure is a symptom of this excessive neuronal discharge and is not a disease unto itself.

Statisticians report the incidence of seizures as one in two hundred, but this information usually refers to the general population or to adults; it is estimated that 5% of children have seizures and that a significant number of these children have recurrent seizures or epilepsy.

Of considerable interest and concern is the alarming increase in the number of young children with epilepsy and this may be explained by the increase in survival of neonates of less than 2500 grams birth weight. Many of these neonates have convulsions.

In a report by Bray and his associates, of 154 patients in the neonatal nursery weighing less than 2500 grams, 31 had seizures or an incidence of 20% of these patients with seizures and subsequently many of them continued to have recurrent seizures or epilepsy.

The recent emphasis on the International Classification of Epilepsy has been an attempt to encourage physicians to understand both the clinical appearance and the electroencephalographic concomitant of various types of seizures. Most new texts of neurology and recent articles in journals have utilized this classification.

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Briefly, the important points of this classification are:

- I. Partial seizures or seizures beginning locally. A sub-category of this is (A) simple partial seizures or seizures without loss of consciousness. Jacksonian seizure would be an example of this type.
(B) Another subcategory is complex partial seizure in which there is loss of consciousness. This is the term that is now used in place of psychomotor or temporal lobe epilepsy.
(C) A third subcategory consists of partial seizures that are secondarily generalized.
- II. The second major category is generalized seizures, that is, there is clinical and electrographic evidence of bilateral onset of the seizure. A large variety of seizures are included in the classification, but two of the most interesting are tonic-clonic seizures (grand mal) as well as absence petit mal seizures. Although, in the past, we have tended to separate these with one being considered a major motor seizure and the other a minor motor seizure, they are generalized at the onset both clinically and as defined by the electroencephalogram.
- III. The third major category consists of unilateral seizures or those that are predominantly unilateral and
- IV. the fourth category unclassified seizures, these being unclassified because of incomplete data

In summary, the International Classification of the Epilepsies consist of;

- I. Generalized Epilepsies
- II. Partial Epilepsies
- III. Unclassified Epilepsies

Unfortunately, as clinicians we may find it difficult to be so exact in classifying the type of seizure in children because of lack of opportunity to witness the onset of the seizure, was it focal or generalized ?; an inability of the patient to describe the onset (usually the patient is unconscious or amnesic for the episode); the child may have a changing pattern of seizures and variability of the type of seizure.

In children the cause or etiology of epilepsy is multi-factorial. Factors implicated in the cause of seizures in children include genetic disorders, difficult labor and delivery, head trauma, nutritional or toxic disorders and brain tumors.

Metabolic disorders especially hypocalcemia, hypoglycemia and hypo or hypernatremia play a major role in causing seizures.

Infections of the central nervous system, either meningitis of bacterial or viral origin or encephalitis are common causes of epilepsy.

The evaluation of a child with epilepsy includes the taking of a careful history, general examination, neurological examination laboratory studies with which all of you are familiar.

If this examination reveals an immediately treatable cause of the epilepsy, e. g. hypoglycemia, then the treatment is specific.

In most children with epilepsy, anticonvulsant medication is necessary.

Much of the recent advance in the treatment of epilepsy has been in the addition of new drugs for controlling seizures and better knowledge about the pharmacokinetics i.e. absorption, distribution, metabolism and excretion of these drugs.

With the advent of a relatively simple and inexpensive technique for determining serum levels of anticonvulsant medications, we have learned that the half life of these medications is much longer than we had anticipated and this has made a unique contribution to our ability to treat children with epilepsy.

The half-life of a drug is the time that it takes for the concentration of the drug in plasma, at the time of its peak level after a single dose at multiple doses and at a steady state, to decline 50%.

Those of us who have been treating patients with seizures for many years and have usually recommended 2, 3 or 4 times daily medication have been astounded by the extremely long half-life of the most prescribed anticonvulsants:

We have learned that once the medication reaches a steady state in plasma, it can be given once or at most twice daily if the half-life of the drug is sufficiently long. This is especially helpful in children and young adults in whom compliance is uncertain.

Children are much more likely to take their medication once daily at bedtime than once in the morning, carry it to school and have the teacher present it to them at mid-day and then taking it at bedtime.

The half-life of Phenobarbital is approximately one and a half to three days, the half-life of Phenytoin 12-36 hours, Ethosuximide 24-48 hours and Carbamazepine 12-17 hours.

In a recent study, patients were given Phenytoin in as 100mg. three times daily and other patients given Phenytoin 300mg. once at bedtime. The serum level of the anticonvulsants in each of these groups of patients was the same and the control of seizures was the same and would seem appropriate in that the patients only have to receive their medication once daily. The same has been true for Phenobarbital.

In addition, the assessment of anticonvulsant levels has taught us that patients vary tremendously on how they metabolize the medication. Some require very high doses to reach levels considered sufficient for control of seizures.

Significant anticonvulsant levels for Phenytoin is 10-20 micrograms per ml; Phenobarbital 20-40 micrograms per ml; Carbamazepine 4-10 micrograms per ml; Ethosuximide 60 to 100 micrograms per ml and for the newer Valproic Acid, the levels have not been fully standardized, but 60-130 micrograms per ml is considered a reasonable range of plasma level.

In summary, the epilepsies are defined as a group of conditions characterized by recurrent seizures.

This definition and the changes recorded in the electroencephalogram have lead to an International Classification of Epilepsies. Seizures are classified as partial seizures or seizures beginning locally, generalized seizures that are bilaterally symmetrical and without local onset, unilaterial seizures and an unclassified group. Seizures are also classified according to specific electro-encephalographic patterns.

It is estimated that 5% of children have seizures and that a significant number of these children have recurrent seizures or epilepsy.

Multiple etiology factors are important and must be evaluated in childhood epilepsy. In 75 to 80% of children with epilepsy, no specific cause can be determined. Factors implicated as causative agents in children with epilepsy include; anoxia, intracranial hemorrhage, injury in the perinatal period, congenital abnormalities of the central nervous system, toxic, metabolic and inflammatory encephalopathies.

The most effective method of treating epilepsy is removal of the causative factors or agent. If the etiology is unknown or cannot be removed, anticonvulsant medication is effective in reducing the number and severity of seizures and, in most instances, of stopping the seizures.

Selection of the anticonvulsant medication depends on the type of seizure, the findings on the electroencephalogram and the response of the patient to a specific medicine. Most epilepsies in childhood can be controlled with succinimide, a barbiturate or hydantoin. The newer anticonvulsants, Carbamazepine and Valproic Acid are additional medications that are proving to be very effective in controlling epilepsy in children;

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