Focal and Multifocal Seizures

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FOCAL AND MULTIFOCAL SEIZURES

Focal seizures originate in one region of the brain, where they may stay confined or spread to other areas

(*partial seizures, IS NOT USED ,ELSE)*

If a discrete area of eloquent cortex is involved, the first manifestation may be an aura—

something that only the patient can describe. If the seizure propagates into bilaterally distributed networks, the patient will likely become unaware of subsequent phases of the seizure. In the past this was referred to as the *complex phase of* the seizure. The simple term *unaware might also suffice.*

Multifocal seizures arise from multiple locations. and may respond differently to medications.

focal epilepsies account for about 60% of all seizure disorders.

The behavioral manifestations of focal seizures relate not only to the region of the brain involved during the ictal discharge, but also to the maturation of the nervous system and the integrity of the pathways necessary for clinical expression.

This is particularly true in infants and children with diffuse encephalopathies, in

whom brain immaturity, diffuse cerebral dysfunction, or both make manifestations of focal seizures difficult to recognize

In a majority of children with focal seizures, no focal

structural lesion is present, and the seizures may be the expression of a self-limited polygenic disorder (e.g., benign rolandic epilepsy).

This finding is in contrast to adults, in whom a focal seizure strongly implies the presence of a focal structural lesion (e.g., stroke, brain tumor)

The prognostic value of seizure classification by itself is Limited two children with the same seizure type can have markedly different

outcomes, so establishing an epilepsy syndrome diagnosis is the best way to determine prognosis and management

three most important factors contribute to the diagnosis of a syndrome,, :

1. Age and development of the patient
2. Type or types of observed seizures
3. Interictal electroencephalogram (EEG) features

Children with focal or multifocal seizures often have interictal focal or multifocal epileptiform discharges in their routine EEGs .

In EEG, *multifocal is* defined as having three or more foci collectively involving both hemispheres.

Children with multifocal seizures (e.g., multifocal migratory focal seizures of infancy, Dravet syndrome) almost invariably have evidence of concomitant diffuse cerebral dysfunction.

And EEG background is often slow, without normal Organization.

- Classifications that emphasize alteration of consciousness
- have substantial limitations in pediatrics. It may be very difficult
- or even impossible to accurately determine alteration of
- consciousness in the preschool child.
- So, old classification (simple or complex partial is not helpful)

SEIZURE SEMIOLOGY INDICATING A FOCAL SEIZURE(NEW CLASSIFICATION)

Aura*

- Behavioral arrest (in most cases, although patients with absence also have behavioral arrest)
- Focal clonus
- Focal dystonic posture
- Focal limb automatisms
- Spasms (approximately one-quarter of patients with spasms have associated focal seizures)
- Tonic postures (particularly asymmetric tonic posture, although symmetric tonic postures also are seen in infants with focal seizures)
- Version (involving the head, eyes, or both)

AURAS

Auras are supportive of the diagnosis of a focal seizure.

A special sensory or psychogenic phenomena that are perceived only by the patient.

occur in a variety of forms and have important localizing value. the concurrent ictal EEG often does not reveal clear electrographic expressionin most patients. discharges arise from subcortical

structures, so the EEG may reveal little to no change

AUTONOMIC

Rarely, the only manifestation of a focal seizure is through the autonomic nervous system.

Some examples include an increase in heart rate, oxygen desaturation, pallor, and piloerection in one region of the body.

AUTOMOTOR

Limb automatisms such as rubbing or fumbling of the hands, or picking at the air, that

may be seen in focal seizures. Oral automatisms, such as lip smacking, can occur with generalized absence seizures, but unilateral limb automatisms suggest a focal process.

BEHAVIORAL ARREST OR HYPOMOTOR

sudden, abrupt cessation of ongoing activity or a marked change in demeanor, as indicated by subtle but distinct changes in facial expression.

Parents easily identify these features because they represent a clear paroxysmal alteration in the child's behavior .

To assess consciousness accurately, test items must be given and recall tested after the seizure.

In children, this often is not possible, so the simple description of a behavioral arrest is more reliably used, rather than trying to infer if the patient was unaware during the seizure. Behavioral arrest seizures also have been described as hypomotor seizures.

The electrographic ictal accompaniment often emanates from the temporal lobe or posterior quadrant and may be composed of monotonous rhythmic delta or theta-alpha patterns with an electrographic “crescendo” appearance, or low-voltage fast discharges that subsequently evolve to other rhythms.

In children above age 3 years, behavioral arrest

may accompany both focal and generalized seizures (absence seizures), however, because absence seizures rarely occur in children less than age 2.5 years, it is likely to be the correlate of a focal seizure in this age group.

CLONUS OR MYOCLONUS—FOCAL

Hand or arm clonus (clonic seizure) or myoclonus is another reliable feature of focal epilepsy.

This activity is easily recognized as ictal by the repetitive nature of the jerking in the case of clonus or the sudden isolated jerk of myoclonus.

seizures can sometimes be distinguished from jitteriness or tremor by the inability to suppress the motion by passive restraint.

Clonus is usually accompanied by runs of rhythmic spike discharges in the contralateral rolandic region.

EEG correlate of myoclonias is most often spikes or spike-wave discharges in the contralateral hemisphere.

DIALEPTIC OR DYSCOGNITIVE

Dialeptic or dyscognitive seizures are those in which the main manifestation is an alteration of consciousness.

Because consciousness and ongoing cognition are very difficult to assess in the young and because children tend to be more active when awake, the most conspicuous manifestation of a focal seizure with dialeptic features often tends to be an arrest of movement (hypomotor).

EPILEPTIC SPASMS WITH ASYMMETRIC FEATURES

Spasms can be recognized by their tendency to recur in clusters, many times in an almost periodic fashion.

Spasms have a quick or myoclonic component at the start, followed by a brief sustained posture (tonic phase), followed in turn by a relaxation.

Spasms that are asymmetric, occur in a child with hemiparesis or other focal pathology, or that are associated with marked inter hemispheric asymmetries on EEG could be considered to be a form of focal seizures . In about 25% of patients with spasms, clear electrographic focal seizures + diffuse electro decrements.

GELASTIC

Gelastic seizures are rarely seen but important to recognize because of their association with hypothalamic hamartomas or with lesions in the frontal lobe.

They are characterized by brief epochs of "mirthless" laughter

HYPERMOTOR

Hypermotor seizures : large movements, resulting in a violent appearance of the event.

Although they have been noted to arise from the mesial frontal ,supplementary sensorimotor area, or other regions of the

frontal lobe in adults, they may also be seen in temporal lobe seizures in children.

TONIC

Tonic postures, both symmetric and asymmetric, are seen with focal seizures. It is surprising to observe how often symmetric tonic postures can occur as a manifestation of a focal seizure in infants .

It is possible that these tonic postures are generated in deeper brainstem or subcortical structures .

This finding would explain why some asymmetric tonic postures can be reversed by passive turning of the head during a seizure, in a fashion similar to the tonic neck reflex elicited in the newborn.

As the child matures, symmetric tonic postures are seen less frequently as a manifestation of a focal epilepsy.

Instead, tonic postures become more asymmetric and show more lateralizing features.

VERSIVE

sustained lateral version of the eyes.

In contrast with older children and adults, in whom the electrographic discharge

often is best developed in the contra lateral frontotemporal region, the ictal discharge in infants is more often in the ipsi lateral

occipital lobe.

ONTOGENY OF FOCAL SEIZURES

The clinical expression of focal and multifocal seizures changes with age Features, that occur with more regularity with increasing age include aura, limb automatisms, dystonic posture, secondary generalization, and unresponsiveness.

In contrast, the frequency of asymmetric clonus and symmetric tonic posturing decreases with age.

The fully developed so-called “automotor” sequence with ipsilateral distal hand automatisms and contralateral dystonic hand posture is not seen in children less than 2 years, and only rarely between 2 and 6 years. Instead, infants often pause their ongoing behaviors, have slight version of the eyes, and show no other outward features.

Two of the most important ictal manifestations in infancy are diffuse tonic postures and infantile spasms. Diffuse tonic postures, even symmetric ones, are common during infantile focal seizures.

Focal seizures in the immature do not frequently tend to go on to orderly secondary generalization. Instead, seizures may spread more diffusely to involve the entire hemisphere, or may arise in the homologous region of the contralateral hemisphere, but they do not tend to develop rhythmic, generalized, and synchronized spike-wave discharges. This characteristic of bilateral secondary synchrony is seen with increasing frequency with maturation and becomes more common after age 6 years.

MANAGEMENT

Although it is important to distinguish focal seizures from their generalized counterparts, this simple segregation is not sufficient to guide treatment.

A broader understanding of the epilepsy syndrome, category of epilepsy, and etiology is even more important.

A good example is Dravet syndrome.

Infants with this condition will often have hemiconvulsive events early in their course. If one focused only on the seizure type, one might correctly diagnose focal seizures and be tempted to select drugs that modulate the sodium channel (e.g., carbamazepine or phenytoin), but these medications may actually worsen the underlying sodium channel dysfunction causing the epilepsy and might very well make the patient worse.

It is not always possible to define a precise epilepsy syndrome
or cause in pediatric patients, particularly early in the
course of their illness.

In our center we have found it very useful to group children into one of five categories based on the clinical presentation and prominent electroencephalographic
interictal features. two most important interictal features to segregate
the epilepsies manifesting with focal seizures are the background
and the morphology of the spikes.

If EEG studies consistently demonstrate few or no spikes and the background
is normal, it is possible there is either a deep-seated focus or a strongly familial epilepsy. The latter could be confirmed by an AD pattern of inheritance in a detailed family history.

Such AD syndromes (e.g., neonatal familial epilepsy or autosomal-dominant nocturnal frontal lobe epilepsy) may be particularly responsive to carbamazepine.

If the background is otherwise normal and there are stereotyped

focal spikes, it is likely that the underlying condition is a self-limited epilepsy such as rolandic epilepsy or Panayiotopoulos syndrome .

In the case of the self-limited epilepsies, it is possible to avoid or limit the use of daily preventative Medication.

If the background shows diffuse slowing, it is possible that focal seizures are occurring in the setting of a more diffuse encephalopathy.

Often, in these cases, there will be multifocal pleomorphic spikes. Even though the patient may be exhibiting focal seizures, a broad-spectrum agent may be a better choice of antiseizure medication.

If there is focal slowing, attenuation, or both it is likely that there is an underlying focal structural lesion. In this case the spikes will often have a pleomorphic appearance and will likely be present in the same location as the nonepileptiform activity.

These findings also imply an epileptogenic focal structural lesion, such as mesial temporal sclerosis .

Most antiseizure medication approved for use may be useful in this setting, and the final choice may depend on a variety of factors