Communication disorders associated with childhood epilepsy

Essay

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LIST OF ABBREVIATIONS

ABR	Auditory brainstem response
ADHD	Attention deficit hyperactivity disorders
AS	Absence seizures
BDMH	Brain damaged motory handicapped
BECT	Benign epilepsy with centro-temporal spikes
BFE	Benign frontal epilepsy
BPE	Benign psychomotor epilepsy
CAE	Childhood absence epilepsy
CSWS	Continuous spike wave of sleep
DLD	Delayed language development
EcoG	Electrocorticography
EEG	Electroencephalogram
EOP	Epilepsy with occipital paroxysms
ESES	Electrical status epilepticus of sleep
GTCS	Generalized tonic-clonic seizures
IPEC	Idiopathic partial epilepsies in children
LKS	Landau Kleffner syndrome
MEG	Magnetoencephalogram
MSTs	Multiple subpial transections
OAE	Otoacoustic emission
PET	Positron emission tomography
RS	Rolandic spikes
SL	Sign language
SPECT	Single photon emission computed tomography
STM	Short-term memory
TBI	Trumatic brain injury
TLE	Temporal lobe epilepsy
VNS	Vagal nerve stimulation

INTRODUCTION

Communication entails exchange of ideas and meaning between two or more persons. Failure to communicate accurately may lead to many of the problems experienced in families, in school, in social interactions and in employment. The main process of communication is language, spoken or written ***(Svoboda, 2004).***

Language is an arbitrary symbolic system that pairs sounds and signs to meanings ***(Kotby, 1980)***.

Speech is defined as acoustic vibrations resulting from patterns of movement of speech organs such as lips, tongue, jaw, palate and pharynx ***(Lawrence and Raymond, 1982).***

Epilepsy is a disorder of the brain characterized by generation of seizures and by neurological, cognitive, psychological and social consequences of this condition ***(Fisher et al., 2005).***

The brain is a dynamically changing and developing organ, especially in the early years of life. Seizures can inhibit or distort brain development as well as the related functions. Seizures interfere with brain functions by over activation, inhibition or destruction of vital brain functional pathways ***(Bishop, 1981).***

It has been noted that epilepsy may be associated with one or more of the following disorders:

1- Language problems: The seizure discharge may disrupt the language processing, which

results in delayed language in early childhood or aphasic symptoms if it occurs after language development ***(Gilmore and Heilman, 1981)***

2- Speech problems: Stuttering may be a characteristic of left complex partial seizures, as an interictal or postictal finding ***(Baratz and Mesulam, 1982).*** Also ***Lecours and Joanette (1980)*** reported that dysarthria can be seen with partial seizures involving the dominant hemisphere.

3- Behavior problems associated with childhood epilepsy include attention deficits, autism, anxiety, depression, conduct disorders and psychosis ***(Onuma, 2000).***

4- Learning problems in the form of learning disabilities are more apt to be seen with partial seizures and medication reactions ***(Dam, 1990)***.

Thus it is claimed that childhood epilepsy is very much correlated with different communication disorders. It is accused with language, speech, learning and behavioral disorders whether per se or due to the antiepileptic drugs used. Still details of this correlation are not known to phoniatricians and may be to neurologists.

AIM OF THE WORK

The aim of this work is to present a comprehensive review about communication disorders associated with childhood epilepsy, its incidence, etiology, assessment and different lines of management. This will help phoniatricians a lot in dealing with a child with communicative disorders associated with epilepsy.

Speech, Language and Communication

Man is distinguished from other creatures by acquisition and utilization of complex codes for the purpose of communication. The main process of communication is language ***(Kotby, 1980).***

Language is a dynamic complicated system of symbols, spoken or written, used in various ways for thought and for communication. Spoken language is not the only process of communication, other means of communication include reading and writing, visual symbols and telegraphy. Cognition has a primary and vital role of language. The child has to reach a certain level of cognition to start language symbolization ***(Svoboda, 2004).***

Language processing

Incoming auditory sensations are perceived and discriminated in the temporal lobe. Language stimuli are then transferred to the posterior temporo-parietal area on the dominant side to be understood. Connections to the limbic system and diffuse cortical memory areas draw upon related associations to form concepts, which are projected forwards either to the dominant posterior inferior frontal lobe to be expressed in spoken efforts or

just above that area to be expressed in a written or gestured manner ***(Gordon, 1996).***

Organization and localization of language in the brain:

The brain is neither anatomically nor functionally symmetrical. The dominant hemisphere, that handles the majority of basic language functions, is usually the left side. The non dominant hemisphere, usually the right, not only process non language functions such as perceptual-motor skills but also contributes the emotional flavor to language, adding feelings and melodious features that prevent the speech from being a flat monotone ***(Ojelmann, 1979).***

Language areas are distributed around the Sylvian fissure, the anterior language area is responsible for expression while the posterior language area is responsible for reception. ***Gordon (1996)*** reviewed the organization of language in the brain at the American epilepsy conference. The auditory discrimination, which is the distinguishing between various speech sounds, is performed in the posterior superior temporal lobe. On the left, in the temporal parietal occipital junction, is Wernicke's area, where the word and phrase sound clusters are given meaning. In the inferior temporal and pre-occipital area, interpretation of the meanings of sounds and of pictures occurs on the left and right sides respectively. The information is then sent forwards to be expressed. Production of sounds and language is in the

classic Broca's expressive area in the lower pre-motor frontal area. About 90% of individuals are naturally right handed, with language function strongly in the left hemisphere. Only about 10% of individuals are left handed, often there is a family history of left handiness. Those left handed individuals with a strong family history of left handiness are more apt to have a language function shared between the two brain halves or lateralized to the right side. Those with little or no family history of left handiness may have had their language shifted to the right hemisphere because of some early brain insult.

Language development:

At 30 weeks of pregnancy, the language areas of the brain are already prominent. Language is not fully developed until nearly seven years of age. In prenatal period, language potentials, originally bilateral, tend to develop predominantly on the left side. The portion of the brain over the posterior temporal lobe known as the plenum temporale is already becoming asymmetrically prominent on the left side in 90% of fetuses (right handed individuals). This area is destined to serve receptive language functions. This area enlarges more than the similar area on the right side of the brain. The asymmetries are less marked, absent or sometimes are reserved in left handed individuals ***(Geschwind, 1972).***

In infancy, within days or weeks after birth, the newborn can distinguish different sounds. Within months,

the infant is identifying and categorizing sounds. The young child's receptive understanding precedes the expressive language skills in development. Receptive language is continually being shaped and developed in the first year of life. The first half year of life is associated with emotional vocalization and babbling. The infant practices through repetition. Then, over the ensuing half year, repetitive sounds are initiated and practiced. By around one year and certainly below two years, the infant begins to experience with single words. By two years of age, the infant is into phrases, mainly nouns and verbs ***(Geffen, 1976).***

In early childhood (2-7 years), receptive language develops before expressive language. Girls tend to develop language skills more rapidly than boys. By the age of two and half years, children have the beginning of the adult language pattern, with words, syntax and grammar basically developed. By three years of age, the child uses pronouns, adjectives and adverbs ***(Hardy, 1965).***

In late childhood (above 7 years), complex sentences and full grammar are almost developed as the language areas approaches maturity. The language areas become fully developed by around seven years of age, when the myelination is essentially completed. By the eighth year of age, articulation is fully developed. In children older than eight years, the configuration of language cortex is similar to adults ***(Risse et al., 1999).***

Kotby (1980) categorized pre-requisites for language development into four main groups:

1-Normal sensory channels.

2-Intact brain functions.

3-Intact psychological state and desire of the child to communicate with others

4-Stimulating environment.

Damage versus plasticity:

The ability of the immature human brain to adjust for insults is called plasticity. Damage to established language areas may result in a loss of language abilities, as seen in adult and older children. Damage to undeveloped areas, as in younger children, may allow the shift of development of language to other capable areas of the brain, resulting in non classical localizations or unexpected lateralization for language. The younger child may be able to compensate, after a slight developmental delay, by developing alternative sites for language functions ***(Bishop, 1981).***

Ross and Mesulam (1979) reported that the right hemisphere processes melodious tone variations, accents and inflections that give emotional feeling to language. It assists in some recognition of single words but not phrases. Damage to the right hemisphere renders a person unable to understand or to express the emotional aspects and inflections of language. The resultant language may seem featureless monotone. The language of the left hemisphere is the language of thought and logic, while the language of the right hemisphere is the language of emotions and feelings.

Up to three years of age, the child is often able to recover language fairly well after an insult to left hemisphere language areas. If the original insult has been overcome, the child usually will essentially have recovered a good command of the language, within about ten years of the insult. Left hemisphere damage after five years of age but before puberty, does not necessary result in irreversible loss of functions but incomplete recovery is still possible. Permanent speech and language problems become apparent around puberty ***(Bishop, 1981).*** However, ***Thulborn et al. (1999)*** noticed functional recovery from dysphasia after acute stroke. They concluded that, recovery of dysphasia in adults can occur rapidly and is concomitant with an activation pattern that changes from left to a homologous right hemispheric pattern.

Childhood epilepsy

Definition:

Epilepsy is a brief and usually unprovoked stereotyped disturbance of behavior, emotion, motor function or sensation which on clinical evidence results from cortical neuronal discharges. It is a recurrent transitory disturbance of brain function which develops suddenly and ceases spontaneously. It is a recurrent state of disturbance in the chemico-electrical activity of the brain characterized physiologically by an abnormal excessive neuronal discharge (dysrythmia). Single fit does not in general merit a diagnosis of epilepsy or treatment ***(Kaufman, 1995).***

Epileptic syndrome is a disorder of the brain characterized by generation of seizures and by the neurological, cognitive, psychological and social consequences of this condition ***(Fisher et al, 2005).***

Incidence:

The rates of epilepsy range between 20-70 per 100,000 populations per year. The incidence is age dependent, with a maximum in early childhood, and lowest rates in early adulthood. Incidence figures rise again in older age groups, probably because of the higher prevalence of cerebrovascular disease. The overall

risk of epilepsy is slightly higher in males than in females ***(Barry et al., 1999).***

The electroencephalogram (EEG):

Table (1): Normal EEG rhythms ***(Kaufman, 1995)***

Activity	Hz(cycles/sec)	Usual location
Alpha	8-13	Posterior
Beta	>13	Anterior
Theta	4-8	Generalized, may be focal
Delta	1-4	Generalized, may be focal

Alpha activity (8-13 Hz) is the regular activity overlying the occipital region. It is accentuated when individuals are relaxed with their eyes closed, but it disappears if they open their eyes, concentrates or become anxious.

Beta activity, frequencies faster than 13 Hz, usually has relatively low voltage and overlies the frontal region. Although present in normal persons, beta activity is accentuated when people are concentrating or anxious.

Theta (4-8 Hz) and delta (1-4 Hz) frequencies are normally detected in children and in all people as they enter deep sleep.