Epilepsy

The word originating from the ancient Greek word “epilepsia", meaning seizure, epilepsy has been recognized throughout history. The disease can be traced back to references made to the disease in literature written hundreds and hundreds of years ago. For example, in ancient Egypt, epilepsy was considered a sacred disease because of the belief that a god had entered the person. But by the medieval times, epilepsy was called the "falling sickness" and was thought to be caused by demons possessing the person.1 Today, however, we have come to know a great deal more about the medical nature of the disease, as it has continued to be a threat to our very existence. Today's knowledge of the disease can better answer to the patient's needs than it did just a few years ago. New discoveries about the disease and advancements in how to deal with the disease are being made everyday. Today, epilepsy and seizures are classified into their many different forms, some suggests as to the origins and the causes of the disease have been provided, and a wide range of diagnosis and treatment options are offered.

"Epilepsy is a neurological disorder characterized by short, recurrent, periodic attacks of sensory and motor malfunctions called seizures. Epileptic seizures are initiated by abnormal discharges of electricity from the brain. They occur suddenly and overwhelm the patient without any possibility of avoiding the fit. Seizures are brief, lasting from seconds to minutes. "The negative phenomenon that a patient might experience as a result of seizures is loss of awareness, loss of muscle tone, or loss of language."3 A nonepileptic seizure, one that is not caused by epilepsy, is an episode of abnormal behavior that is not caused by a disturbance in brain activity, but by some other problem. Abrupt drops in blood pressure, an imbalance of body fluids or chemicals, or certain psychological problems can cause nonepileptic seizures.4

There are currently more than 1.5 million Americans who have epilepsy. Active epilepsy is defined as epilepsy that has been treated with antiepileptic drugs during the past five years. The prevalence of epilepsy is 0.65%; that is, 6.5 out of 1000 people have epilepsy. More men than women have epilepsy. New cases of the disease are most common among children, with another peak occurring in the elderly. The highest rate of occurrence of new cases, or the incidence, of epilepsy is during the first year of life. The incidence of epilepsy declines over the first twenty years of life and then remains stable until age fifty-five to sixty, when there may be an increase, largely related to stroke, brain tumors, and Alzheimer's disease. By eighty years of age, the cumulative incidence of epilepsy is between 1.3% and 3.1%. In other words, there is a 1.3% to 3.1% chance that if you live to eighty years of age, you will have active epilepsy at some time during your life. By forty years of age, there is a 1% to 2% chance of having had epilepsy.5

An understanding of the human brain anatomy and physiology is important in interpreting epilepsy and its relation to its methods of diagnosis and treatment. The brain has three major subdivisions: the hindbrain, the midbrain, and the forebrain. The hindbrain consists of the medulla and the cerebellum. The medulla regulates all the automatic bodily functions such as the heartbeat, blood circulation, and respiration. The cerebellum has to do with fine body movements and muscular coordination. The midbrain contains the Reticular Activation System, which has to do with arousal and lower level auditory and eye movements. The forebrain contains the hypothalamus,

which has to do with the feelings for hunger and thirst, and the cerebral cortex. The cerebral cortex, in the forebrain, consists of gray matter and white matter. The gray matter are the cell bodies of neurons and the white matter are axons or nerve fibers called tracts or pathways. This gray and white matter are the top layer of the brain. The cortex is separated into two hemispheres that are connected to each other by fibers collectively called, the corpus callosum. The right hemisphere controls the left side of the body and has more spatial, artistic and musical abilities, and the left hemisphere controls the right side of the body and has better logical and language abilities.

The brain is divided into four lobes: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe. The frontal lobe controls the executive functions of the brain like thinking, planning, and memory. The parietal lobe is concerned with orientation in space. The occipital lobe's primary function is vision. The temporal lobe has to do with hearing, or the auditory system.

The entire brain is composed of unique cells called neurons. These neurons communicate with neurotransmitters, chemicals produced by each neuron. There are four known neurotransmitters: serotonin, acetylcholine, doparnine, and norepinephrine. As the control center of the body, the brain communicates with every part of the body through neurons.6

A more complete description of a person's disorder would include the type of epilepsy he or she has, and the kind of seizures he or she experiences. Epilepsy is classified by the specialists in this area into three major divisions. In partial (focal) epilepsy, the seizures are focused in a limited portion of the brain. In generalized epilepsy, only either no specific part of the brain can be identified as the source of the seizure, or the part that starts the seizure causes the whole brain to become involved. In epilepsy of unknown origin, monitoring has been unable to detect abnormal brain activity or has produced unclear results.7

A person with epilepsy may only experience one kind of seizure or several different kinds, either during the same episode or at different times. Seizures are classified by the behavior and changes that occur in electroencephalography (will be discussed later) during the seizure. The following descriptions are simplified from the seizure classifications established by epileptologists, physicians who specialize in treating and studying epilepsy.

Partial seizures, which begin in one part of the brain, can be classified as simple partial, complex partial, or tonic-clonic. Simple partial seizures cause one kind of movement or a strange sensation such as emotion, smell, taste, or dizziness. In complex partial seizures, the person loses awareness as the seizure begins or loses awareness after having a simple partial seizure. Almost two-thirds of people with epilepsy have complex partial seizures. Partial seizures that proceed to what are called tonic-clonic convulsions cause the body to become rigid (tonic), usually causing the person to fall to the ground and then to begin shaking or jerking as the muscles relax rhythmically (clonic).

Generalized seizures affect the whole body at the start of the seizure. Generalized seizures are characterized by loss of consciousness affecting the whole body. The person may have an absence seizure, in which awareness of surroundings is cut off; jerking of whole muscle groups (clonic seizures); muscle rigidity (tonic seizure); a tonic-clonic seizure, in which the person's body becomes stiff (tonic phase), he falls, followed by alternating stiffening and relaxation (clonic phase); or an atonic seizure, in which all the muscles suddenly relax, causing a collapse and fall.8

Some individuals experience seizures that appear to be caused by disturbances in brain activity, but are really not. Some people think they have experienced a seizure, but are actually misinterpreting a sensory experience or temporary feeling such as dizziness, inability to concentrate, or forgetfulness. Others experience true episodes of abnormal behavior that appear to be seizures, but when monitored by an electroencephalography (will be discussed later), show no brain disturbance.9 "These episodes of nonepileptic seizures appear to be caused by psychological stress, misinterpretation, or other mental factors. They are called psychogenic seizures, a term that reflects their psychological cause."10

In about half of the cases of epilepsy, the cause is unknown. However, some possible causes of the disease have been determined. Inherited diseases such as phenylketonuria (PKU), tuberous sclerosis, and neurofibromatosis can cause a person to have recurrent seizures. There is also an inherited tendency to develop epilepsy. About 2% of the general population develops epilepsy by age 40. When one parent or a brother or sister has epilepsy, there is about a 5% chance that a child will develop epilepsy.11 "This is because the child may inherit a lower than normal seizure threshold or level of stimulus at which a seizure is triggered. The inherited tendency is more likely to cause epilepsy to develop in childhood than later in life.12

New research has shown that genetic factors play an important role in epilepsy. Epilepsy is a heterogeneous disorder. Genetic linkage has been established for several inherited epilepsies, and in one case a mutation.13

Epilepsy can be caused by problems occurring during the development of a fetus, which can be caused by such things as the mother being exposed to certain medications, street drugs, alcohol, infections, or injury. It can also be caused by problems occurring during birth, such as lack of oxygen, damage from forceps delivery, or other injury to the baby's brain.

Head injuries at any time of life that are severe enough to cause an injury to the brain can also cause epilepsy. A seizure may occur at the time of a head injury or even two or three years later, but the person does not have epilepsy unless repeated seizures occur at different times. A tumor in the brain, or a blood clot or abnormal blood vessel formation in the brain, although uncommon, also can cause epilepsy.14

After one experiences seizure attacks for the first time in his or her own life, several tests are conducted on the person to determine whether or not the person has epileptic seizures or nonepileptic seizures. These tests include blood and urine tests, which show "abnormalities such as infection, organ -failure, mineral imbalance, and high or low blood sugar"15; neuropsychological examinations that are used to "study muscle, reaction time, planning abilities, and memory"16; and various types of radiological studies and brain scans that produce "pictures of the brain and show how it worksffl7. However, the

Most commonly used test to diagnose epilepsy is an electroencephalographic examination (EEG), which can detect the very small amount of electricity given of f by the brain. All living things generate small amounts of electricity, and the human brain creates electrical charges as activity takes place within it.18

During an electroencephalographic examination, electrodes, which pick up the small amount of electricity that is given off by the brain, are attached to the scalp. The electrodes connect the brain to the electrodiagnostic instrument which collects the

information and makes it available for interpretation in the form of an electroencephalographic read out. An epileptic disturbance is suggested by the presence of spike discharges or sharp waves an electroencephalographic read out. These sharp waves last between seventy to two-hundred milliseconds, while a spike is defined as a potential having a sharp outline, lasts seventy milliseconds or less. This could occur in patients without epilepsy; therefore, the interpretation must be done carefully.
Occasionally, an electrocardiogram is included in the data collected after an EEG test is performed. This is because the heartbeat of a patient may affect the data that is collected by the instrument during the procedure. Neurological abnormalities can be detected from the EEG data as well as the EKG data.
The electroencephalographic examination is a safe and painless procedure. The actual recording usually lasts only twenty to forty minutes, but the time it takes to prepare for it often takes forty to fifty minutes. Thus, the entire procedure usually takes from 1 to 1 1/2 hours. The test is performed by an electroencephalographic technologist. A neurologist studies and can tell from the data that is collected in the examination if there is something wrong with a part of the patient's brain. Often, though, the electroencephalographic recording will look normal except during the time the patient is actually having a seizure. If the seizures occur many days apart, however, it may be hard to diagnose them using an electroencephalographic examination.19
One strategy for the treatment of epilepsy is to treat the cause and to try to prevent the person's seizures, as can be done in such cases as a brain tumor or blood clot. When epilepsy has a more general cause, such as an inherited tendency to have seizures or a head injury that causes repeated seizures, the strategy will be to find a treatment that controls the seizures, so that they will occur rarely, if ever. The same strategy will apply if no specific cause can be identified.
Epilepsy is most often treated with medications, which are referred as antiepileptic medications or anticonvulsants. There are about twenty commonly used antiepileptic medications, but most people with epilepsy are successfully treated with one of three major types. Specific medications are prescribed to treat specific types of seizures. This means that if a person has more than one type of seizure, more than one drug may be prescribed. A combination of medications may also be prescribed if the person's seizures are difficult to control.20
A small number of children with certain types of seizures may be treated with a ketogenic diet, which includes a high intake of fats. It is not known how this diet helps prevent seizures. Diet is a very important part of treatment in people with phenylketonuria (PKU). This disorder can be detected through newborn screening, and a special diet must be followed to help prevent health problems, including seizures.21
After extensive evaluation, some individuals with epilepsy may be candidates for brain surgery. Although uncommon, brain tumors are one cause of epilepsy in which surgery may be required. Some people with uncontrolled partial or complex partial seizures may also be helped by surgery that involves removing the temporal lobe of the brain. This is called temporal lobectomy. These patients must meet two general qualifications: first, that their seizures have not been controlled by extensive attempts with antiepileptic medication therapy and, second, that their seizures can be traced to a certain small part of the brain, which will not cause major problems if removed. About 70% of people who have a temporal lobectomy in a leading epilepsy center are seizure-free after surgery.

Many surgical patients will still have to take medications to control their seizures.22 "There is about a 3-5% risk of a partial loss of vision, motor function, memory, or speech after a temporal lobectomy."23

The second most common type of surgery for epilepsy involves partly disconnecting the two cerebral hemispheres, which are interconnected by the corpus callosum. The bundle of fibers that makes up the corpus callosum acts as a kind of bridge that allows electrical activity to spread from one hemisphere of the brain to the other. The operation to cut part of the corpus callosum is called a corpus callosotomy. Some people have seizures that start in one hemisphere and then spread through the corpus callosum to the other. These generalized seizures can be very dangerous, causing the person to fall without warning. Epileptologists have found that if they cut about two-thirds of the corpus callosum, they can often prevent or reduce the number of seizures that spread to the second hemisphere. This results in the patient having predominantly partial seizures, which are less dangerous, because they usually don't cause falls. Few patients who undergo a corpus callosotomy will be seizure-free after surgery. Most will have much less severe seizures that can be controlled with medications. Sometimes a second operation to complete the division of the corpus callosum is necessary if the first is not successful. There is about a 10% risk of some complication occurring as a result of a corpus callosotomy.24 there have been major advances in brain surgery in recent years, but it is still a treatment that is suitable for only a small proportion of people with epilepsy. Even those who are helped by the removal or disconnection of a small part of the brain usually continue to require medications to control seizures.

When a person is diagnosed as having epilepsy,' he may suddenly find that he is treated differently, and sometimes unfairly. Employment discrimination, for example, is one of the biggest problems affecting people with epilepsy. At this time, there is no general ban on employment discrimination against persons with handicaps in the United States. A person with epilepsy must, therefore, look to a variety of state and federal laws to protect his rights. Every state now has some type of law prohibiting employers from refusing to hire people with disabilities, but some of these apply only to state employees. Most of these laws require that, to use a condition such as epilepsy as a reason not to hire someone, the employer must show that the person's epilepsy would make it impossible or unsafe for the person to do the j ob. The federal antidiscrimination law applies only to the federal government, and to employers who get federal funds or have federal contracts. Unfortunately, some persons will still find that they have no protection at all.

Obtaining health, life, and auto insurance also continues to be a major problem for many persons with epilepsy. When coverage is available at all, premiums are often higher than most people can afford. States are increasingly enacting "unfair discrimination" laws prohibiting insurance companies from denying insurance to individuals who are handicapped. While these laws are a step in the right direction, enforcement of these laws continues to be difficult. Some states have passed laws setting up an assigned risk insurance plan for persons who do not otherwise qualify for health insurance because they have preexisting medical conditions such as epilepsy. These laws guarantee access to health insurance, however, the premiums are usually expensive and not all persons can afford the cost.

People with epilepsy have a right to access to other types of services, such as public transportation, public programs, and any public place, or private facility open to the

public. The EFA believes that people with epilepsy deserve to be evaluated as individuals, not according to the often erroneous assumptions that are made about people with the disorder.25

Epilepsy has been and will continue to be a threat to our very existence for as long as we continue to exist. But as our knowledge about the disease continues to increase as it has over the past few years, we will be able to better cope with the causes and effects of the disease. Today, a great deal is known about epilepsy and we are able to answer to many questions about the disease such as its means of classification, its causes, and its means of diagnosis and treatment that we were unable to answer to just a few years ago. Many notable figures in history have had epilepsy: Socrates, Alexander the Great, Julius Caesar, Alfred Nobel, and Thomas Edison.26 Today there are people with epilepsy represented among the writers, artists, scientists, politicians, and sports stars. Does this mean that epilepsy gives a person certain special powers? Well, it does affect the brain, but there is no evidence to support the idea that it increases a person's intelligence or creative abilities. There is one way that epilepsy can help to make a person successful, though. Like all other chronic conditions, epilepsy forces an individual to focus on what is important in life. It requires constant attention to a treatment p1an, which if followed, teaches the person to control his or her own life. Epilepsy can even make a person stronger because of the challenge it presents. The same skills built by controlling epilepsy will be valuable assets when it comes to accomplishing other goals in life.