2.3 Epilepsy

- **Epilepsy** is a chronic neurological disorder characterized by recurrent seizures, which are sudden, abnormal electrical discharges in the brain. These discharges can cause a variety of symptoms, depending on the part of the brain affected.
- Epilepsy disrupts this rhythmic electrical impulse pattern. Instead, there are bursts of electrical energy — like an unpredictable lightning storm — between cells in one or more areas of brain.

Causes of Epilepsy:

The exact cause of epilepsy is often unknown, but it can be triggered by:

- **Genetics:** A family history of epilepsy can increase the risk.
- **Brain Injury:** Traumatic brain injuries, strokes, or infections can damage brain tissue and lead to epilepsy.
- **Developmental Abnormalities:** Birth defects or abnormalities in brain development can predispose individuals to epilepsy.
- **Metabolic Disorders:** Conditions like liver disease or electrolyte imbalances can affect brain function and trigger seizures.
- **Tumors:** Brain tumors can irritate nearby brain tissue and cause seizures.
- **Medications:** Certain medications can lower the seizure threshold

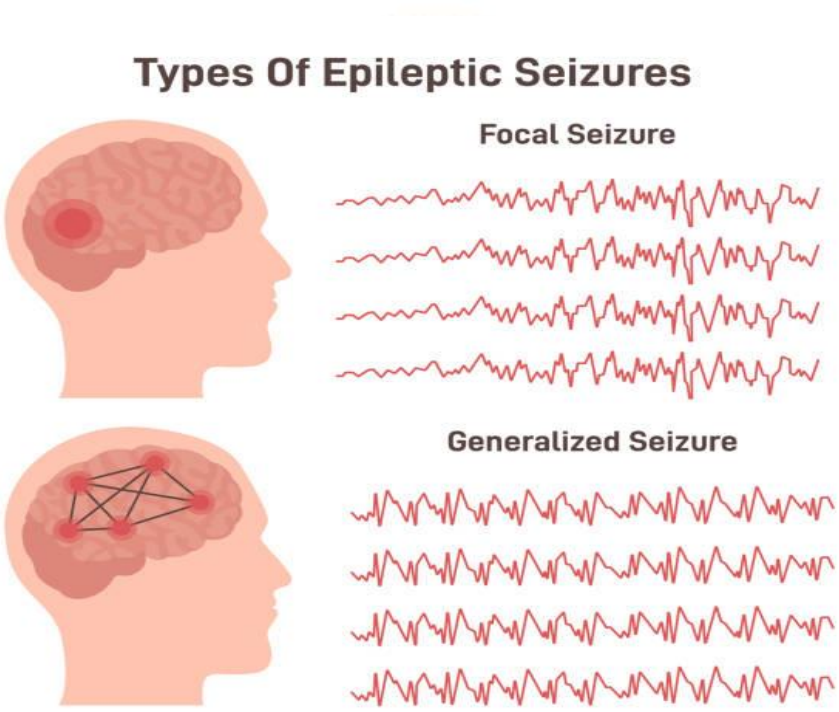
Types of Seizures

Epilepsy can manifest in various ways, and seizures can be classified into two main categories:

1. **Focal Seizures:** These begin in a specific area of the brain.
    - **Simple Focal Seizures:** Cause symptoms limited to one side of the body, such as twitching, numbness, or changes in sensation.

- **Complex Focal Seizures:** Involve loss of consciousness or awareness, often accompanied by automatisms (repetitive, purposeless movements).

2. **Generalized Seizures:** Involve the entire brain.
    - **Tonic-Clonic Seizures:** Characterized by a stiffening of the body (tonic phase) followed by rhythmic jerking (clonic phase).
    - **Absence Seizures:** Brief periods of loss of consciousness, often with staring.
    - **Myoclonic Seizures:** Brief muscle jerks.
    - **Atonic Seizures:** Sudden loss of muscle tone, leading to a collapse.



Diagnosis and Treatment

Diagnosing epilepsy often involves a combination of medical history, physical examination, and EEG (electroencephalogram) to record brain activity. Treatment typically involves anti-seizure medications, but in some cases, surgery, lifestyle changes, or other therapies may be considered.

Different Diagnosis Methods:

1. **Electroencephalogram (EEG).** This is the most common test used to diagnose epilepsy. In this test, small metal discs called electrodes are attached to your scalp with an adhesive or cap. The electrodes record the electrical activity of your brain.
2. **High-density EEG.** In a variation of an EEG test, you may have a high-density EEG. For this test, electrodes are placed closer together compared with a conventional EEG. High-density EEG may help more precisely determine which areas of your brain are affected by seizures.
3. **Computerized tomography (CT) scan.** A CT scan uses X-rays to obtain cross-sectional images of your brain. CT scans can detect tumors, bleeding or cysts in the brain that might be causing epilepsy.
4. **Magnetic resonance imaging (MRI).** An MRI uses powerful magnets and radio waves to create a detailed view of the brain. Like a CT scan, an MRI looks at the structure of the brain to detect what may be causing seizures. But an MRI provides a more detailed look at the brain than a CT scan.
5. **Functional MRI (fMRI).** A functional MRI measures the changes in blood flow that occur when specific parts of the brain are working. This test may be used before surgery to identify the exact locations of critical functions, such as speech and movement. This allows surgeons to avoid those areas while operating.
6. **Positron emission tomography (PET).** PET scans use a small amount of low-dose radioactive material. The material is injected into a vein to help visualize metabolic activity of the brain and detect changes. Areas of the brain with low metabolism may indicate places where seizures occur.
7. **Single-photon emission computerized tomography (SPECT).** This type of test is used if MRI and EEG didn't pinpoint the location in the brain where the seizures start.

   A SPECT test uses a small amount of low-dose radioactive material. The material is injected into a vein to create a detailed, 3D map of blood flow during

seizures. Areas of higher than typical blood flow may indicate areas where seizures occur.

8. **Neuropsychological tests.** These tests assess thinking, memory and speech skills. The test results help determine which areas of the brain are affected by seizures.

9. **Magnetoencephalography (MEG).** MEG measures the magnetic fields produced by brain activity. This helps find the potential areas where seizures start. MEG can be more accurate than EEG because the skull and tissue surrounding the brain interfere less with magnetic fields. MEG and MRI together provide images that show areas of the brain both affected by seizures and not affected by seizures.

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