What is epilepsy?

Epilepsy is a group of neurological disorders in which individuals are at risk for recurrent seizures. The diagnosis of epilepsy is defined as the occurrence of two or more unprovoked seizures during an individual's lifetime. In the general population, about 1 in 10 (10%) will have one seizure during their lifetime and about 3% will be diagnosed with epilepsy.

What causes epilepsy?

There are a number of different causes for epilepsy, including genetic and non-genetic factors. Majority of epilepsy is caused by a combination of these factors, with most related to infection, stroke, head trauma, brain tumor, or brain malformation. Factors that impact whether an individual has an underlying genetic cause to their epilepsy include the type of seizure (partial, generalized, or other), age of onset, family history, and other clinical features such as intellectual disability, autism spectrum disorder, or congenital anomalies. An underlying genetic cause may be identified in 30-50% of those with epilepsy (this percent is variable depending on the population and other factors considered). The genetic causes may include chromosomal abnormalities or single gene disorders. The different causes may be de novo (new) or inherited in an autosomal dominant, autosomal recessive, X-linked, or mitochondrial pattern.

What type of genetic testing may be recommended?

For those with epilepsy, particularly childhood onset, there are multiple types of genetic tests that may be considered. Recommendations may differ between patients depending on whether there are other clinical features present. Testing may include biochemical screening, chromosome microarray, single gene tests, multigene panels, or whole exome sequencing.

For those with other clinical features such as intellectual disability, autism spectrum disorder, or congenital anomalies, the chromosome microarray may be considered as a first tier test. The chromosome microarray is used to identify small missing or extra pieces of chromosome material, and can identify or rule out several hundred known genetic syndromes. This testing has a detection rate (the chance for the testing to come back positive) of about 20-30%. For all individuals with epilepsy the detection is less than 5%.

Further testing that may be considered includes single gene testing, multigene panel testing or whole exome sequencing which involves analysis of one, many, or all of our genes. About 15-40% of individuals with epilepsy are found to have a single gene disorder on one of these

tests.

Genetic testing may be considered for those with epilepsy as the identified underlying genetic cause may impact the treatment of the individual. For instance, there may be indication or contraindication for a specific anti-epileptic drugs, a biochemical diagnosis that directs medication or dietary management, or other.

Learn more about scheduling a genetic counseling appointment.

More Resources:

- Epilepsy Foundation
- Epilepsy.org
- American Epilepsy Society

References:

- Heyne et al 2019. Targeted gene sequencing in 6994 individuals with neurodevelopmental disorder with epilepsy. Genetics in Medicine, epub 06 May 2019.
- Myers, Johnstone, Dyment 2018. Epilepsy genetics: Current knowledge, applications, and future directions. Clinical Genetics, 95:95-111.
- Dunn et al 2018. Next Generation Sequencing Methods for Diagnosis of Epilepsy Syndromes. Frontiers in Genetics, 9:20.