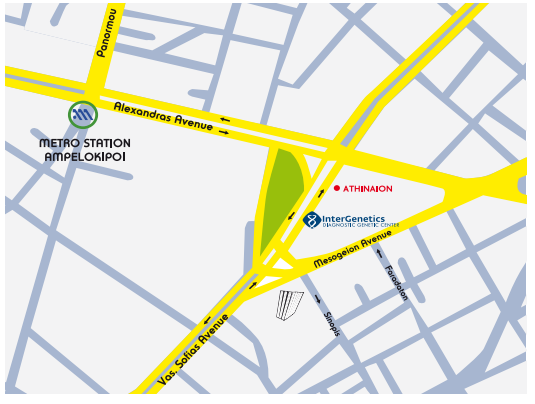
Many of the genes encode ion channels involved in the stabilization or proliferation of neuronal activity, genes coding for neuro-transmitter receptors and genes related to syndromic types of the disease.

The test is based on the method of next generation sequencing (NGS) and utilizes a special Genome Analyzer instrument together with complex and highly specialized software tools. The test is generally completed within 3-4 months.

Genetic counseling

Proper clinical genetic assessment of each case and genetic counseling, both before and following the test, is essential in order to determine the appropriate strategy for laboratory testing and to interpret correctly the concepts of pathological and normal.



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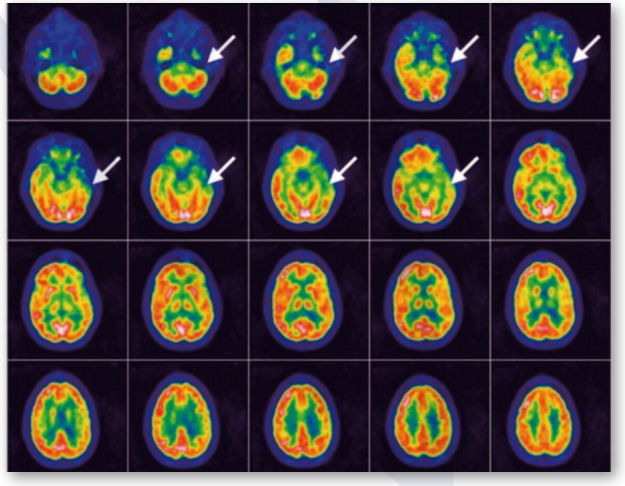
GENOMIC TESTING OF ALL EPILEPSY GENES



- ✓ *genetic testing was selective and incomplete, often without a conclusive diagnosis*
- ✓ *comprehensive genomic testing of all genes currently known to be associated with epilepsy leads in a single step to successful diagnosis*

Clinical features of the disease

Epilepsy is defined by the occurrence of at least two unprovoked seizures occurring at least 24 hours apart. It is a relatively common neurological disorder, affecting at least 0.8% of the population. The International Union against Epilepsy classifies seizures into two main categories:

- Generalized seizures, involving both cerebral hemispheres. For example, tonic-clonic, myoclonic, clonic, tonic and atonic seizures are some of the types of generalized seizures

- Partial seizures, originating from neural networks of a single hemisphere of the brain. Traditionally, focal seizures are classified as 'simple focal epileptic seizures' that do not result in loss of consciousness, and 'complex focal epileptic seizures' that cause a change in behavior and/or consciousness.

Some types of seizures, such as infantile spasms, do not belong to any of the above categories and remain unclassified.

The genetic basis of epilepsy

Epilepsy may be due to a genetic disease, trauma or infection as well as to structural abnormalities of the brain, though in many cases the exact cause is not known.

Genetic causes are the basis for approximately 40% of patients and numerous genes have been identified, which cause generalized seizures and partial seizures as well as non-specific types of epilepsy, including infantile spasms.

The genetic etiology of idiopathic generalized epilepsy is often complicated, due to a combination of many genetic factors, each conferring a small risk for epilepsy and can be further modified by environmental factors.

Today we know that approximately 2% of patients with idiopathic generalized epilepsy carry a mutation in a gene associated with hereditary epilepsy. However, the proportion of patients with inherited epilepsy is higher for certain types of epilepsy, such as infantile spasms and benign familial neonatal epilepsy.

The mode of inheritance may be autosomal dominant, autosomal recessive or X-linked. Similarly, mutations in a single gene may be associated with different types of epileptic seizures (clinical heterogeneity) and conversely, mutations in different genes can cause the same phenotype of epilepsy (genetic heterogeneity).

Moreover, epilepsy may be a single neurological symptom or it may be manifested in conjunction with other neurological symptoms or diseases. Finally, several genetic syndromes, such West syndrome, Ohtahara syndrome or Lennox-Gastaut syndrome, etc. include the manifestation of epilepsy in affected patients.

Why is genomic testing for epilepsy useful?

Seizures may be of limited duration or not and are typically treated with proper medication. In some cases, however, people suffering from epileptic encephalopathy, have severe seizures which do not respond to any treatment and lead to serious disability.

The ultimate goal of genomic testing for epilepsy is to achieve an accurate and effective identification of the genetic causes, and the results are particularly useful for:
1) the diagnosis of the type of epilepsy,
2) the prediction of disease progression,
3) the determination of the appropriate medication and management of symptoms and
4) the prevention of the disease in the wider family.

Generally, the identification of the mechanism leading to epilepsy through genetic testing, undoubtedly facilitates the development and introduction of new and personalized treatments.

How genomic testing is performed and how long does it take to be completed

The test involves the parallel analysis of the DNA sequence of all the exons of ~300 genes associated with all known forms of epilepsy.