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Myasthenia Gravis

Myasthenia gravis (MG) is an autoimmune disease. It causes weakness of voluntary muscles. These are the ones we can control, like those in our arms and legs. It might also affect the muscles we use to breathe. MG does not affect involuntary muscles, like those in our heart. There is no cure for MG. It's a condition that people have for life.

About 1 in 5000 people in the United States have MG.[1] People of both genders and all ethnic groups can have MG. It most often develops in young women (under 40 years of age) and older men (over 60 years of age). But it can strike at any age.

Causes of MG

MG is caused by faulty transmission of nerve impulses to muscles. Normally, a nerve impulse travels along a nerve cell to a muscle cell. There the nerve ending releases acetylcholine, which binds to receptors on the muscle cell. This causes the muscle fiber to contract. But in MG, antibodies prevent acetylcholine from binding to its receptor. This prevents some muscle fibers from contracting. The end result is a muscle that can contract with only some of its fibers. So the muscle gets tired more easily than it should.

Scientists don't yet understand why some people get MG. It's not directly inherited but sometimes affects more than one member of the same family. It isn't contagious.

Symptoms of MG

The hallmark of MG is muscles that become weaker with activity and then improve after rest. In most cases, the first symptom is weakness of the eye muscles. This results in drooping of one or both eyelids and double or blurred vision. Eye symptoms may come and go. When eye muscles are the only muscles affected, the condition is called ocular MG. This form accounts for about 15% of people with MG.[1]

The other form, which affects other muscles too, is called generalized MG. In addition to eye symptoms, a person with generalized MG may have:

- An unstable or waddling gait
- A change in facial expression
- Difficulty in chewing or swallowing
- Difficulty breathing

Factors that can make symptoms worse

These factors can trigger MG symptoms or make them worse:

- Being stressed
- Being sick
- Being tired
- Having a high fever
- Being in bright sunlight
- Having an operation
- Getting an immunization
- Menstruating
- Taking certain medicines

- Impaired speech
- Weakness in the arms, hands, fingers, legs, and neck

Although not a symptom, an abnormal thymus is a sign of MG. It is abnormal in 80% to 90% of people with MG.[2] This gland is part of the immune system. It's thought to produce the antibodies that occur in MG. About 20% of people with MG develop a tumor of the thymus called a thymoma.[1] These are usually benign, but they can become malignant.

Most people with MG have a normal life span.

Diagnosing MG

Several kinds of tests are used to diagnose MG.

Clinical tests

The ice pack test and rest test can be used in people who have eye symptoms. If neither of these tests is positive, a test using a drug injected into a vein can be used. This drug can temporarily relieve eye symptoms. If any of these tests are positive, nerve conduction and/or antibody tests are used to confirm a diagnosis.

Nerve conduction tests

Two nerve conduction tests are used. The repetitive nerve stimulation test is used most often. If it's negative, the single-fiber electromyography test can be used. It's more difficult to perform but is more sensitive.[1] It's positive in the great majority of MG cases.

Antibody tests

The majority of people with generalized MG have antibodies to the acetylcholine receptor (AChR).[1] There are 3 types: binding, blocking, and modulating. The presence of any of these antibodies is diagnostic of MG. But a negative AChR antibody test does not exclude MG.

Other antibody tests are also useful for diagnosing MG. These include:

- Striational antibodies. Testing for some of these, eg, antibodies to titin and ryanodine receptor, is useful for:
  - Providing more clinical information
  - Aiding diagnosis of thymoma (positive in most people with a thymoma)[3]
- Antibodies to muscle-specific tyrosine kinase (MuSK). Testing for this antibody can be used to:
  - Help confirm a diagnosis when an AChR antibody test is negative
  - Monitor disease severity

Coping with the symptoms of MG

These approaches may help people with MG make the most of their energy:

- Adjust eating routines: eat when muscle strength is good. Avoid foods that need more chewing, such as raw fruits or vegetables.
- Use safety precautions at home. Install grab bars or railings in places where support is needed, like next to the bathtub. Remove loose rugs that could cause a fall.
- Use electric appliances like electric toothbrushes and can openers.
- Wear an eye patch to relieve double vision. Periodically switch it to the other eye to help reduce eyestrain.
- Plan chores and errands to coincide with the most energetic time of day.
- Consider joining a support group. Support groups can help people with MG and their family members cope with the disease.

Can women with MG have children?

MG does not affect normal growth and development of a fetus. Many women with MG have successful pregnancies. About 10% to 20% of infants born to mothers with MG have neonatal myasthenia.[1] It's a condition of temporary weakness in the baby. It usually resolves in weeks or months after birth.

People with similar MG symptoms can have very different AChR antibody levels. So the results of antibody tests for different people with MG can't be compared. Changes in antibody levels in one person, however, are meaningful. So antibody tests are sometimes used to assess disease progression and the response to treatment.

No single test can prove the diagnosis of MG. That is why a combination of tests is used. The importance of antibody tests is increasingly being recognized.[4]

How doctors treat MG

The symptoms of MG can usually be controlled. With treatment, most people with MG can lead normal or nearly normal lives. Several kinds of medicines are used. These can:

- Strengthen the chemical signal that nerve cells send to muscle cells.
- Reduce the amount of antibodies that the body makes. This kind of medicine may cause major adverse effects. So it must be used carefully.

An operation to remove the thymus gland can help. It's done when people have a thymoma. But it also helps about half of people with MG who don't have a thymoma.[2]

Several other procedures can also be used. When a person has severe symptoms, it may help to:

- Use a machine to remove his/her plasma. This is the part of the blood that contains antibodies. The machine replaces the person's plasma with new plasma. This removes the harmful antibodies from the person's body.
- Give the person helpful antibodies. These come from donated blood. They help the immune system work better. They are injected into a vein.

Additional information

You can find more information about MG at these Web sites:

- National Institute of Neurological Disorders and Stroke. Myasthenia gravis fact sheet: ninds.nih.gov/disorders/myasthenia_gravis/detail_myasthenia_gravis.htm
- Myasthenia Gravis Foundation of America, Inc. What is myasthenia gravis?: myasthenia.org/WhatisMG.aspx
- Muscular Dystrophy Association. Myasthenia gravis: mda.org/disease/myasthenia-gravis/overview

References

1. Berrih-Aknin S, Frenkian-Cuvelier M, Eymard B. Diagnostic and clinical classification of autoimmune myasthenia gravis. *J Autoimmun.* 2014;48-49:143-148.
2. Levinson AI and Wheatley LM. Myasthenia gravis. *In* Clinical Immunology Principles and Practice. Rich R (ed), St. Louis, MO: Mosby Publishers, 1996.
3. Suzuki S, Utsugisawa K, Nagane Y, Suzuki N. Three types of striational antibodies in myasthenia gravis. *Autoimmune Diseases.* 2011; doi:10.4061/2011/740583.
4. Oger J, Frykman H. An update on laboratory diagnosis in myasthenia gravis. *Clin Chim Acta.* 2015;444:126-131.