Myasthenia Gravis
Information Guide

INDIAN ACADEMY OF
NEUROLOGY

A Public Information Initiative

Introduction

Myasthenia Gravis (the term 'myasthenia' refers to muscles, and the word, 'gravis' is used to describe the severity of the disease) is a disorder of the junction between a muscle and a nerve. It is because of a defect in the transmission of electrical impulses from the nerve to the muscle. This occurs due to a chemical defect which forms a link between the muscle and the nerve. Myasthenia Gravis is an immune system disorder in which there is blockage of transmission of impulse at the neuromuscular junction. The disease is characterized by weakness and rapid fatigue in any of the muscles which are under voluntary control. Though myasthenia gravis can affect people of any age, it is more common in women younger than 40 years and in men older than 60 years.

When to suspect Myasthenia Gravis?

The neurologist should be consulted whenever the person may experience any of the following symptoms:

- Drooping of eyelid
- Double vision
- Difficulty in chewing and swallowing
- Easy fatigability on walking for long distance
- Difficulty in using your arms or hands
- Difficulty in holding up your head

Symptoms and signs

Muscle weakness and fatigability are the most prominent symptoms. As such, there may be weakness of arm or leg muscles, double vision, drooping eyelids, and difficulties with speech, chewing, swallowing and breathing, depending upon the specific muscles involved. These symptoms tend to come and go, increase on exertion), and show variation and fluctuations across the day (increase in the evening), and they usually improve with rest. Myasthenia Gravis symptoms, often, progress over time, usually reaching their worst within a few years after the onset of the disease.

Some of the most commonly affected muscle groups are:

Eye muscles: When myasthenia gravis affects the eye muscles, it may lead to eye problems such as:

- drooping of one or both eyelids
- double vision, which improves or resolves when one eye is closed

Face and throat muscles: The involvement of face and throat muscles may lead to:

- Difficulty in swallowing, e.g., difficulties in eating, drinking, taking medicines etc.
- Difficulty in chewing, especially hard things
- Changes in speech, e.g., nasal speech
- Limited facial expressions, e.g., friends or family members may comment that “you have lost your smile”.

Neck and limb muscles: Myasthenia gravis can cause weakness of neck, arm, or leg muscles. This may lead

to difficulty in holding up the neck, moving or raising the arms, or a waddling gait if leg muscles are affected.

Causes

Fatigability and weakness can occur in a number of conditions related to neuromuscular transmission abnormality.

- *Myasthenia gravis:* The nerves communicate with the muscles by releasing chemicals (neurotransmitters) that fit precisely into receptor sites on the muscle cells at the neuro-muscular junction.

  In myasthenia gravis, the immune system produces antibodies that block or destroy many muscle-receptor sites for the neuro-chemicals. With fewer receptor sites available, the muscles receive fewer nerve signals, resulting in weakness.

- *Toxic:* e.g. snake-bites or tic-bites, organo-phosphate or carbonate poisoning, over-dose of certain medicines.

- *Congenital myasthenic syndromes:* Rarely, mothers with myasthenia gravis have children who are born with myasthenia gravis (neonatal myasthenia gravis). If treated promptly, children generally recover within two months after birth.

Myasthenia gravis can worsen with fatigue, illness, stress, extreme heat, and even some medications.

Diagnosis

In order to diagnose, the doctor will review the symptoms and medical history and conduct a physical and neurological examination, which includes the detailed examination of the following:

- Reflexes
- Muscle strength
- Muscle tone
- Senses of touch and sight
- Coordination
- Balance

The key sign that points to the possibility of myasthenia gravis is muscle weakness that improves with rest. Some of the tests to help confirm the diagnosis may include:

Neostigmine test

Precautions: Neostigmine test is often performed in the patients with symptoms of suspected Myasthenia Gravis. Caution should be taken while doing this test in children, elderly, pregnant women, breast-feeding mothers, or those having a history of heart disease. This test should preferably be done in the ICU setting with continuous monitoring of vitals and heart rate.

Procedure: In this test, an injectable reagent is often used to treat Myasthenia Gravis with a short duration of action. Neostigmine (1.5 mg) is injected in order to determine if this produces improvement in the symptoms and signs of Myasthenia Gravis. This injection is followed by an hour of observation at 15-minute intervals

assessing the patient on both the subjective and objective improvement in symptoms, with continuous watch on heart-rate and vitals. Improvement in symptoms like drooping eyelid, disappearance of double vision, or improvement in muscle weakness, following neostigmine injection indicates myasthenia gravis.

Ice-pack test: In case of a person with a droopy eye-lid, the doctor places a bag filled with ice on the eyelid. After two minutes, the doctor removes the bag and analyzes the droopy eyelid for signs of improvement.

Blood analysis: A blood test may reveal the presence of abnormal antibodies that disrupt the receptor sites where nerve impulses signal the muscles to move.

Repetitive nerve stimulation: In this nerve conduction study, doctors attach electrodes to the skin over the muscles to be tested. Neurophysiologists deliver small pulses of electricity through the electrodes to measure the nerve's ability to send a signal to the muscle, and see if it worsens with fatigue.

Single-fiber electromyography (EMG): Electromyography (EMG) measures the electrical activity traveling between the brain and the muscle. It involves inserting a fine wire electrode through the skin and into a muscle. In a single-fiber EMG, doctors test a single muscle fiber.

Imaging scans: The doctor may order a CT scan or an MRI to check if there's a tumor or other abnormality in the thymus gland.

Pulmonary function tests: The doctor may perform pulmonary function tests to evaluate whether the myasthenic condition is affecting breathing.

Treatment

The treatment of Myasthenia gravis should be individualized, as treatment strategies vary with the cause, the severity, or the presence or absence of other co-existing disorders. There are medications such as cholinesterase inhibitors, corticosteroids, and immune-suppressants. Besides, there is a procedure called plasmapheresis, and another therapy known as immunoglobulin (IVIg) therapy. However, these treatments are associated with side effects, and so are used in a hospital-setup under strict medical supervision, along with regular follow-up visits. These treatments don't cure the underlying condition, but they may improve muscle coordination and muscle strength. However, the beneficial effects of these treatments last only a few weeks.

Prognosis

There is good outcome in the modern era with newer and more effective medicines and techniques; and the affected individuals can lead normal life with treatment.

Myasthenic crisis

Myasthenic crisis is a life-threatening condition that occurs when the muscles that control breathing and swallowing become too weak to do their work. The physician should be consulted immediately. Emergency treatment is needed to provide mechanical assistance with breathing (e.g., ventilator). Medications and blood-filtering therapies help people to again breathe on their own.

Preventive strategies

There is no preventive strategy for myasthenia gravis, but factors responsible for myasthenic crisis, such as, stress, drugs, and infections should be explained to the affected individuals and their family members. They

should be given the list of offending drugs and safe drugs. They should be advised to report at the earliest if weakness increases or any infection occurs. In pregnant myasthenia gravis patients, delivery should be conducted at a medical set-up where neurologist and neonatal care are available.

Lifestyle changes

The key to lifestyle changes is to plan your eating schedules, other daily chores, shopping or errands to do, and other activities to coincide with the time at which you have the most energy. Make environmental changes so that you are able to walk easy, and free of any obstacles without tripping or stumbling.

Use electrical appliances and power tools which may help you to perform your tasks without expending much effort.

Find ways to relax as stress may worsen the condition.

List of commonly used drugs to be avoided in Myasthenia gravis.

1. Antimicrobials
   a. Antibiotics: aminoglycosides, macrolides, quinolones, nalidixic acid
   b. Antimalarials: chloroquine, quinine
2. Antipsychotics: neuroleptics (phenothiazines, sulpiride, atypicals like clozapine)
3. Antiepileptics: phenytoin, carbamazepine, pregabalin, gabapentin.
4. Cardiovascular drugs
   a. Antihypertensives: alpha and beta-blockers, calcium-channel blockers.
   b. Antiarrhythmics: quinidine, procaineamide
5. Neuromuscular-blocking agents
6. Local anaesthetics (lignocaine)
7. Muscle relaxants (long-acting bezodiazepines, baclofen)
8. Iodinated radio-contrast agents
9. Botulinum toxin

Disclaimer:

This brochure is for the general information of the public and the patients. People should not self-medicate themselves with the medicines and treatments mentioned here. Before taking any of the medications mentioned in the information brochure, please consult your neurologist.

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