Overview of Motor Neuron Disease (MND) & Amyotrophic Lateral Sclerosis (ALS)

Motor Neuron Disease (MND) is a rare, progressive neurological disease characterized by the degeneration of motor neurons. These motor neurons, or nerve cells, control voluntary muscles which are used for actions such as swallowing, talking, breathing, and walking. A continuous decline of the nerve cells eventually leads to their death. When they die, the ability of the brain to initiate and control muscle movement is lost. Therefore, patients in the later stages of the disease may become totally paralyzed.

Amyotrophic lateral sclerosis (ALS), is the most common form of MND, with weakness and wasting in the limbs, muscle stiffness and cramps. Someone may notice they are tripping when walking or dropping things. *In the UK, motor neurone disease (MND) is used as an umbrella term to cover all forms of the disease. In the USA, ALS is used as the umbrella term.*

There are four types of MND: the most common form is ALS followed by Bulbar onset MND or Progressive bulbar palsy (PBP), Progressive muscular atrophy (PMA) and Primary lateral sclerosis (PLS).

MND is life-shortening and there is no cure. Although the disease will progress, symptoms can be managed to help achieve the best possible quality of life. Six people are diagnosed every day. Up to 5,000 people are fighting MND at various stages of the disease. Six people die each and every day

MND affects up to 5,000 adults in the UK at any one time. There is a 1 in 300 risk of getting MND across a lifetime. It can affect adults of any age, but is more likely to affect people over 50.

Once MND starts, it invariably progresses, leading to a profound loss of basic functions. Individuals typically experience losing the ability to walk, dress, write, speak, swallow, and breathe. The prognosis for those diagnosed is bleak, MND kills a third of people within a year and more than half within two years of diagnosis.

Not all MND patients experience the same symptoms or the same sequences or patterns of disease progression. However, the gradual onset of increased muscle weakness is the most common initial symptom of the disease. Additional early symptoms may include tripping, dropping things, abnormal fatigue of the arms or legs, slurred speech, muscle cramps and twitches and uncontrollable periods of laughing or crying. More severe symptoms can include shortness of breath, difficulty breathing, chewing, and swallowing, weight loss, as well as the inability to stand or walk independently. Anxiety and depression are also common because MND patients usually remain able to reason and are aware of their loss of function. Ultimately, progressive muscle weakness and paralysis will be experienced by all MND patients. When breathing muscles are affected, MND patients will need permanent ventilatory support to assist with breathing.

There is no single test to diagnose MND. Healthcare providers conduct physical and neurological exams to test reflexes, muscle strength, and other responses. Muscle and imaging tests such as electromyography (EMG), a nerve conduction study (NCS), or a magnetic resonance imaging (MRI), as well as blood and urine tests may be done to rule out other diseases and confirm the diagnosis.

At the present time, there is no treatment to reverse damage to motor neurons or cure MND. Therefore, available drug therapy is utilized to alleviate symptoms, prevent complications, and slow disease progression. Medications may be prescribed to help manage muscle cramps, stiffness, excess saliva, unwanted episodes of crying or laughing, pain, depression, sleep disturbances, or constipation.

Currently, there is a single drug, riluzole, approved by the European Medicines Agency (EMA) to treat MND that prolongs life. Over the next few years, Europe can anticipate the approval of additional therapeutic options. Globally, there are many clinical trials investigating various treatments for MND.

In addition to drug therapy, supportive health care provided by a multidisciplinary team of health care professionals can work to keep patients mobile, comfortable, and independent for as long as possible. Physical therapy, dietary advice, and speech therapy are crucial components. Splints, braces, grab bars, reach devices, and wheelchairs can also help to prolong the independence of MND patients.

Studies all over the world, many funded by The ALS Association, are ongoing to develop more treatments and a cure for ALS. Notably, several investigational therapies are currently in phase III trials, with the potential for regulatory approval as early as 2024 or 2025. These developments offer hope for individuals battling this challenging disease and underscore the importance of ongoing research efforts.

While a wealth of new scientific understanding about the physiology of MND has occurred in recent years, much remains to be discovered and is the focus of current research. Ongoing studies are seeking to understand the mechanisms that selectively trigger motor neurons to degenerate in ALS, which may lead to effective approaches to halt this process. Other clinical research studies are working to identify additional genes that may cause or put a person at risk for either genetic or spontaneous ALS. In addition, a large-scale collaborative research effort with both public and private organizations is analyzing genetic data from thousands of individuals with ALS to discover new genes involved in the disease. Scientists are also working on the development of disease biomarkers that help identify the presence or rate of progression of a disease or the effectiveness of a therapeutic intervention. Finally, numerous investigational treatments are in development that include gene therapies, antibodies, as well as cell-based therapies.

The number of ALS cases is expected to rise to nearly 380,000 worldwide by 2040, partially due to the aging population. Therefore, optimization of current therapeutic approaches and the development of new treatment options is extremely relevant. A number of factors including environmental, genetic, and age-related changes can lead to motor neuron cell death causing impairment and paralysis in different parts of the body. As a result, finding suitable therapy to slow down or possibly stop disease progression remains challenging. Until satisfactory treatment is available, supportive therapy remains important to keep MND patients mobile and living as independently as possible. Fortunately, the vast amount of ongoing MND research being conducted on a global scale as well as ALS research provides the hope of improved future care and therapy for patients and their families.

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