



Parkinson's Disease.

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1 Introduction

This eBook contains information about **Parkinson's Disease**, including history, symptoms, effects, impacts, treatments, and research.

A Glossary of Terms used in this eBook is provided in section 17 on page 49.

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This book should not be used as a basis for any form of diagnosis or treatment for any medical condition. Always seek professional medical advice.

In addition, other factors may cause symptoms similar to Parkinson's Disease. Prolonged or high-exposure to certain drugs is also believed to cause symptoms similar to those of Parkinson's Disease. A diagnosis from a professional medical doctor is the only way to be sure.

1.1 *Target Audience*

This eBook is intended to provide assistance and information to people who are interested in learning more about **Parkinson's Disease**, or who may be worried about the possible onset of Parkinson's, or the friends, family, or relatives of those who might suffer or be at risk of suffering from Parkinson's.

1.2 *Benefits of Using this Book*

This eBook provides clear and concise details of Parkinson's Disease, that would otherwise need to be obtained from a variety of sources, such as internet, reference books, qualified doctors, and so on.

1.3 Copyright Notice

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1.4 Disclaimer

Please note: This book was written with great care. However, in spite of this, errors or omissions may occur. This book is provided "as-is", without any warranty whether expressed or implied. All readers of this book agree to use the information provided in this book entirely at their own risk.

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In addition, other factors may cause symptoms similar to Parkinson's Disease. Prolonged or high-exposure to certain drugs is also believed to cause symptoms similar to those of Parkinson's Disease. A diagnosis from a professional medical doctor is the only way to be sure.

2 What is Parkinson's Disease

Parkinson's Disease is one of a larger group of neurological conditions called *motor system disorders*. Parkinson's is a disorder that affects nerve cells (neurons) in the part of the brain that controls muscle movement. After Alzheimer's Disease, Parkinson's Disease is the most common neurodegenerative disease to affect the human race. Parkinson's Disease is characterized by:

- trembling,
- muscle rigidity,
- difficulty walking, and,
- problems with balance and coordination.

Parkinson's Disease mostly develops in people after the age of 50, although the disease also affects a small percentage of younger people as well. Approximately, 0.1-0.2% of the population have Parkinson's, but for people

over 50, people are ten times more likely to suffer from the disease, with 1-2% of the over 50's having Parkinson's.

Over 4 people million in the world have Parkinson's - more than those affected by Multiple Sclerosis (MS), Muscular Dystrophy, and Lou Gehrig's Disease combined. Over one million people in the United States have Parkinson's.

Parkinson's is a progressive disease, which mean that the symptoms become more severe over time. Eventually, after many years, Parkinson's may be disabling. However, the disease usually progresses so slowly that the vast majority of people have many years of productive living after a diagnosis before the symptoms become severe.

Unlike many other serious neurological diseases, the symptoms of Parkinson's are mostly treatable with a range of medications and treatments, and these can be used to reduce the effects of Parkinson's.

There is no particular hurry to begin treatment for the symptoms of Parkinson's. If treatment is not started immediately, then the person is not disadvantaged in any way. In fact, some specialists suggest that a person waits until their symptoms are causing some difficulties with their daily living before they start treatment.

Various drugs can improve the physical symptoms, but they can have a range of side-effects that include hallucinations, delusions, and a temporary worsening of confusion and abnormal movements.

Though full-blown Parkinson's can be crippling or disabling, early symptoms of may be so subtle and gradual that patients sometimes ignore them or attribute them to the effects of aging. For example, initially patients may feel overly tired, "down in the dumps," or a little shaky. Or, their speech may become soft and they may become irritable for no reason. Movements may be stiff, unsteady, or unusually slow.

Late in the course of the disease, some people may develop dementia.

3 What Causes Parkinson's Disease

Parkinson's disease was first described in 1817 by James Parkinson in his "An Essay on the Shaking Palsy" paper. Since then, a great deal of research

has been undertaken to understand some of the processes of this complex disorder.

Dopamine is a chemical released by cells in the *substantia nigra* section of the brain. This chemical transmits signals between the nerve cells in this part of the brain and the *corpus striatum*, another section of the brain. These signals allow your muscles to make smooth, controlled movements.

Parkinson's Disease occurs when the dopamine producing neurons in the *substantia nigra* are damaged or destroyed.

Every person loses some dopamine-producing neurons (and other brain neurons) as a normal part of the aging process. However, people with Parkinson's Disease lose at least half of neurons in the substantia nigra. These dopamine-producing cells are critical for movement and their loss causes noticeable (and eventually severe) physical symptoms. When dopamine levels drop in the brain, nerve cells "fire" wildly, leaving patients unable to control their movements.

The causes of the severe loss of dopamine-producing neurons in the substantia nigra are subject to intense research. Current research indicates that Parkinson's Disease may result from a combination of genetic and environmental factors. These factors are discussed below.

Please note: Various other factors may cause symptoms similar to Parkinson's Disease. Exposure to certain drugs, diseases and toxins are also believed to cause symptoms similar to those of Parkinson's Disease. A diagnosis from a professional medical doctor is the only way to be sure.

3.1 Genetic Factors

A person's genetic make up can directly influence the chances for the onset and development of Parkinson's. A person's genes are inherited from their biological parents and passed along family lines to their biological children.

Current research indicates that people with a family history of Parkinson's are more likely to develop Parkinson's themselves. However, it is rare for multiple people in one family group to suffer from Parkinson's.

For example, if you have two or more close relatives (parent, child, or sibling, etc) with Parkinson's, then your risk of also developing the disease increases two or three-fold, although, even at this elevated level of risk, the

overall risk of developing the disease during your life is still **less than 5 percent**.

So, there does seem to be a genetic link for Parkinson's Disease, but this link seems to be minor in most cases.

In order to learn more about the Parkinson's, research has concentrated on rare family groups where multiple people have developed Parkinson's, and this research has provided useful insights into the cause of the disease in general.

Researchers have identified two types of genetic causes in families with Parkinson's:

➤ **High Levels of Specific Proteins**

Abnormally high levels of *alpha-synuclein*, a unique protein that accumulates in degenerating brain neurons of those with Parkinson's. Other known genes include DJ-1, PINK-1, and UCHL-1, but altogether these represent far less than 1% of Parkinson's cases.

➤ **Problems with Disposing on Unwanted Proteins**

Problems with the systems in the body that dispose of unwanted proteins. The most important is a gene called *parkin*, which creates a protein, also called *parkin*. This protein helps to break down defective proteins inside brain cells (neurons). When the parkin gene is altered, or mutated, this function is impaired, and this may lead to the accumulation of defective proteins that contribute to death of neurons. Two mutated copies of the parkin gene are needed to develop Parkinson's. This type of inheritance pattern is called *autosomal recessive*. One copy of the defective gene is inherited from each parent. Parkin mutations are believed to cause young-onset PD, with symptoms beginning usually in the 40s – see section "13 Young-Onset Parkinson's". Parkin mutations are the most common genetic cause of Parkinson's, but they still account for less than 1% of all Parkinson's cases.

It is believed that both of these factors play a key role in the development of Parkinson's in all people, but further research is required.

Researchers have also found a variation in the *CYP2D6* gene that appears to make people more likely to develop Parkinson's if they are exposed to certain pesticides. See section “3.2 Environmental Factors”.

3.2 Environmental Factors

At this stage, researchers have not been able to link a specific herbicide or pesticide component to the disease.

Nevertheless, current research indicates that people with lengthy exposure to certain herbicides and pesticides are more likely to develop Parkinson's than people who don't have this same level of exposure.

Researchers have also found a genetic variation that appears to make people more likely to develop Parkinson's if they are exposed to certain pesticides. A fairly strong and consistent finding of research is that the risk of Parkinson's is increased by rural living, exposure to well or ground water, and agricultural work, suggesting that pesticides or herbicides may cause or contribute to Parkinson's.

The normal *CYP2D6* gene produces an enzyme that helps break-down pesticides, making them less toxic to the body. However, a variant of this gene produces an enzyme which is less effective against pesticides, causing an increase in the body's sensitivity to pesticides and a corresponding increase in the risk of developing Parkinson's Disease. However, people with this genetic variation have nothing to fear and do not have an increased risk of developing Parkinson's unless they are exposed to pesticides.

In addition, exposure to certain toxic substances, such as manganese and carbon monoxide, has also been linked to Parkinson's.

It is believed that the effects of these toxins may build up in the body, over many years or decades, and eventually lead to the development of Parkinson's.

4 What Else Causes Parkinson's-like Symptoms

A variety of causes and conditions can cause Parkinson's-like symptoms, such as:

- Drugs and Medications

- Age
- Other Causes

Each of these are briefly discussed further below.

4.1 Drugs and Medications

If some drugs and medications are used for long periods of time, or in excessive doses, then they can cause some symptoms which are similar to Parkinson's Disease. For example:

- Medications used to treat **psychiatric disorders**, such as *haloperidol* (Haldol) and *chlorpromazine* (Thorazine), can cause similar symptoms to Parkinson's.
- Drugs used to treat **nausea**, such as *metoclopramide* (Reglan) and *prochlorperazine* (Compazine), can also cause similar symptoms to Parkinson's.
- The **epilepsy** drug *valproate* (Depacon) may also cause similar symptoms to Parkinson's, such as severe tremors.

The problems and side-effects caused by these drugs are reversible and they usually disappear completely a few weeks or months after you stop taking them.

4.2 Age

Old age can cause some mild, Parkinson's-like symptoms. For example, a slow, unsteady walk, trembling, and slight trouble with speaking or writing.

4.3 Other Causes

Parkinson's-like symptoms can also be caused by a range of other conditions. For example, a common type of tremor, known as *essential tremor*, isn't caused by Parkinson's. Stiffness can be caused by *arthritis*. A stooped posture may be caused by age or osteoporosis.

5 History of Parkinson's Disease

Parkinson's Disease has plagued the human race for millennia. In fact, historians have found evidence of the Parkinson's Disease going back as far as 5,000 B.C.

The symptoms of Parkinson's Disease were first formally described in 1817 by James Parkinson, a British physician, in his paper "An Essay on the Shaking Palsy". Because of Parkinson's pioneering work in identifying symptoms, the disease came to bear his name.

Dr. Parkinson described a puzzling set of symptoms that he found in some of his older patients, which he described as "a pronounced trembling and an increasing sense of weakness". The disease is sometimes known as *paralysis agitans*, which translated from Latin means "shaking palsy."

Almost 200 years later, doctors have a much clearer idea of the underlying pathology of Parkinson's. Parkinson's Disease is a syndrome rather than a single disease, which means that the disease has several causes instead of a single cause.

Today, most neurologists agree that Parkinson's Disease is due to a combination of genetic and environmental factors, however these largely remain to be identified, and further research is required.

6 Risk Factors for Parkinson's Disease

It is highly likely that the Parkinson's results from a highly complex and interrelated combination of genetic and non-genetic factors.

These so called *risk factors* influence a person's risk to developing Parkinson's disease. Currently, each of these *risk factors* is the subject of a great deal of research around the world.

The main risk factors for Parkinson's Disease include:

- Age
- Sex
- Exposure To Pesticides And Herbicides
- Reduced Estrogen Levels
- Reduced Folate Levels

- Caffeine
- Non-Smoking

Each of these risk factors is discussed further below.

6.1 Age

Age is one of the main risk factors for Parkinson's Disease. Even though the disease can affect adults in their 20s, in the vast majority of cases it affects people over 50 years of age. The risk continues of developing to Parkinson's Disease increase with age. Some researchers believe that neural damage from genetic or environmental factors may become worse over time, leading to the onset of the visible symptoms of Parkinson's Disease.

6.2 Heredity / Family History

Current research indicates that people with a family history of Parkinson's are more likely to develop Parkinson's themselves. However, it is rare for multiple people in one family group to suffer from Parkinson's.

Also see section "3.1 Genetic Factors".

6.3 Sex

Research and history indicate that men are more likely to develop Parkinson's than women. This could be due to hormonal differences, life style differences, or other factors.

6.4 Exposure to Pesticides and Herbicides

Direct contact with herbicides and pesticides puts you at increased risk of Parkinson's. You also have a higher risk if you're involved in farming, live in a rural area, or drink well water.

Also see section "3.2 Environmental Factors".

6.5 Reduced Estrogen Levels

Estrogen, also known as *oestrogen*, is a group of steroid compounds that function as the primary female sex hormone. Estrogens are present in both men and women, but they are usually present at significantly higher levels in women of reproductive age. Estrogens promote the development of female secondary sexual characteristics, such as breasts, and are also involved in the thickening of the *endometrium* and other aspects of regulating the menstrual cycle.

Research indicates that reduced *estrogen* levels may cause an increased risk for Parkinson's Disease.

Menopausal women who receive little or no *hormone therapy (HT)* seem to be more likely to develop Parkinson's Disease. In addition, menopausal women who have had hysterectomies may also be at higher risk of developing Parkinson's.

Menopausal women using HT appear to have less chance of developing Parkinson's. However, not all of the effects of HT are positive. For example, taking HT as a combination therapy - estrogen plus progestin - can increase your risk of a range of serious side-effects.

6.6 Reduced Folate Levels

Folate is a B vitamin that is necessary for the production and maintenance of new cells. Folate occurs naturally in food. Folic acid is the synthetic form of this vitamin that is found in supplements and fortified foods. Folate is especially important during periods of rapid cell division and growth such as infancy and pregnancy, and it is also used to make normal red blood cells and prevent anemia.

Research indicates that low levels folate may increase susceptibility to Parkinson's Disease. For example, researchers have found that mice with low folate levels developed severe Parkinson's symptoms, while those with normal levels remained healthy.

Low levels of folate have also been linked to the onset a range of other serious diseases, such as cancer and heart disease.

6.7 Caffeine

Caffeine consumption, in moderation, has also associated with a slightly reduced incidence of Parkinson's in some studies.

6.8 Non-Smoking

A factor that has been consistently associated with a slightly reduced risk of Parkinson's, in numerous studies, is cigarette smoking. That is, smoking actually reduces your risk for Parkinson's.

It is not known whether smoking confers a genuine protective effect, or whether individuals who are prone to develop Parkinson's for other reasons are also prone to avoid smoking.

Nevertheless, the large negative impact on general health from smoking far outweighs any slight reduction in risk for Parkinson's.

As such, there is no way that smoking can be recommended as a strategy for avoiding Parkinson's.

7 Warning Signs and Symptoms

The earliest warning signs of the onset of Parkinson's disease can be very subtle. For example, the early symptoms can include: one arm might not swing normally during walking, mild tremors might occur in the fingers of one hand, or soft, mumbling speech. In addition, the early warning signs may include a lack of energy, depression, or trouble sleeping. People may also notice that it takes longer to do ordinary, everyday activities, such as showering, shaving, or eating.

The four primary symptoms of Parkinson's are:

- Tremor or trembling in hands, arms, legs, jaw, and face;
- Rigidity or stiffness of the limbs and trunk;
- Bradykinesia, or slowness of movement; and,
- Postural instability or impaired balance and coordination.

These and other symptoms of Parkinson's may reveal themselves in many ways, for example:

- Cognitive issues;
- Constipation - this is common in Parkinson's and is caused by a reduction in the ability of the bowel to contract.
- Dementia;
- Depression (common);
- Difficulty swallowing (dysphagia);
- Drooling of saliva;
- Excessive sweating;
- Greasy skin (seborrhoea);
- Handwriting may become small (micrographia);
- Impaired speech;
- Loss of automatic movements (hand gestures, eye blinking, etc);
- Loss of coordination and balance (postural instability);
- Loss of facial animation - fixed, staring expression with little emotion causing a "mask like" facial expression;
- Reduced blinking frequency;
- Rigid muscles;
- Skin sensations and pain - many people develop unusual skin sensations, such as electric or tingling sensations of the limbs. They are often more prominent at night.
- Slowed motion (Bradykinesia);
- Stooped posture;
- Tiredness - some people find tiredness can be improved with regular exercise and rest.
- Tremors of limbs when at rest, increasing during times of stress;
- Voluntary movements have less amplitude (hypokinetic). e.g. arms move less when walking.
- Walking issues - difficulty walking or starting to walk, walking with slow shuffling steps or walking with rapid small steps (festination). 'Freezing' often occurs when changing direction.

When at least two of these symptoms are present, and especially if they are more evident on one side than the other, then this is a fairly strong indication of Parkinson's.

Symptoms typically begin on one side of the body and spread over time to the other side as the disease progresses.

These symptoms are discussed further below.

7.1 Tremors

These tremors often start with a slight shaking in part of the hand or even just one finger and later extend to the entire arm. At other times, the hand tremors may be experienced as a back-and-forth rubbing of a thumb and forefinger, an activity known as *pill rolling*. Tremors occur in limbs even when they are at rest. Tremors may also develop in your head, lips, or feet, and on just one side of your body or both sides of your body. The tremors may become especially pronounced during times of stress or anxiety. Although the tremors caused by Parkinson's can be very distressing, they are rarely disabling and they often disappear during sleeping and resting.

7.2 Slowed Motion (Bradykinesia)

Parkinson's Disease may eventually cause certain muscles to freeze up, making it hard to perform or resume normal movements. This can cause great distress because it can make the simplest of tasks difficult and time-consuming to perform.

For example, Parkinson's Disease may eventually force a person to move with a slow, shuffling, unsteady walk and a stooped posture.

This symptom isn't limited to external muscle movement, control of muscles inside the body can also be impaired. For example, the muscles in the digestive tract may also slow down, causing problems with swallowing, digestion, and elimination. The resulting constipation is a common symptom for people with Parkinson's Disease, and one that causes a lot of problems.

7.3 Difficulty Swallowing

Problems with swallowing food can develop during the later stages of the Parkinson's. In all but the most advanced and extreme cases, people who have trouble swallowing can continue to eat on their own.

7.4 Rigid Muscles

Rigid muscles or muscle stiffness often occurs in the limbs and neck, and can be so severe that it limits the extent of arm, leg, and head movements.

7.5 Loss of Automatic Movements

Humans normally exhibit a range of automatic movements that we perform without thinking about them. For example, blinking, smiling, moving your arms back and forth when you walk, moving your arms and making gestures when talking, and so on are all unconscious acts that are a normal part of being human.

For Parkinson's sufferers, these acts are diminished or even lost completely. In their place, some people may develop a fixed staring expression with unblinking eyes, or they may no longer use hand gestures when talking, or they may seem frozen and rigid while speaking.

7.6 Impaired Speech

Because of the lack of muscle control caused by the disease, many people with Parkinson's have some trouble speaking, and their voices often become monotone and very soft.

This problem may be especially difficult for older people because the soft voice of a person with Parkinson's may not be easily heard by a spouse or partner with poor hearing.

7.7 Dementia

The term *dementia* literally means loss of mentation or thinking. Dementia is a broad term which describes the loss of memory, intellect, rationality, social skills and normal emotional reactions.

Most people with dementia are older, but it is important to remember that most older people do not get dementia. It is not a normal part of the ageing process. Dementia can happen to anybody, but it is more common in people over 65 years of age. People in their 40's and 50's can also develop dementia.

A small percentage of people with Parkinson's go on to develop dementia late in the course of the disease. Although dementia is often associated with *Alzheimer's Disease*, dementia can also occur with a range of other conditions.

For Parkinson's sufferers, the onset of dementia is often marked by slowed thought processes and problems with concentration.

7.8 Symptoms by Stage of Disease

Not every Parkinson's sufferer will experience all of the symptoms listed above at each stage of the disease. Some symptoms, such as dementia, only develop in some people, and then only in the latest, most progressed stages of the disease.

At each stage of the Parkinson's Disease, as the disease progresses, the symptoms become more pronounced and more severe.

In addition, many of the symptoms may be caused or exacerbated by the various side-effects of the medication and drugs being used to help control other, more troublesome and debilitating symptoms of Parkinson's. See section "9.3 Medications and Drugs" below.

8 Diagnosing Parkinson's Disease

It's important to seek medical advice if you experience or notice any of the symptoms associated with Parkinson's - not only to diagnose and test for the presence of the disease but also to rule out other causes for the symptoms.

Although Parkinson's Disease can sometimes be difficult to diagnose, getting an accurate diagnosis is important so that appropriate treatment can be started as soon as possible. This treatment may halt or delay the onset of the disease as well as help manage the various symptoms of the disease.

Unfortunately at the current time, no definitive tests exist for Parkinson's Disease, making the disease can be difficult to diagnose, especially in its early stages.

Various drugs and medications, aging, and other conditions can cause some mild, Parkinson's-like symptoms, and this can make diagnosing Parkinson's in some people more difficult. In addition, doctors sometimes miss Parkinson's disease in younger people because they may believe that it mainly affects older adults.

A diagnosis of Parkinson's Disease is based on medical history, observations of the symptoms, and a neurological examination. As part of your medical history, your doctor will especially want to know about any medications you are taking and whether your family has a history of Parkinson's. The neurological examination includes an evaluation of your walking and your ability to perform and coordinate some simple tasks.

During this examination, your doctor may also notice some other subtle signs of Parkinson's, such as reduced facial expressions, a lack of gestures, or a subtle tremor.

9 Treatment for of Parkinson's Disease

There is no particular hurry to begin treatment for the symptoms of Parkinson's. If treatment is not started immediately, then the person is not disadvantaged in any way. In fact, some specialists suggest that a person waits until their symptoms are causing some difficulties with their daily living before they start treatment.

At this time no medication or drug has been shown to slow or stop the progression of this Parkinson's. A variety of medications provide dramatic relief from the symptoms. Various physical therapies and muscle-strengthening exercises can also be beneficial in reducing the most troublesome symptoms of Parkinson's. In some cases, surgery is an appropriate treatment.

There is no standard or "best" treatment for Parkinson's, and various treatments are available in the following categories:

- Avoid the Risks
- Therapy and Life Style

- Medications and Drugs
- Surgery

When physical therapy and lifestyle changes are not enough to combat or reduce the effects of Parkinson's, your doctor will likely recommend certain medications, either alone or in combination. Eventually, as the disease progresses, a surgical procedure may be required.

9.1 Avoid the Risks

By reducing or eliminating as many of the risk factors as possible (for example, see section “6.4 Exposure to Pesticides and Herbicides” above), it should be possible to greatly reduce your chances of developing Parkinson's as a result of these causes.

9.2 Therapy and Life Style

Physical therapy and lifestyle changes should be considered the primary or front-line defense against Parkinson's. When physical therapy and lifestyle changes are not enough to combat or reduce the effects of Parkinson's, your doctor will likely recommend certain medications, either alone or in combination. Eventually, as the disease progresses, a surgical procedure may be required.

The following therapies and life style changes can help:

- Healthy Eating
- Exercise
- Physical Therapy
- Sleep
- Speech Therapy

These are discussed below.

9.2.1 Healthy Eating

A healthy diet and regular exercise are beneficial treatments for many health issues, and Parkinson's is no exception to this rule. If you are suffering from Parkinson's, ensure that you eat healthy diet with lots of fruit and vegetables, and whole grains. These foods contain natural anti-oxidants that help protect against free radical damage. They are also high in fiber, which is important for helping prevent constipation.

If you take a fiber supplement, such as psyllium powder, Metamucil or Citrucel, be sure to introduce it gradually and drink plenty of fluids daily. Otherwise, your constipation actually may become worse. If you find that fiber helps your symptoms, use it on a regular basis for the best results.

9.2.2 Exercise

Regular exercise is extremely important for people with Parkinson's Disease, because it provides a number of important benefits, including improved mobility, balance, range of motion, and emotional well-being.

Your doctor or physical therapist may recommend a formal exercise program, but any physical activity, including walking, swimming or gardening, is beneficial. Weight-bearing exercises, such as walking, jogging and dancing, are also beneficial.

Keep in mind that your energy level may go up and down as a result of your medications, so you should pace yourself and select the best times for exercise. For example, if you are tired, try doing one part of your exercise routine at one time of day and doing another routine later in the day. Select times to exercise when your medicines are working well and you feel strong.

Be sure to warm up and stretch before and after you exercise, as this will help prevent stiffness while also improving your flexibility and balance.

Parkinson's Disease can disturb your sense of balance and physical coordination, making it difficult to walk and move normally. Be careful to keep within your limits and avoid falls.

9.2.3 Physical Therapy

Physical therapy can be extremely beneficial for people with Parkinson's Disease in all stages of the disease and as the disease progresses. Physical therapy can help improve mobility, range of motion, and muscle tone.

Even though specific exercises cannot stop the progress of the disease, improving muscle strength can help you feel more confident and capable.

A physical therapist can also work with you to improve your walking gait, posture, and balance.

9.2.4 Sleep

The brain recharges its dopamine levels overnight, so a good night's sleep is beneficial for Parkinson's sufferers. Most people with Parkinson's feel that they have good mornings and tend to deteriorate throughout the day. Most people also find that a good night's sleep leads to day with less pronounced symptoms of Parkinson's.

9.2.5 Speech Therapy

For many people suffering from Parkinson's, working with a speech pathologist can help improve problems with speaking and swallowing.

9.3 Medications and Drugs

Parkinson's Disease occurs when the dopamine producing neurons in the *substantia nigra* are damaged or destroyed. An obvious treatment is to supplement the missing dopamine with medication.

Unfortunately, treatment with dopamine itself isn't possible, because dopamine doesn't cross the body's blood-brain barrier. The tightly packed cells in the walls of the brain's capillaries prevent certain substances from crossing into the brain, including dopamine. As a result, dopamine cannot be directly administered to a patient to boost their dopamine levels to reduce or reverse the effects of Parkinson's.

However, a range of other medications and treatments can be used to treat Parkinson's.

Medications can also be used to manage problems cause by various Parkinson's symptoms, including walking, general movement, and tremors by increasing the brain's supply of dopamine.

For many people with Parkinson's, the initial improvement following treatment with drugs and medicines can be dramatic. However, over time the benefits of drugs frequently diminish or become less consistent, although symptoms can usually still be fairly well controlled. Because medications may become less effective over time, your doctor will also recommend lifestyle changes, such as physical therapy, a healthy diet, and exercise.

For many Parkinson's medications, the dosage needs to be adjusted over time to improve the effectiveness of the drugs, and/or to manage the side-effects of the drugs. Your doctor will work with you to design a treatment program that best suits your situation.

The medications used to treat Parkinson's disease include:

- Levodopa (carbidopa, benserazide)
- Dopamine Agonists
- Selegiline (Atapryl, Carbex, Eldepryl)
- COMT Inhibitors (Entacapone, Tolcapone)
- Anticholinergics
- Amantadine (Symmetrel, Symadine)
- Co-enzyme Q-10

These drugs and their side-effects are discussed below.

Please Note: The list of side-effects below is not complete, and patients should consult their physician if these or other side-effects develop while they are taking any of these medications. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.1 Levodopa (carbidopa, benserazide)

The drug *levodopa*, commonly known as *L-dopa*, has been used since the 1960's as the main treatment for Parkinson's Disease.

Parkinson's Disease occurs when the dopamine producing neurons in the *substantia nigra* are damaged or destroyed. An obvious treatment is to supplement the missing dopamine with medication.

Unfortunately, treatment with dopamine itself isn't possible, because dopamine doesn't cross the body's blood-brain barrier. The tightly packed cells in the walls of the brain's capillaries prevent certain substances from crossing into the brain, including dopamine. As a result, dopamine cannot be directly administered to a patient to boost their dopamine levels to reduce or reverse the effects of Parkinson's.

Levodopa is a naturally occurring substance that is found in plants and animals. The compound is actually a precursor to dopamine, and it can cross the blood-brain barrier. As a result, when given to people with Parkinson's, levodopa is converted into dopamine by nerve cells in the brain.

When administered on its own, blood enzymes, known as AADCs, break down much of the levodopa prior to it reaching the brain. As a result, only a small amount of levodopa crosses the blood-brain barrier and reaches the brain. However, combining levodopa with an decarboxylase enzyme inhibitor, such as *carbidopa* (*Sinemet*, or *benserazide*), allows more levodopa to reach the brain and helps reduce some of the side-effects of this therapy. *Sinemet CR* is a prolonged-release version of this drug.

Levodopa is absorbed into the blood stream in the gut and then transported to the brain, where it is transformed into dopamine. There, it is then released by brain cells and triggers dopamine receptors which allows the movement control parts of the brain to return to normal levels of operation.

The resulting increase in dopamine levels can reverse many of the disabling symptoms of Parkinson's disease, but as time passes, side-effects may increase and dosage adjustments will be required to compensate.

Levodopa is available in two main forms: a standard (or immediate) release form and a long-acting (controlled-release) form. The controlled release form provides a prolonged effect by slowing down the rate of levodopa absorption in the gut.

9.3.2 Levodopa (carbidopa, benserazide) – Side-effects

During early treatment, the side-effects from levodopa therapy are usually more than offset by the benefits of the treatment. However, as the disease progresses, levodopa works less evenly and less predictably, and the side-effects caused by the treatment become more pronounced.

Some of the side-effects of levodopa treatment include:

- Confusion,

- Discoloration of urine/sweat
- Dizziness,
- Drop in blood pressure (especially when standing) (a condition called *orthostatic hypotension*),
- Dry mouth,
- Hallucinations,
- Involuntary / abnormal movements (a condition known as *dyskinesia*),
- Nausea,
- Sweating,
- Vomiting,
- Waxing and waning of the response to the drug (wearing off effects) is common.

With long term use, levodopa can also cause:

- Involuntary / abnormal movements (a condition known as *dyskinesia*),
- Neuropsychiatric problems, including confusion, hallucinations, and psychosis.

In spite of these side-effects, levodopa often allows people with Parkinson's to extend the amount of time that they are able to lead relatively normal lives and, in many cases, it is effective for a number of years.

In addition to these side-effects, levodopa can become less effective as the disease progresses and the symptoms become more severe, and the beneficial responses to levodopa can also become more erratic over time.

Response fluctuations may occur after 2-3 years of use.

For these reasons newer drugs are often used, either alone or with levodopa.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.3 Dopamine Agonists

This class of drugs includes the older dopamine agonists:

- bromocriptine (Parlodel)

- pergolide (Permax)

and the newer drugs:

- pramipexole (Mirapex)
- ropinirole (Requip)
- cabergoline (Dostinex)
- apomorphine
- lisuride (Dopergine)

Unlike levodopa, these dopamine agonist drugs aren't changed into dopamine inside the brain. Instead, they mimic the effects of dopamine inside the brain and allow the brain neurons to act as though sufficient amounts of dopamine were present. Dopamine agonists may be used in addition to levodopa therapy. In younger adults, dopamine agonists may be used instead of levodopa.

The various dopamine agonists vary in chemical structure, the range of side-effects that they cause, and their duration or length of action. For example, lisuride has a short duration, while pergolide has the longest duration.

The side-effects and benefits of a particular drug can vary from person to person. If one drug does not reduce symptoms or causes unwanted side-effects, then another dopamine agonists may be better.

9.3.4 Dopamine Agonists – Side-effects

The side-effects of dopamine agonists are similar to those of levodopa:

- Confusion,
- Dizziness,
- Drop in blood pressure (especially when standing) (a condition called *orthostatic hypotension*),
- Dry mouth,
- Hallucinations,
- Involuntary / abnormal movements (a condition known as *dyskinesia*),
- Nausea,
- Sweating (particularly around the ankles),
- Vomitting,

- Waxing and waning of the response to the drug (wearing off effects) is common.

However, dopamine agonists are less likely to cause involuntary movements than levodopa and more likely to cause hallucinations, sleepiness, and confusion.

While these symptoms are common when starting a dopamine agonist, they typically decline over several days.

Avoid dopamine agonists and talk to your doctor if you have experienced these side-effects.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.5 Selegiline (Atapryl, Carbex, Deprenyl, Eldepryl)

This drug helps prevent the breakdown of both naturally occurring dopamine and dopamine formed from levodopa, by blocking the action of monoamine oxidase type B. Selegiline is often used in addition to levodopa therapy.

Selegiline prevents the breakdown of dopamine by inhibiting the activity of the enzyme *monoamine oxidase B (MAO-B)*, an enzyme that metabolizes or breaks down dopamine in the brain.

Initially it was hoped that selegiline might reduce the rate at which Parkinson's Disease progresses, but this now appears not to be the case. Selegiline also has a slight anti-depressant effect.

9.3.6 Selegiline (Atapryl, Carbex, Deprenyl, Eldepryl) – Side-effects

Toxic reactions have occurred in some patients who took selegiline with the narcotic drug *demerol*. Selegiline can also cause the following side-effects:

- Heartburn, Nausea,
- Dry mouth,
- Dizziness,
- And, on rare occasions, confusion, nightmares, hallucinations, and headache.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.7 COMT Inhibitors (Entacapone, Tolcapone)

COMT (Catechol-O-MethylTransferase) Inhibitors are relatively new drugs that prolong the effect of levodopa therapy by blocking an enzyme that breaks down dopamine in the liver and other organs.

Tolcapone (Tasmar) is a potent COMT inhibitor that easily crosses the blood-brain barrier.

Entacapone (Comtan) is a COMT inhibitor that shares some of the properties of tolcapone but doesn't cross into the brain. This drug may help manage fluctuations in the response to levodopa in people with Parkinson's Disease.

Entacapone has been combined with *carbidopa* and levodopa in a medication called *Stalevo*.

9.3.8 COMT Inhibitors (Tolcapone, Entacapone) – Side-effects

COMT Inhibitors may cause:

- Involuntary / abnormal movements (a condition known as *dyskinesia*),
- Hallucinations,
- Diarrhea,

In addition, tolcapone has been linked to liver damage and liver failure. In fact, tolcapone is no longer available or licensed in the UK due to some deaths due to liver failure. In countries where the drug is still available, it is used only in people who aren't responding to other therapies. People who take tolcapone should have regular blood tests to monitor their liver function.

Entacapone is relatively safe and doesn't cause liver problems.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.9 Anticholinergics

Anticholinergic medications are the oldest Parkinson's medications available, and were the main treatment for Parkinson's before the introduction of levodopa in the 1960's. Anticholinergic medications generally reduce tremor or rigidity, especially in the early stages of Parkinson's. Anticholinergics can be taken either on their own or with levodopa. Because of their side-effects, such as increased confusion, these drugs tend not to be used with elderly patients.

A number of anticholinergic drugs, such as *trihexyphenidyl* (*Artane*), *Benzhexol*, and *benztropine* (*Cogentin*), are available.

However, they only tend to be mildly beneficial, and sometimes the mild benefits are outweighed by significant side-effects.

The antihistamine *diphenhydramine* (*Benadryl*) and antidepressants such as *amitriptyline* work much like anticholinergics and may be used in older adults who cannot tolerate the side-effects caused by anticholinergics.

9.3.10 Anticholinergics – Side-effects

The side-effects of anticholinergics include:

- Blurred Vision,
- Confusion,
- Constipation (severe).
- Delirium,
- Dry mouth,
- Hallucinations,
- Involuntary / abnormal movements (a condition known as *dyskinesia*),
- Nausea,
- Urine retention - especially in men with an enlarged prostate,
- Various mental problems, including confusion, memory loss, and hallucinations.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.11 Amantadine (Symmetrel, Symadine)

Initially, amantadine was envisaged as an anti-viral medication. However, by chance amantadine was also found to have a beneficial effect on the symptoms of Parkinson's. It may be used alone or with levodopa or dopamine agonists. Amantadine helps to reduce tremor, bradykinesia, and fatigue in some Parkinson's sufferers. For people with more advanced Parkinson's, amantadine may reduce motor fluctuations, in particular, dyskinesia. Amantadine can also help with the side-effects caused by prolonged levodopa usage, such as involuntary movements (dyskinesia).

9.3.12 Amantadine (Symmetrel, Symadine) – Side-effects

The side-effects of amantadine drugs are usually mild, but they may include:

- Agitation,
- Confusion,
- Difficulty in concentrating,
- Hallucinations,
- Insomnia,
- Nightmares,
- Purple mottling of the skin,
- Swollen ankles.

If you experience these or any other side-effects, discuss them with your doctor. It may be necessary to change the dosage of your medication or change to another medication which may be more suitable for you.

9.3.13 Co-enzyme Q-10

Small structures within your cells called mitochondria manufacture substances that are essential for the cells to work normally. One of these substances is Co-enzyme Q-10. Co-enzyme Q-10 is an enzyme which transports electrons during cellular respiration, which allows cells get their energy from oxygen. Co-enzyme Q-10 is manufactured by mitochondria within the cells.

People with Parkinson's Disease also tend to have low levels of Co-enzyme Q-10. Boosting your levels of Co-enzyme Q-10 can help reduce some of the effects of Parkinson's.

You can buy Co-enzyme Q-10 without a prescription in drug and natural food stores. Some products may be more effective than others.

9.3.14 Co-enzyme Q-10 – Side-effects

There are no adverse side-effects associated with taking Co-enzyme Q-10.

9.4 Surgery

Before the development of levodopa in the 1960's (see section "9.3 Medications and Drugs" above), surgical procedures were commonly used to treat Parkinson's Disease. Since then, the surgical procedures have fallen from favor, but they are now seeing a resurgence. The following surgical procedures may be appropriate when symptoms cannot be controlled with medications:

- Thalamotomy
- Pallidotomy
- Deep Brain Stimulation

These procedures and their side-effects are discussed below.

9.4.1 Thalamotomy

Thalamotomy involves the surgical destruction of small amounts of tissue in the *thalamus*, a major brain center for relaying messages and transmitting sensations.

This procedure has been used for years to reduce tremor in people with Parkinson's, although it's not helpful for controlling the other symptoms of Parkinson's, such as muscle rigidity and slowed movement.

9.4.2 Thalamotomy - Side-effects

Thalamotomy can cause various side-effects, such as slurred speech and sometimes lack of coordination when performed on both sides of the brain. To avoid these side-effects, the surgery is usually performed on one side of the brain only, with the benefits confined to one side of the body.

9.4.3 Pallidotomy

Pallidotomy improves various symptoms of Parkinson's, such as tremors, muscle rigidity, and slowed movement, by interrupting the neural pathway between the pallidum and the thalamus. This treatment is very effective in reducing the involuntary movements caused by drug therapy.

In this procedure, an electric current is used to destroy a tiny amount of tissue in the *pallidum* (globus pallidus), a part of the brain that has been linked to many of the symptoms of Parkinson's.

There has been renewed interest in pallidotomy since improved imaging techniques have allowed surgeons to pinpoint the areas to be treated with greater precision.

Although pallidotomy has been helpful for some aspects of Parkinson's in some people, it's not a cure all, and in many cases benefits may not be permanent.

9.4.4 Pallidotomy - Side-effects

Pallidotomy can cause a range of side-effects, including slurred speech, disabling weakness, and vision problems, especially when performed on the left and right sides of the body.

9.4.5 Deep Brain Stimulation (DBS)

Another treatment that has had encouraging results is *Deep Brain Stimulation (DBS)*. For some people, DBS can be so successful and control some Parkinson's symptoms, such as shaking and trembling, so well that medications can be greatly reduced.

The DBS consists of a stimulator unit, similar to a heart pacemaker, which is surgically implanted in the chest wall and transmits electric impulses through a wire to tiny electrodes placed in a structure deep within the brain.

This brain structure, the *subthalamic nucleus*, controls many aspects of motor function.

The DBS device produces the same effects as pallidotomy and thalamotomy, but because it can be turned on and off, the effects can be controlled.

Deep Brain Stimulation has markedly improved the symptoms of Parkinson's for many people.

Deep Brain Stimulation isn't beneficial for people who don't respond to levodopa. In addition, the device isn't appropriate for use by people who already have serious difficulty with thinking and memory because it may make those symptoms worse.

9.4.6 Deep Brain Stimulation (DBS) - Side-effects

Potential risks exist with Deep Brain Stimulation, including infection caused by the wire connecting the electrode to the stimulator and the need to periodically perform minor surgery to change the unit's battery.

10 Experimental Therapies

A range of experimental treatments for Parkinson's are also being researched, and some of these research areas include:

- Cell Transplant Therapy
- Gene Therapy
- Growth Factor Delivery

These procedures and their side-effects are discussed below.

10.1 Cell Transplant Therapy

The surgical transplant of *fetal substantia nigra cells* has been performed in several hundred patients to date in multiple centers throughout the world.

The results for this procedure have been encouraging for some patients, but two recent double-blind placebo-controlled studies showed that consistent benefit was only seen in young Parkinson's patients (age 60 or below), and side-effects were significant in some patients.

For example, some patients developed off-medication dyskinesias (uncontrolled movements) even without any levodopa or other dopaminergic medication.

The lack of consistently good results and the significant side-effects encountered indicate that further research – particularly in animals - is needed.

Another cell transplant technique that shows some promise is the use of *retinal pigment epithelial cells*. These cells are derived from tissue at the back of the eye, and they produce and release dopamine. An open-label trial in six advanced Parkinson's patients has shown promise, and further trials and research are underway.

10.2 Gene Therapy

Gene Therapy has currently been tried in only a few Parkinson's patients to date, and the procedure is still highly experimental.

While experiments in animals with Parkinson's have shown promise, further research is needed.

10.3 Growth Factor Delivery

Glial Cell-Derived Neurotrophic Factor (GDNF) stimulates the growth of new dopamine producing neurons in animals.

In initial trials with a small number of patients, direct delivery of GDNF to the brain produced promising results. However, in recent larger trials, the treatment failed to produce the same high levels of results.

Further research is needed, especially regarding how to improve delivery of growth factors to the correct targets in the brain.

11 Complications Associated with Parkinson's Disease

In addition to the complications resulting from the symptoms of the disease, and medications for the disease, a variety of other complications can also result from Parkinson's. As such, the complications associated with Parkinson's Disease can be divided into the following categories:

- Complications Resulting from the Symptoms
- Complications Resulting from Medications
- Complications Resulting from Parkinson's

Each of these complication areas are discussed below.

11.1 Complications Resulting from the Symptoms

In section 7, the signs and symptoms of Parkinson's Disease are listed as:

- Tremors
- Slowed Motion (Bradykinesia)
- Difficulty Swallowing
- Rigid Muscles
- Loss of Automatic Movements
- Impaired Speech
- Dementia

There are a range of complications associated with Parkinson's which directly relate to the worsening of these symptoms as the disease progresses. Examples include tremors, difficulty coordinating movement, various movement and mobility issues, and speech problems. In some cases, people with Parkinson's may eventually develop dementia, a condition that can cause memory loss, impaired judgment, and personality changes.

11.2 Complications Resulting from Medications

The various medications and drugs used to treat Parkinson's Disease may cause a number of complications, including:

- Confusion,
- Drop in blood pressure (especially when standing) (a condition called *orthostatic hypotension*),
- Dry mouth,
- Hallucinations,
- Involuntary movements (a condition known as *dyskinesia*),

- Liver damage / failure,
- Memory loss
- Nausea,
- Purple mottling of the skin,
- Severe constipation,
- Sleepiness,
- Swollen ankles,
- Urine retention - especially in men with an enlarged prostate,

11.3 Complications Resulting from Parkinson's

One of the most common complications associated with Parkinson's is depression. Almost half of the people with Parkinson's develop depression, and, in some cases, depression can start months or years before Parkinson's is even diagnosed. This depression is caused by changes to the brain that are brought about by Parkinson's.

Other complications of Parkinson's disease include:

- **Difficulty Chewing and Swallowing:** In the later stages of Parkinson's, the mouth and throat muscles may be so affected that eating, chewing, and swallowing become quite difficult.
- **Urinary issues:** Some of the medications used to treat Parkinson's Disease may cause either urinary incontinence or urine retention. However, Parkinson's Disease itself cause the same problems independently of any medication.
- **Constipation:** Constipation can be a side effect of the medications used to treat Parkinson's. However, Parkinson's Disease itself cause the same problems independently of any medication because the digestive tract works more slowly.
- **Sleep issues:** People with Parkinson's often have trouble getting to sleep and staying asleep. During the night, they may be restless and may get up frequently. They may even act out their dreams, a condition that is called *rapid eye movement sleep behavior disorder*. Some of the problems with sleep may be associated with depression.

- **Sexual Dysfunction:** A decrease in sex drive and sexual desire is perfectly normal as people age. However, some people with Parkinson's may also notice a decreased sexual desire (libido). This may be caused by a combination of the psychological and/or physical factors associated with Parkinson's.

12 Living and Coping with Parkinson's

Over time, the symptoms of Parkinson's become more pronounced. A mild tremor becomes more bothersome and more noticeable. Difficulties may develop with cutting food or handling utensils with the affected limb. Eventually, bradykinesia (slowness in movement) becomes a significant problem and also tends to be the most disabling symptom. Slowness may interfere with daily routines, such as getting dressed, shaving or showering, and these activities may go from being "quick 5 minute tasks" to taking an hour or more.

In addition, symptoms may initially be restricted to one limb, but usually they will spread over time to the other limb on the same side. For example, from left arm to left leg, or right arm to right leg. Eventually, the symptoms will gradually spread to cover both sides of the body.

As the disease progresses and the symptoms become worse, it is important for patients to talk with their doctors so that optimal and appropriate treatment can be provided.

At this stage, treatment cannot totally abolish symptoms, but it can reduce the symptoms and enable the patient to manage their symptoms, function independently, and make the appropriate adjustments to the disease.

Patients are aware of the progressive nature of the illness and this can become a source of great anxiety and concern. It is not uncommon for patients to over-monitor themselves and their symptoms, compare themselves to other Parkinson Disease patients whom they may meet (length of diagnosis, level of symptoms, etc.), and avoid situations such as support groups, where they may see patients who are worse off than they are. Concern about the progression of the disease and the ability to continue working and operating independently are often voiced.

In this section, we discuss the following:

- Tremors
- Moving and Walking with Care

- Avoiding Falls
- Dressing
- Speaking
- Coping with Parkinson's

12.1 Tremors

Tremors may be the least disabling symptom of Parkinson's, but they can often be the most embarrassing for the patient. Patients try and hide the tremors by keeping their affected hand in their pocket, behind their back, or holding onto something. As a result, tremors may be more psychologically distressing than any physical limitation that it imposes. Your doctor will be able to help you manage the tremors.

12.2 Moving and Walking with Care

Parkinson's disturbs your sense of balance and physical coordination, making it difficult to walk normally. While it is important to get regular exercise, it is equally important not to push yourself too hard or further endanger your health by falling.

If you are walking and you notice yourself shuffling or freezing up, there are several things you can do to get moving again:

- Slow down and check your posture - it is best to stand up straight with your back straight and your head directly above your hips and your feet 8 to 10 inches apart.
- Practice taking long steps and exaggerate lifting your legs and swinging your arms.
- If you become stuck in place, an occurrence known as freezing, rock gently from side to side or pretend that you are stepping over an object on the floor.

12.3 Avoiding Falls

In the later stages of Parkinson's, you may fall more easily because the disease is affecting the balance and coordination centers of your brain. This may mean that you can be thrown off balance by just a small push or bump. The following will help:

- Take up exercises that help improve your balance, such as Tai Chi, as they can help improve your balance and strength. Tai Chi originated in China more than 1,000 years ago, and slow, graceful movements to relax and strengthen muscles and joints.
- Remove all area rugs from your home, and secure any loose steps or flooring that may cause you to trip and fall. Ensure floors are uncluttered, electrical cords are tucked away, and that passageways are wide enough to comfortably walk down.
- Install handrails, especially along stairways.
- Install grab bars around your tub and beside the toilet.
- Make sure you can reach the telephone from your bed and carry a cordless phone with you during the day so you don't risk having a fall while rushing to answer the phone.

12.4 Dressing

Dressing can be the most frustrating of all activities for someone with Parkinson's. The loss of fine motor control makes it hard to button and zip clothes, and the other symptoms caused by Parkinson's make it hard to step into a pair of pants or shoes. The following suggestions may help:

- Allow plenty of time so you don't feel rushed.
- Place clothes near to where you are dressing so they are within easy reach.
- Choose clothes that you can slip on easily, such as sweat pants, simple dresses or pants with elastic waistbands.
- Look for clothes and shoes with velcro fasteners, or replace buttons and zips on existing clothes with velcro.

12.5 Speaking

Even in the early stages of Parkinson's disease, your voice may become very soft or hoarse. In later stages, you may experience slurring. To communicate more easily:

- Practice reading out loud at home, focusing on your breathing and on having a strong voice.
- Face the person you're talking to, and deliberately speak a little louder and slower than you think is necessary.
- Speak for yourself - don't let others speak for you.
- Consulting a speech-language pathologist, who is trained to treat people with Parkinson's disease, may also help a lot.

12.6 Coping with Parkinson's

Living with any chronic illness can be difficult, and it's normal to feel angry, depressed and discouraged at times. In addition to the symptoms caused by Parkinson's, the disease also presents an additional range of problems because it can cause chemical changes in your brain that cause you to feel anxious or depressed.

Also, the medications and drugs used to treat Parkinson's can also cause depression and other mental changes, along with a range of nasty side-effects.

Furthermore, Parkinson's can be profoundly frustrating, particularly in the later stages of the disease when simple, every-day tasks take longer to accomplish, and walking, talking and even eating become more difficult.

The following suggestions may help you deal with the stress and frustration of living with Parkinson's:

- **Research.** Learn all you can about your illness. Understand your enemy, and what it is trying to do to you. Your local library, medical books, and the internet can be great sources of information. Find out how the disease progresses, ask about your prognosis for the future, and find out what your treatment options are, along with their side-effects. The more you know, the more pro-active you can be in your own care, and the more control you will have.

- **Pace Yourself.** Recognize that you cannot be as active as you were in your twenties, and learn to step back from work and delegate activities onto others.
- **Be Proactive.** Although you may often feel anxious or discouraged, don't let others - including your family and your doctors - make important decisions for you. Take an active role in your treatment.
- **Friends and Family.** Maintain a strong support system with your friends and family. Strong relationships are crucial in dealing with chronic illnesses. Friends and family are your best allies, and if they understand what you are going through, then they will be more accommodating and sympathetic to your situation, and they will also know what support you will need.
- **Join a Support Group.** Support groups aren't for everyone, but for many people, they can be a good resource for practical information about Parkinson's disease. You may also find that you develop lasting bonds with people who are going through the same experiences as you. Support groups also exist for the families of people with Parkinson's disease. To learn about support groups in your community, talk to your doctor, a Parkinson's disease social worker or a local public health nurse. Or contact the National Parkinson Foundation.
- **Minimize Stress.** A diagnosis of Parkinson's Disease does not mean that you have to stop working. Many people with the disease continue to hold either full- or part-time jobs. But you may need to approach work differently. Start by breaking your job into individual tasks. Then consider whether your symptoms will affect your ability to perform each task. Create a schedule that allows you to do the most challenging assignments when you're at your peak. You may be able to change to working part-time or even change jobs to ensure that you can cope with your work. Although you may not feel comfortable talking about your illness, it is always best to be candid with your supervisor. That way, they know what the score is and can work with you to make the adjustments necessary to meet your needs.
- **Your Partner.** Maintain good communication with your partner, because it is important that they know what the score is and understand what you are going through. Parkinson's may change your life and the lives of your loved ones in a number of ways, so it is best to talk honestly about these changes. You may longer be able to work

full time, and this may cause financial issues. As your symptoms worsen, or the side-effects of medication worsen, you will need additional time to perform tasks and additional care. You will also need to let your partner know when you need help and when you don't. Sometimes couples experience sexual problems, such as movement problems, impotence (men), and decreased libido (women). But these problems can often be helped or reduced. Discuss them with your doctor. Most important, try to talk frankly about your feelings and concerns. Repressed feelings can be harmful to your immediate well-being and long-term health, as well as harmful to your relationship with your partner.

- **Be honest with your Family.** If you have children, don't try to hide the diagnosis from them. They will usually sense when something is wrong in the family, and the anxiety and fear of not knowing is often worse than knowing the truth. In addition, children will want to help out where possible, and feel reassured that you are receiving proper care and treatment. Answering your children's questions honestly can help them cope.

13 Young-Onset Parkinson's

While Parkinson's is often considered an older persons condition and the average age of diagnosis is early 60's, many people younger than this are living with Parkinson's.

In fact, approximately 10% of people diagnosed with Parkinson's are under the age of 40.

In rare instances, Parkinson's-like symptoms can appear in children and teenagers. This form of the disorder, called "juvenile Parkinsonism," is viewed as a distinct disorder, which often is genetically determined. Juvenile Parkinsonism usually has a different course and treatment options than the typical later-life Parkinson's Disease.

Because Parkinson's can be often overlooked as a diagnosis in younger patients, it is thought that the number of cases occurring in individuals under 60 may actually be much higher than currently estimated.

With the advent of new drugs that may have neuro-protective benefit and slow the progression of the disease, it is important that an accurate diagnosis be made as soon as possible, particularly for younger people.

When Parkinson's disease is seen in individuals under the age of 40, it is called "young-onset" or "early-onset" Parkinson's Disease.

As is the case of older-onset Parkinson's disease, the speed and severity of the progression of young-onset Parkinson's disease can vary greatly among individuals. Although the neuropathology and most clinical symptoms are the same at whatever age Parkinson's disease develops, the psychological, social, and medical management implications are very different for people with young-onset Parkinson's.

Parkin mutations are believed to cause young-onset PD, with symptoms beginning usually in the 40s – see section "3.1 Genetic Factors".

14 Trends for Parkinson's Disease

Parkinson's Disease mostly develops in people after the age of 50, although the disease also affects a small percentage of younger people as well. Approximately, 0.1-0.2% of the population have Parkinson's, but for people over 50, people are ten times more likely to suffer from the disease, with 1-2% of the over 50's having Parkinson's.

Over 4 people million in the world have Parkinson's - more than those affected by Multiple Sclerosis (MS), Muscular Dystrophy, and Lou Gehrig's Disease combined. Over one million people in the United States have Parkinson's.

Current research indicates that Parkinson's Disease may result from a combination of genetic and environmental factors. The environmental factors include exposure to toxic substances, such as pesticides and herbicides.

Because of these causes for Parkinson's, the chances of developing the disease are fairly constant and low – the rates are not particularly increasing or decreasing.

15 Supporting Research into of Parkinson's Disease

To donate money towards Parkinson's research, please contact an Parkinson's Association in your area. See section "16 Further Information - Internet / WEB Links" below.

16 Further Information - Internet / WEB Links

16.1 Parkinson's Associations

Just about every country and state / county has their own Parkinson's Association.

To find the Parkinson's Association in your area using the internet, go the to **Google** web site :

<http://www.google.com>

and type in : "Parkinson's Association" +*location*. For example, searching on the following :

"Parkinson's" +"New Jersey"

"Parkinson's" +"South Australia"

will list the Parkinson's Association(s) is New Jersey (USA) and South Australia respectively.

The following are some useful web links that can provide a wealth of information about Parkinson's.

- American Parkinson Disease Association

<http://www.apdaparkinson.org>

- National Parkinson Foundation

<http://www.parkinson.org/>

- Parkinson Alliance

<http://www.parkinsonalliance.net>

- Michael J. Fox Foundation for Parkinson's Research
<http://www.michaeljfox.org>

- Parkinson's Action Network (PAN)
<http://www.parkinsonsaction.org>

- Parkinson's Disease Foundation (PDF)
<http://www.parkinsons-foundation.org>

- Parkinson's Institute
<http://www.parkinsonsinstitute.org>

- Parkinson's Resource Organization
<http://www.parkinsonsresource.org>

- Worldwide Education & Awareness for Movement Disorders (WE MOVE)
<http://www.wemove.org>

16.2 Clinical Trials

- ClinicalTrials.gov
<http://www.clinicaltrials.gov>

- Advanced Parkinson's Therapies (APT)
<http://www.pdtrials.org>

17 Glossary of Terms

The following definitions are used throughout this book:

- **Alzheimer's Disease:** The most common form of dementia, a group of brain disorders that impair a person's mental functioning, especially memory, thinking, and behavior.
- **Co-enzyme Q-10:** is an enzyme which transports electrons during cellular respiration, which allows cells get their energy from oxygen. Co-enzyme Q-10 is manufactured by mitochondria within the cells.
- **Dementia:** Significant loss of intellectual abilities such as memory capacity, severe enough to interfere with social or occupational functioning.
- **Dopamine:** is a chemical released by cells in the *substantia nigra* section of the brain. This chemical transmits signals between the nerve cells in this part of the brain and the *corpus striatum*, another section of the brain. These signals allow your muscles to make smooth, controlled movements.
- **Estrogen:** also known as *oestrogen*, is a group of steroid compounds that function as the primary female sex hormone. Estrogens are present in both men and women, but they are usually present at significantly higher levels in women of reproductive age. Estrogens promote the development of female secondary sexual characteristics, such as breasts, and are also involved in the thickening of the *endometrium* and other aspects of regulating the menstrual cycle.
- **Folate:** Folate is a B vitamin that is necessary for the production and maintenance of new cells. Folate occurs naturally in food. Folic acid is the synthetic form of this vitamin that is found in supplements and fortified foods. Folate is especially important during periods of rapid cell division and growth such as infancy and pregnancy, and it is also used to make normal red blood cells and prevent anemia.
- **Magnetic Resonance Imaging (MRI):** A special radiology technique using magnetism, radio waves, and a computer to create images of the internal structures of the body, especially the brain.
- **Mitochondria:** are the "power plants" of cells, because their primary function is to convert organic materials into energy.

- **Neurodegenerative:** A condition or disease marked by or pertaining to neurologic degeneration, that is, deterioration of the structure or function of tissue within the nervous system.
- **Neurologist:** A doctor who specializes in the diagnosis and treatment of disorders of the brain and nervous system.
- **Neuron:** One of the types of cells that constitute nervous tissue. Neurons are capable of transmitting and receiving nervous impulses. The adult human brain contains billions of neurons.
- **Neurotransmitter:** A substance that transmits nerve impulses from one cell to another across a synapse. Examples include *norepinephrine* and *acetylcholine*.
- **Oestrogen:** see *Estrogen*.
- **Parkinson's Disease:** is a disorder that affects nerve cells (neurons) in the part of the brain controlling muscle movement. Parkinson's Disease is characterized by trembling, muscle rigidity, difficulty walking, and, problems with balance and coordination.
- **Pathology:** The study of the essential nature of diseases and especially of the structural and functional changes produced by them in living organisms.
- **Plaque:** A localized abnormal patch on a body part or surface.
- **Stroke:** Refers to the death of a piece of brain tissue because the blood vessels which supply it are blocked or interrupted.
- **Synapses:** are the nerve-fiber connections in the brain that enable neurons to communicate with one another.
- **Tangles:** Twisted fibers that build up inside the nerve cells.
- **Thalamus:** a major brain center for relaying messages and transmitting sensations.
- **Transgenic:** Having genetic material (DNA) from another species. This term is applied to any organism that has genes from any other organism, regardless of whether these have been incorporated artificially or naturally.

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